Geographical Information for all: Breaking the Barriers for GI Distance Learning

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Geographical Information, Distance Learning, International Partnerships between Universities, Role of ICT in Education, collaborative learning.

Summary
Based on the experiences of UNIGIS Amsterdam at the VU University of Amsterdam, the Netherlands, this article demonstrates that distance learning in the filed of Geographical Information Science can be a successful venture. Three Good Practices explaining this success are discussed explicitly: 1) the importance of establishing international partnership in education delivery; 2) the synergy between IT innovation in education and GIS and; 3) the need to include forms of collaborative learning into the distance learning curriculum, by using inspiring educational techniques. An example of collaborative learning in the UNIGIS curriculum will be dealt with in detail, stressing the importance of students' mutual knowledge construction and the need to introduce variation in teaching and assessment methods in distance learning.

1. INTRODUCTION

Geographical Information (GI) Science is a discipline in crises in Dutch higher education. There is too little inflow of new students into the field of GI education, and geo related companies cannot find suitable personnel to fill in all the available GI positions. Demand and supply of GI professionals simply do not match in the Dutch economy (Janssen 2008, Kemeling e.a. 2002, Vi-matrix 2006, GI Beraad 2008).

The combination of GI education with the method of distance education, makes things even worse. It is said that distance learning strands. In the words of Perreton (2006, p. 199):

> *"Open and distance learning is regarded by students and ministries of education as a second-rate system used to offer a shadow of education while withholding its substance."*

The completion rates in distance education for instance are dramatically low. The technological infrastructure hampers, especially in the delivery of distance education to developing countries. Only recently, the Dutch government[1] has started a pilot

[1] The Dutch government has delegated this responsibility to the Nuffic (the Netherlands Organisation for International Cooperation in Higher Education). The Nuffic is responsible for providing, amongst others, bursaries for talented students from developing countries to come to the Netherlands study for their master's studies.

study to look into the possibilities of providing scholarships for students from developing countries, engaged in distance learning education.
Enough reasons to assume that GI education based on distance learning is doomed to fail. And indeed, in the Netherlands, we have shared bad and gloomily experiences and practices of GI education at conferences and thematic meetings. But in this article however, we will prove the contrary. On the basis of the experiences of UNIGIS Amsterdam at the VU University of Amsterdam (VU), the Netherlands, we will demonstrate that GIS education based on distance education can be a successful venture by establishing international partnership in education delivery (Good Practice 1), by using the synergy between IT innovation in education and GIS (Good Practice 2) and especially by designing inspiring and novel educational techniques to shape distance learning (Good Practice 3). This last Good Practice will be illustrated by a detailed description of the incorporation of collaborative learning in the UNIGIS curriculum.

In this article we will share these good practices of UNIGIS Amsterdam. UNIGIS Amsterdam (VU) is part of the international UNIGIS network (the so-called UNIGIS International Association) of collaborating universities, providing education in Geographical Information Science, based on distance part-time learning for GIS professionals and those seeking to enter the GI field (see also www.unigis.net). Before addressing the good practices however, we have to position these experiences within the changing landscape of academic education (paragraph 2). In paragraph 3 we will focus on the UNIGIS network and the benefits resulting from international collaboration in starting up, implementing and monitoring the GI programme. Next (paragraph 4), we will zoom in into specific ways in which a "learner community" can be established within GI distance education. By adopting collaborative learning strategies in the standard curriculum, students will experience only virtual distance in their education. We will demonstrate some examples of this, improving the quality and output of distance education as applied in the UNIGIS curriculum. The article will end with several considerations for the future of successful GI distance education.

2. UNIGIS WITHIN THE CHANGING ACADEMIC LANDSCAPE

For our understanding of the UNIGIS Good Practices, we have to take into account two external factors influencing current academic education: one is the globalization of higher education, and the second has to do with developments in Information and Communication Technology (ICT). Boeren (2005) describes the changing academic landscape as a result of the progressive importance of internationalization in higher education: the emergence of a global market for knowledge and education, the Europeanization of higher education and the growing importance of institutional cooperation and international networks linking research to education (Nuffic 2006).

