

Harmonizing GIS Education: South – North Perspectives

Lessons learnt from Mozambique, Rwanda, Sweden, and Uganda

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Abstract

The aim of this paper is to critically examine, discuss, draw conclusions, and come up with ideas how to harmonize GIS education in order to realize the envisaged clientele benefits globally. The paper draws experiences and lessons learnt, with examples from ongoing joint GIS MSc programs/courses being implemented in Mozambique, Rwanda, and Uganda. All the five courses (3 in Uganda, 1 in Mozambique, and 1 in Rwanda) are currently financially supported by the Swedish International Development Cooperation Agency (Sida) capacity development and institutional development grants. The GIS programmes and course units in the southern institutions have a high demand from clients, especially at graduate level. However, their implementation and uptake is impeded by challenges like credit systems, pedagogic approach, field work, student interaction, and software, which are discussed. It is concluded that there is still a long way to go before harmonization, allowing GIS students to freely move between different countries during their education, is possible. Low/no cost exchange of teachers and “best practice” are identified as important initial steps to reach harmonization, focusing on younger teachers, as well as exchange of material and use of open source GIS software.

Keywords: GIS education, Harmonization, Mozambique, Rwanda, Sweden, Uganda

1 Introduction

There is an on-going cooperation between universities in East/South-East Africa and Sweden regarding development of GIS related masters (MSc) programmes. Three programmes are being developed in Uganda, at Makerere University, one is developed in Rwanda, at University of Rwanda (UR), and one is developed at University Eduardo Mondlane (UEM) in Mozambique. Lund University (LU) in Sweden is involved in all these five programmes.

A new MSc program in GIT for sustainable environmental development is being designed at UEM. The aim of the program is to train students to get expert knowledge in GIT and its applications in environmental/disaster management. For the development of the curriculum, existing materials at UEM, LU, Royal Institute of Technology (KTH) in Stockholm, and North West University (NWU) in South Africa will be used. In addition, through establishing workshops, the opinion of experts and students in Mozambique will be collected and used. Academic staff of UEM together with LU, KTH, and NWU will outline and carry out a research based and thematically appropriate programme for the MSc-students. Courses included will be

focused on a progression of the curricula of the revised BSc-programme in order to maintain a high level of academic competence in line with the educational commitments.

Between 2014 and 2017, a new MSc program in GIScience for Land Administration was designed at University of Rwanda (UR) and the first intake will start in October 2018. Given that Rwanda is a densely populated country where land related matters are highlighted as one among the top agenda of the government priorities, the aim of this MSc program is to increase the number of qualified staff in land administration and management by using geospatial technology. The proposed program will attract not only Rwandan students but also students from Kenya, South Sudan, and Uganda in the framework of the Northern Corridor Integration Projects (NCIPs), where UR has been designated as a regional Centre of Excellence in GIS related trainings.

For the first intake (2018 – 2020), students will be taught by leading academics from UR, and Swedish lecturers from Lund University (LU) and Royal Institute of Technology (KTH) in the framework of the on-going UR–Sweden Program for Research, Capacity Building and Institutional Advancement (2013–2019). After the first intake, new Rwandan PhD holders educated in Sweden will join the team of UR academic staff for the smooth running of the program.

At Makerere University (MU), Uganda, GIS and related course units are offered at undergraduate and graduate levels. For example, in the Department of Geography, Geo-Informatics and Climatic Sciences, four course units are offered at two levels in preceding semesters i.e. introductory GIS covering principles, and advanced GIS. At master's level, course units in (a) Introduction to Geo -Information Science, (b) Earth Observation Techniques for Disaster Risk Management, and (c) Geographical Information Science are embedded within the Master of Geographical Sciences programme and the Master of Science in Disaster Risk Management. In addition, a stand-alone MSc. Degree programme in Geographical Information Systems and Technology is also being implemented in Makerere University. This gist of these course units is to equip students with desirable skills to solve development challenges with a geographical dimension.

The Master of Science in Geographical Information Science and Technology (MSc GIST) is a 2 years evening program taught on modular basis with each module averagely running for 3 weeks. The program has been running since 2013. Under the Sida support program to Makerere 2015-2020, the program is being revised to be aligned with the trends in Geographical Information Science and Technology.

2 Aim

Based on experience obtained from the development and implementation of the five MSc programmes briefly described above, the aim of this paper is to identify and discuss, and suggest solutions to address, challenges linked to implementation of international MSc programmes in GIS related topics.