For UNIGIS Amsterdam, the transition from the specific Dutch academic structure towards a general European wide Bachelor-Master structure has changed the set-up of the programme. From a postgraduate multi layered programme (Certificate, Diploma and MSc layers), we moved to a plain one-layered master programme structure. This transition has facilitated collaboration with other UNIGIS partners, for example with

regard to student exchange between UNIGIS sites or by offering UNIGIS students a specifically international add-on qualification for professionals active in the field of Geographic Information (the so-called EuroMasterGI, see www.euromastergi.org).
In the next paragraph, the impact of globalization on the UNIGIS programme will be described in detail. Here we suffice by stating that as a result of globalization, the Board of the VU University of Amsterdam has put expansion and differentiation of the education supply high on the agenda, favouring demand driven education, education for new target groups (such as professionals), and in general an international focus on education. All these components come together nicely in a programme like UNIGIS.

The second development causing changes in the academic landscape results from developments in the information and communication technology (ICT). These developments caused powerful changes in the way education is delivered, the way students learn, the way lecturers teach, the way researchers work together, the way international collaboration takes place, the way the marketing of the courses can take place. ICT has become indispensable for UNIGIS: it facilitates content delivery (the web as the new digital learning environment); it facilitates communication between and amongst students and staff; and it allows for efficient marketing targeted both to students and industrial partners).

The content delivery to students has improved considerably. On a protected internet site, students can access their personal study centre, in which they find their study status and records, their personalized course materials, and contact information of other students and staff. The intranet site also contains a special area for the staff involved, e.g. to consult the submission of student assignments and assignments to be graded, or to look up student records, awarded grades and study progress.

The content sharing within the academic network has improved notably as well. By hiring a virtual office place on the Internet, neither hardware and software installation nor maintenance required, all members of the network have access to all the documents of the UNIGIS network. Without distinctions, every network member can publish new information on the intranet site for other members to see (announcements on GIS Summers Schools, on published newsletters, on conferences, magazines and software developments). And every network member disposes of all up-to-date information regarding the network, such as the shared learning materials, official documents, contracts with Industry and Institutional partners, information on shared educational and research projects, and materials for marketing and promotion. There is a database of all UNIGIS students worldwide as well, respecting the rules of privacy. This is extremely helpful in negotiating favourable contracts with Industry. Impressive student numbers seduces Industry to supply the students with free or almost free software, in the expectation that these professionals will also use their commercial software within their professional work environment after finishing the program.

The communication advantages of ICT are obvious: through email and digital communication fora, students can discuss course material[2]. Further on in this paper we will demonstrate how ICT supports student collaboration within online distance education. It is obvious as well that from a marketing perspective, a public website like the UNIGIS International one, is very useful for the recruitment of students and for promoting the publicity of the UNIGIS brand. Although most of the students still find their way to the UNIGIS program by mouth-to-mouth advertisements from fellow students and alumni, the UNIGIS web pages are important to draw students to the program.

These tremendous developments in the field of ICT have made it possible to strengthen considerably the virtual network. Besides attracting more students to its program, the internet offers the UNIGIS International Association a new way of communication, which makes the organization transparent and democratic, with equal access for every member. Above all however, it is the extraordinary progress in communication between students themselves and between students and staff, together with the impressive content available on the web, that the web is causing revolutionary changes in education and which has made the UNIGIS network a sustainable network.

3. UNIGIS INTERNATIONAL NETWORK

With eighteen years of experience in successful international academic distance learning in spatial information management and geoinformatics, UNIGIS is one of the oldest distance learning initiatives. The network consists of fifteen universities in fourteen countries[3] that offer UNIGIS courses on a franchise basis. At present, per year over 1500 professionals from more than 40 different countries worldwide subscribe to one of the universities of the network to participate in the UNIGIS program.

UNIGIS Amsterdam is offered at the VU University of Amsterdam. The Dutch Accreditation Organisation (NVAO) has approved this master program in 2007. The part-time master programme takes three years to finish. Annually 25 students are enrolled in the UNIGIS programme, leading to an active student body of approximately 80 students. Of our students, about 60% is working in the Netherlands, 20% works in a European country, and 20% is employed outside Europe.

UNIGIS students are professionals working in GIS for a wide range of organizations, including central and local government, utilities, consultancy, business, GIS vendors, research and education. They are people who link GI Science to a broad range of practical applications.

[2] The only drawback though that must be observed, is the dominance of native speaking English students on the general email forum; non-native speaking students seem to be more hesitant to participate.

[3] The network comprises of 7 universities in Europe, 4 in Asia, 2 in Africa, and 1 in South America and 1 in North America.

Since specialized undergraduate provision is still in its infancy (see also Korevaar and Koenders 2003, and Korevaar and Van der Schee 2004), and spatial information has been leaking out slowly into mainstream applications and uses (RGI 2005), a large number of mid-career professionals, with different formal educational backgrounds, are being asked to take on GIS responsibilities, whilst their backgrounds do not include any GIS formation. The students are interested in acquiring a broad academic foundation to underpin their knowledge, in the course of which conceptual, technical and organizational aspects of GIS come under discussion. For many, taking a career break in order to obtain a GIS qualification is simply not possible. Because of their work and responsibilities they cannot attend conventional courses. On the other hand vendor training in GIS software is considered too superficial, unbalanced and related too much to certain products, and not scientific in nature.

This vacuum in the educational market, and the specific pedagogical ways needed to address this specific target group, gave rise at the end of the eighties to the UNIGIS network. At an early stage, it was realized that collaboration with other institutions is necessary, and that the development of educational material goes hand-in-hand with collaborative research. The skills and knowledge needed to develop a comprehensive GIS course and optimally support students required resources from more than one university. GIS specialists in each institution are too few to support independently the administrative and academic inputs to a complete course, but together they represent a strong team with wide-ranging and complementary skills. The network also provides opportunities for organizing international Summer and Winter Schools, making agreements with software vendors, obtaining European accreditation amongst other scale advantages.

From the start, the focus has been on a part-time distance-learning route to postgraduate qualifications in the GI Science, suitable for those using GIS in the workplace. The professionals need flexible education that can be followed part-time, at times that are convenient for them. This means that the education must be as free as possible from limitations of time and place.

The UNIGIS network consists nowadays of local UNIGIS offices at the associated universities that work independently, but strong collaboration exists in curriculum design, the development of course materials and student support. Since 2002 the UNIGIS International Association was officially established, which created a legal framework for the activities of the network. The aim of the Association is to promote education and interest in GIS at the highest level, both in national and international context, and to represent in the broadest sense of the word the interests of its members in that area.

Good practice 1: Benefits from international collaboration
From the previous, it is eminent already that international collaboration has become a necessity for survival in the global market for knowledge and education. International collaboration is our Good Practice 1. In table 1, the main benefits are summarised.

Good practice 1: Benefits from international collaboration		
Nr	*Benefit*	*Lesson*
1	Staff and student exchange, international Summer Schools	Promote student and staff exchange between the associated universities; promote mobility and enlarge the horizon of students and staff through the organization of Summer Schools or other international events.
2	Balance globalisation trends and local needs	The UNIGIS courses are in continuous development and are offered in several languages. The curriculum, the modules and the communication with the students are adjusted according to the local needs and demands. Each participating university has a considerable degree of independence. The UNIGIS International Association looks after the mutual interests of the network
3	Mutual projects	The International network facilitates the collaboration within research and educational projects, for instance projects on curriculum development and capacity building, or GI research projects.
4	Quality course materials	International collaboration is extremely positive for augmenting the quality of the course materials. Not only are the materials evaluated on a yearly basis by students from all over the world, the modules itself are developed by the network members according to each speciality.
6	Diploma certification	The European Bachelor-master structure facilitates diploma certification, such as the common European master in GIScience.
7	Industry and institutional partners	International collaboration, and having a large international student community, is very favourable for negotiating beneficial contracts with Industry and institutional partners. The network has agreements with the main software players in the GIS field. Although UNIGIS does not favour one particular GIS software package in its' education, each UNIGIS office decides for itself which GIS software packages are supported.
8	Academic interest	Keep in mind that the interest to participate in the network should be of an academic nature, and not so much of a commercial nature. The network can function financially independently, but great financial benefits should not be expected from it. Joining the network is not about getting high quality educational materials for a bargain.

Table 1: Good practice 1 - Benefits from international collaboration. UNIGIS Amsterdam.

4. COLLABORATIVE LEARNING IN DISTANCE EDUCATION

The UNIGIS web-based distances learning methods were developed and implemented in the end of the nineties. After some years, these methods gave rise to some concerns. In the first place, student evaluations demonstrated that distance learning was too much of an individual undertaking. Although it has great advantages to be able to study at home in your own time, whenever you want, students missed discussions on the subject material with other students and staff. Collaboration beyond the yearly UNIGIS conference was a clear request.