Issues of harmonization will be brought up at different scales, from the local national level, via an East/South-East African level, to a more global South-North level. Identified challenges are of course restricted to the experience of the involved researchers in this study, and all aspects of harmonization are not expected to be covered.

3 Challenges and lessons learnt

Below follows an introduction and discussion of the major challenges identified. It should be noted that the list below is not complete, but focuses on the most obvious issues that have to be solved/discussed when designing an international MSc program in GIS related topics. Also the discussion is not complete, but gives examples of possible ways forward.

3.1 Background and language

When universities open up for international students it is impossible to get harmonized groups in terms of academic background and language skills. Generally, a bachelor degree in a GIS related natural science or technical topic is a requirement for admittance to a master's programme, and a certain level of English proficiency is also a must.

Even if the student population has a science/technical background, and a GIS related bachelor degree, we see a need for "streamlining" within the group at the start of the program. Repetition, and for some students new knowledge, about basic concepts and skills have to be covered. This can partly be made as a preparatory part of the program, for the students to grasp before the actual teaching commences, but still a need for control/examination is important. To get the students on more or less "the same level" within the first semester is highly important to ensure smooth running and equity in instilling the required skills. This also ensures that there will be co-learning or peer to peer learning which is a critical component particularly at graduate level.

Also language skills can be very diverse, even if international tests are used to prove a defined entrance level. This is more pronounced in northern institutions (Sweden) which commonly receive graduate students from very heterogeneous institutions and countries. Thus, it is recommended to make personal interviews with applicants to the program, if needed over e.g. skype, in order to verify a certain level of language skills. In the southern institutions, the applicants for graduate programmes are often more homogenous in terms of language background. It is therefore not surprising for the case of Makerere University that English language proficiency is never stated as a requirement for application/admission to the graduate programmes.

3.2 Pedagogic approach and student involvement

All teachers have different pedagogic approaches, different strengths, and weaknesses.

There is growing consensus among education leaders and researchers that both teaching and learning need to change to help students develop the skills they need to succeed in the 21st century (Butler et al., 2017). The changes need to happen from different aspects such as teaching techniques (e.g. teacher-center vs. student-center), tools and technologies (e.g. traditional paper-based vs. e-learning), and teaching organization (senior vs. young teachers and single vs. multiple universities involved), to name a few.

Student-center approaches, where more responsibilities are given to the students to learn and share their learnings, have proven to be more effective for deep learning than teacher-centered ones, where the teacher has the main role in transferring the knowledge (Svinicki and McKeachie, 2014). While Sweden has more concentration on the student-center approach, East-African countries are often using the teacher-centered one. Currently there are different bilateral Sida programs as well as EU capacity building programs ongoing in East-Africa, in which exchange of experiences and practices is an aim. Student-center approaches are also considered and encouraged in the development and/or revision of the programs and courses at master and PhD levels in Uganda, Rwanda, and Mozambique.

ICT and e-learning tools have revolved education and pedagogic approaches. Open Networked Learning (ONL) and Massive Open Online Courses (MOOC) are low cost tools and materials that provide new opportunities in North and South to improve pedagogic approaches and the quality of learning. Introducing MOOC to the students and also developing ONL infrastructures in Africa and Sweden can

considerably improve the quality of learning, especially if linked to student-center approaches.

Based on the discussion above, the recommendation is to increase the use of Internet-based learning (e.g. ONL and MOOC) as well as other low/no cost solutions based on exchange of teachers and “best practice”, focusing on younger teachers, open to changes in pedagogic approaches and techniques.

3.3 Teaching hours and length of the program

Also in Europe, where most countries have committed themselves to move in to the Bologna process and the 3-2-3 cycle, there are still differences between the lengths of post-graduate programs and the number of teaching/contact hours offered to the students. These differences increase the more countries and rules/traditions that are involved. However, we strongly recommend a unified global effort to harmonize the length of an MSc program to two years full time studies. This increases possibilities to access and pursue PhD programs on a global level, as well as student mobility between different universities and countries.

In many parts of the world, including countries in Africa, most of the MSc students study and work in parallel. This automatically limits the “available contact time” between students and teachers to late afternoons/nights and week-ends. This in turn makes it extremely difficult, or even impossible, for the students to study at full time, normally equal to approximately 40 hours per week (contact hours plus self-studies).