Secondly, ICT possibilities for education were developing at a rapid pace. All sorts of easy, accessible and free groupware emerged, and lots of pilot applications of groupware in academic education can be consulted at specialized websites[4]. These interesting pilots based on videoconferencing, document sharing, skype, instant messaging, chat etcetera could have an added value to the current GIS curriculum. The role of ICT in GIS is so dominant, so why not apply modern ICT in the education delivery itself?

Thirdly, more fundamentally, some principal characteristics of academic education, as laid down in the so-called Dublin descriptors, were not fully covered in our distance-learning programme. The Dublin descriptors are general European qualifications that academic master programmes must meet, comprising of five main criteria: knowledge and insight, application of knowledge and insight, critical judgment, communication and learning skills. More specifically these have to do with e.g.

- *to be able to integrate data and information from different disciplines (knowledge and insight)*
- *to be able to make connections between technology, data, methods and organizations in relation to the use of GIS (knowledge and insight)*
- *to have enough knowledge and practical skills to design and implement GIS projects (application of knowledge and insight)*
- *to think in a multidisciplinary way and recognize the importance of disciplines for his/her own specialization and connect different types of factual information (critical judgment)*
- *to be able to handle multidisciplinary issues and know the limits of her / his own expertise (critical judgment)*
- *to be able to actively and constructively participate in discussions on issues and meetings in the domain of spatial information (communication)*
- *to cooperate in projects, in small international and multidisciplinary working groups and with colleagues of different scientific backgrounds (communication).*

So far, the GIS programme consisted for 60% on the same pedagogical concept, namely writing individual essays. The abovementioned attainment levels of the GIScience master based on distance learning, were not met in full. Forms of collaborative learning had to be specifically developed to meet these levels.

It was realized that the current learning methods did not meet the pedagogical concept of "*mutual knowledge construction*". The module assignments so far had been individual student undertakings, whereas from literature it is clear that the largest learning effect results when students are explaining the subject matters to each other, as can be seen in figure 1 (see also Bales[5]). The average retention rate of students teaching students can be up to 80%, compared the 5% retention rate of classic lectures, or 10% for reading.

[4] In the Netherlands principally the website of the SURF foundation -www.surf.nl-, the Dutch government funded organization for ICT services in higher education and research.

[5] Bligh DA (1998) What's the Use of Lectures. Second Edition, Intellect, Exeter, pp 10-23.

Figure 1 Learning pyramid after Bales (1996)

More specifically for GI distance learning, the added value of collaborative learning lies in the fact that the UNIGIS student body is many-sided. Students have different disciplinary backgrounds, work in a broad range of organisations in different functions and even in different countries. So approaching a common assignment from these different angles, a technical GI student can for instance work together with a GI managerial student, thereby broadening their views.

Furthermore, it became clear that the *present teaching and assessment method was of a one-sided character*: each module is assessed based on an individual theoretical assignment and one individual practical assignment. Not all of the attainment levels of the GIScience master can be met by one teaching methodology. And not all students approach learning in the same way, nor perform equal on assessment tasks. Therefore variety in these instruments is needed to be able to assess student understanding (Johnston 2001; p. 200). Students should be provided with a stimulating learning environment, including especially variation and differentiation in teaching forms.

A way to differentiate in teaching forms in the UNIGIS programme can be as simple as straightforward as for instance the use of *online lectures*. One specialization pathway in the UNIGIS curriculum concerns "GIS and Health". Together with the UNIGIS partners in Manchester, U.K., two online lectures were made as an addition to the module, on malaria epidemiology and on data health issues, which can be consulted via the internet[6].

More fundamentally, mutual knowledge construction can be achieved by introducing *blended learning* in the curriculum or by introducing *collaborative learning* in the distance curriculum itself. The UNIGIS Amsterdam curriculum applies blended learning since its' start, and nowadays all students, without regard to their study

[6] Lecture health data issues: http://collegerama.tudelft.nl/mediasite/Viewer/?peid=e141c169-a1df-4315-9044-179ea34de201. Lecture Malaria epidemiology: http://collegerama.tudelft.nl/mediasite/Viewer/?peid=8158241f-4e99-4523-b0ee-be0d8ea2d59c

progress, are obliged to attend the Annual UNIGIS Amsterdam Conference. During this conference, the students are attending plenary lectures, as well as intake specific intensive workshops. Students meet "in person", not only the students of their own intake, but also students of other intakes and alumni.

Introducing collaborative learning also addresses the lack of mutual knowledge construction: by obliging students to work together on an assignment, comment on the work of other groups (peer review) and receiving feedback on their own work, improving the assignment and handing in a group report to be assessed. In one UNIGIS module, students had to work together in groups of three and apply the five-component model of GIS (Petch 2006) on an applied scientific research project. Figure 2 demonstrates the education setup of the assignment.

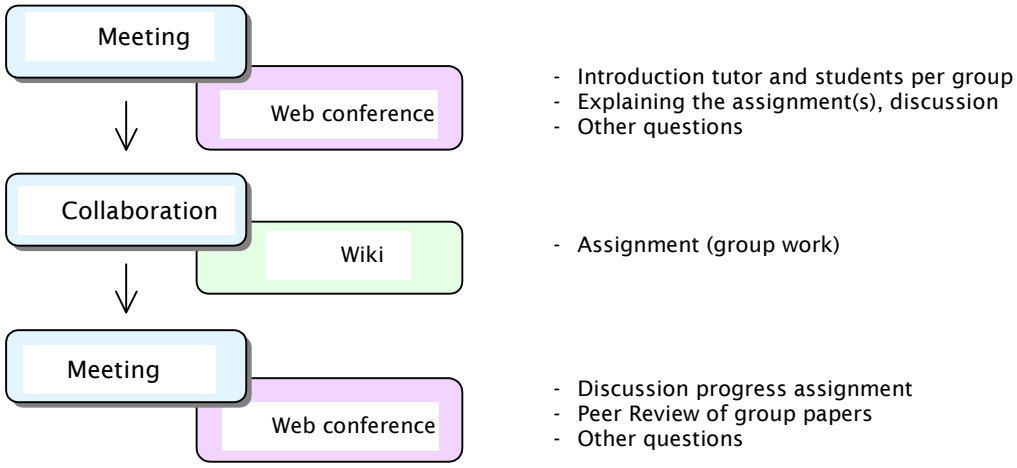

Figure 2: Educational design collaborative learning, UNIGIS Amsterdam

In a first *web conference session*, using Adobe Connect software, students introduced themselves by presenting their personal websites to the other group members. Subsequently, the tutor explained the module assignments, and the students made a work plan to deliver the group paper on time.

After this first session, *wiki* was used as the virtual working place for the students (see figure 3). Communication between the group members varied between email, Skype, Adobe Connect and telephone.

Halfway the course, the students finalised their draft report on the wiki site. Than another web conference session was organised, in which the groups provided structured *peer feedback* on each other's draft papers. This gave the groups the input necessary to improve their papers, and hand in the final version to the tutor.