The obvious solution to this is to extend the time for a student to obtain a degree, e.g. from two to four years. However, this results in additional costs for the students but also for the teaching institutions, and is thus in many cases not appreciated/accepted.

Also the proportions of taught courses contra research work and thesis writing differ globally. In some countries (e.g. Mozambique) an MSc can consist of only research, while it e.g. in Sweden has to include 75% (three semesters) course work and one semester research. In Uganda, the teaching component generally covers two semesters and research equally covers two semester with the overall graduation time constructed in two years. This variation is generally attributed to traditions and historical context of the institutions. To harmonize this asks for legal actions, and is a long term process.

The harmonization of teaching hours, structure, and length of program might be the most difficult challenges to solve when it comes to harmonization of education globally. For now, most probably these have to be scrutinized on a case by case level in order to evaluate the quality, and thus the employability of the graduates, of each MSc program.

3.4 Software, laboratories, and literature

As mentioned above, hands-on training is crucial for a successful GIS education. Access to hardware, software, and adequate laboratory space help the students to build up technical skills and understanding of real-world problems.

When it comes to software a lot has happened during the last decade. A number of open source/freeware software has

been developed and is now freely available. However, the commercial providers, particularly ESRI, still dominate the labor market, often used by private companies and governmental bodies. This is however changing, and based on experience and recent trends it is recommended to focus on no or low cost software solutions. This will most probably also result in lower prices for commercial software,

Access to laboratories is another challenge, mainly linked to security. Access cards are often not available/implemented, making it necessary to always have one staff member present in the lab. This results in increased costs and lower accessibility. One way around this is to install the software on the students’ own computers (laptops), which should be doable if freeware is used. Another solution is to make certain students tutors, responsible for other students in the laboratory, and with full access to it. Then a logging system, registering tutors entering the lab, might have to be installed.

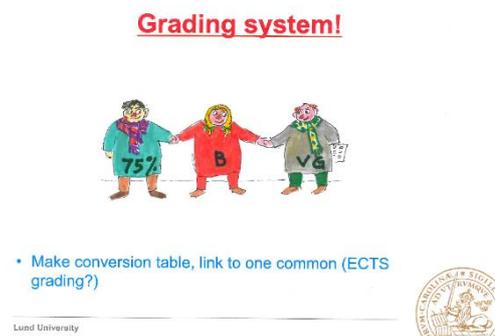
The literature access is less difficult than the laboratories. Many universities world-wide today have access to digital libraries, and joint courses make it possible to access data-bases open for students at partner universities.

3.5 Credit/grading systems and examination

In order to increase mobility, harmonized credit/grading systems and quality assessed programs are essential. Quality in terms of content is normally secured by joint development of curricula, while credit systems and examination procedures are more challenging.

Even if using one and the same credit/grading system there might be differences between different universities and programs. In Europe, the European Credit Transfer System (ECTS) credits are often used, supposed to guarantee harmonization. However, different educators award different numbers of credits for the same work, or at least for the same amount of student time spent. This is a problem, and conversion tables have to be established. As a rule of thumb, one can assume that one week full time work of a student corresponds to 40 hours (contact hours plus self-studies). Then it is up to each educator to define how many credits this corresponds to in their system. The same goes for different grading systems (see Figure 1), where some educators are using percentages, others pass/high pass, and others A, B, C etc. conversion tables have to be established.

Figure 1: It is important to make realistic conversion tables between different grading systems.



Also examination, or control of specific, practical, theoretical, and generic skills have to be properly harmonized. Here it is suggested to exchange examinations and tests between partners, in order to get insight in other educators “level of difficulty” in exams, and adopt a reasonable level themselves.

4 Conclusions

This paper is based on discussions between partner researchers/teachers from four different universities, located in East/South-East Africa and in Sweden. Some of the GIS related MSc programs presented are already implemented, while others are in the development phase.

It is obvious that there are many challenges remaining in order to create high quality international education programs at master’s level, encouraging and making it possible for students to move freely between different universities and countries, and to obtain a degree as highly valued as other degrees from universities elsewhere.

Even if most of the discussion and recommendations presented above might be obvious, and in many cases relates to “common sense”, they are still extremely important to take into account. If we ever will be able to create harmonized and flexible education programs in GIS, we have to criticize ourselves, and be open to change. Best practice is diverse, and we can all learn from each other. Protectionism and prestige are very destructive for development, while exchange and understanding are highly positive.

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