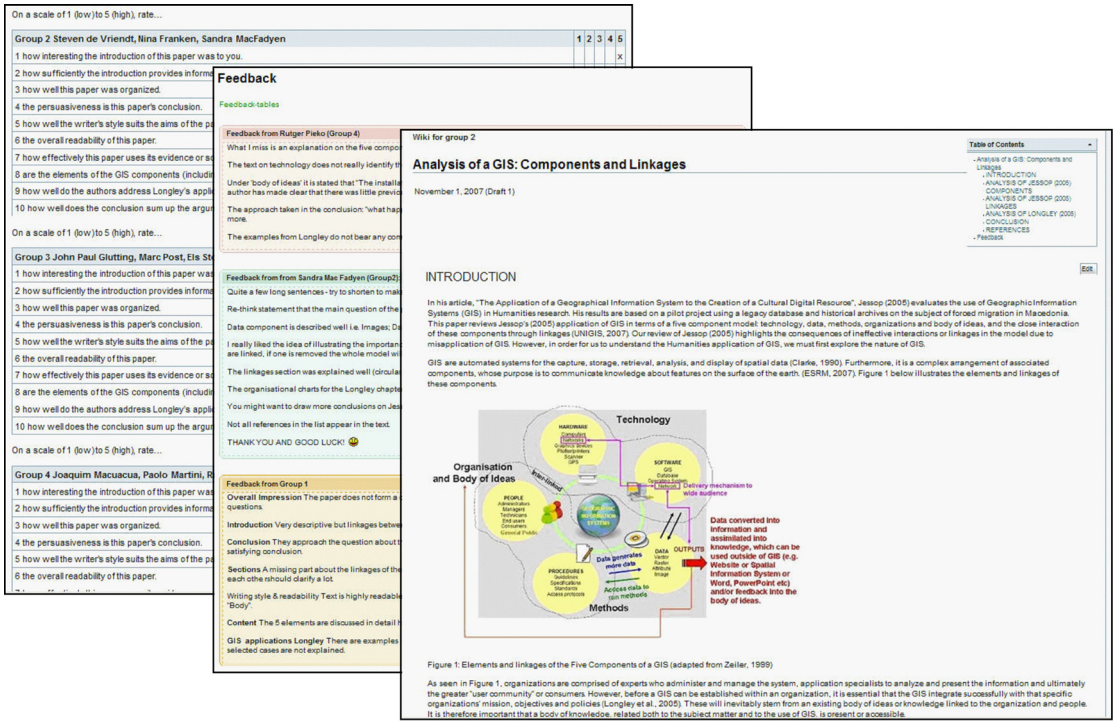

Figure 3 Wiki environment for collaborative learning

The evaluations of the collaborative exercise of consecutive UNIGIS student intakes are positive. For students, it is an interesting and valuable experience to work together with (internal) colleagues on an assignment. Some interesting conclusions can be drawn from the student evaluations:

- students confirmed that they achieved a better paper due to the individual strengths of the team members
- all confirmed that they had learned a lot from reviewing the papers of other students. On the other hand they stated the feedback they received was very useful to improve their own paper.
- the collaboration within the team was evaluated positively and the team members completed their work on time.

Some specific drawbacks with the web sessions occurred, especially with the technological less advanced countries:

> *"I unfortunately experienced some problems communicating via Breeze with the slow network speed and unpredictable power-supply in the Kruger National Park. However, between Skype, Breeze and Email we managed to complete our task."*

> *"The big constrain found is infrastructure which was not effectively efficient due to the Internet connection in my country. The rest was a good experience. I have enjoyed ..."*

Fast Internet connection is indispensable for collaborative learning in distance education. Most students in the GIS programme live in modern societies and therefore have sufficient Internet capacity, comparable to the situation in the Netherlands. Some students do not have a fast Internet at their disposal yet (like the students from Ethiopia, Tanzania, Mozambique, Irak) and as a consequence could not participate

actively in the web sessions. Slow Internet (for wiki) in combination with Skype works however fine for all.

In the recent past, and after intensive internal debates, certain hardware and communication requirements, such as email facilities, were made compulsory for students to apply successfully for the UNIGIS program. This meant that some students were excluded from the program. These requirements are now however generally accepted, without discussion. And this leads to the second Good Practice: taking into account the nature of the GI programme, it's high IT content, we are convinced that within the foreseeable future all students will have sufficient internet capacity at their disposal, making it possible to add fast internet to the compulsory entry requirements, and consequently improving the quality of distance learning.

Good Practice 2: **Using the synergy between IT innovation in education and GIS.** By its very nature, GI programmes have a high IT content. In the foreseeable future, additional entry requirements in terms of communication facilities in GI distance learning programmes are recommended, improving significantly the quality (and output) of distance learning.

The collaborative learning was a positive experience for tutor and staff as well. The tutors were provided with pedagogical and technical skills for the design of an appealing assignment based on collaborative learning. The web conferencing sessions enabled the tutor to get to know the students and to make sure all students understand the module assignments. Consequently, the use of the wiki environment allowed the tutor and students to have a complete overview of all student work in one website, conveniently arranged in folders. Moreover, the latest versions of the student work are displayed, thus reducing the usual confusion over which version to assess. The wiki can demonstrate "old revisions" as well, visualising the history of contributions to the end product, allowing everyone to monitor the progress and contributions. The wiki proved valuable for the peer review as well: the structured feedback criteria were at hand enabling the students to carry out the peer review, to receive the reviews and to compare their work with other groups. No student reported any technical problem with wiki.

Another positive result is the improvement of study progress, one of the mayor challenges in distance learning. Students hand in their assignments on time and the assignments are of good quality. Comparing the study progress figures of the groups of students before ("group1", n is set at 44) and after ("group 2", n=34) the introduction of collaborative learning in the curriculum, it results that 94% of group 2 has handed in the first module on time, whereas 70% of group 1 was on time. For the second module 59 % of the students of group 2 were on time, versus 43% of group 1. When studying the history of the annual conference attendance numbers of students, the same picture can be seen: relatively more students from group 2 participate in the yearly conferences. Although the numbers are relatively small, and difficult to compare because of the flexibility of the program (professional students having study delays because of external reasons, see paragraph 2), it confirms that this teaching

method activates students, they learn to handle distance learning and adopt an appropriate study pace, leading to a community of students. Although students are involved in distance learning, they do form an UNIGIS community, where they learn and develop their skills together with other students and staff. This leads to our third Good Practice.

Good practice 3: Designing inspiring, novel educational techniques to shape distance learning. Collaborative learning allows for the development of a "learner community", with motivated students having a deeper understanding of the topic at hand, and leading to improved completion rates.

On the basis of these experiences, it was decided to introduce collaborative learning at several stages in the curriculum.

5. CONSIDERATIONS ON THE FUTURE OF GI DISTANCE EDUCATION

On the basis of the experiences of UNIGIS Amsterdam at the VU University of Amsterdam, the Netherlands, it has been demonstrated that GI distance education can be a successful venture. After sketching the background of the changing academic landscape and relevant developments in ICT, we mentioned the importance of establishing international partnership in education delivery and the synergy between IT innovation in education and GIS. We extensively described an example of collaborative learning in the UNIGIS curriculum, stressing the importance of students' mutual knowledge construction and of introducing variation in teaching and assessment methods in distance learning.

The experiences of UNIGIS Amsterdam form a central part in this article. However, it is interesting to look at the successes and experiences of other UNIGIS sites in the network. The picture here is ambiguous. Several sites, like the ones in Spain, Austria, Portugal, Hungary and the UK attract large numbers of students and flourish. Also in the USA UNIGIS is doing well, notwithstanding fierce competition in the GI educational field. On the other hand, we witnessed the recent closure of UNIGIS at the Nelson Mandela University (Port Elizabeth, South Africa), due to, among others, the lack of qualified lecturers, despite of a huge demand for GI education.

The future of GI looks promising when we succeed in bridging the gap between the increased demand and lagging supply of GI specialists, as mentioned in the introduction. This can de done by tapping news sources of target groups: aiming at young students as well as professionals (distance learning); broadening the scope of GI education and integrating GIS into the curricula of other disciplines (Goodchild 2000); and by removing the GI education from its present bèta oriented niche, allowing students from different backgrounds into GI education.

In conclusion, starting up the UNIGIS network and developing a common curriculum has been an adventure. The expedition has brought new horizons, excuses to travel

around the world, but above all, a way to deliver GI education to all, making full use of all the ICT and pedagogical challenges in distance education.

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Biographical notes

Drs. Mathilde Molendijk works as education coordinator of the SPINlab (Spatial Information Laboratory, an interfaculty centre that coordinates and stimulates spatial information activities), Institute for Environmental Studies (IVM)) at the Vrije Universiteit in Amsterdam. She coordinates the master programme in Geographical Information Science (UNIGIS) and the BSc. programme Earth and Economy. She is involved in various education and research projects in the field of geo-information, such as projects in the field of GIS education and the use of modern ICT, and projects on international GIS curriculum development. Mathilde has extensive education and research management experience across a number of fields, all having to do with spatial information. She has worked for years in South America. Her focus lies in internationalization of GIS education, with a special interest in developing countries; in the use of modern ICT (Information and Communication Technologies) in GIS education; and in the design and organization of training programmes for international cadastral projects.

Prof. dr. Henk Scholten is professor in Spatial Informatics at the Faculty of Business Economics at the VU University of Amsterdam and Scientific Director of the SPINlab, Center for Research and Education on Spatial Information at the Vrije Universiteit Amsterdam (http://www.spinlab.vu.nl/). Professor Scholten is director of the masterprogramme UNIGIS, which leads to a Master of Science degree in GIS (Geographical Information Systems) at the VU University of Amsterdam (http://www.feweb.vu.nl/unigis/). Professor Scholten is president of UNIGIS International, the association of 17 universities around the world that coordinates education and research in GIS (http://www.unigis.com/). Professor Scholten has written various articles about GIS for publication in international books and journals. He is co-founder and CEO of Geodan in Amsterdam. Geodan specializes in Geographical Information Systems. Since its foundation in 1985 Geodan has grown into an independent group of companies with more than 80 employees, giving form and contents to all the aspects of the Geographical Information Systems (http://www.geodan.com). In his role as director of Geodan, professor Scholten has been supervisor on a large number of national and international GIS projects.

Drs. Judith Kaandorp works as a consultant ICT and Education of the CETAR (Centre for Educational Training, Assessment and Research). CETAR is VU University Amsterdam's expert institute for the study of secondary and higher education. She is involved in various educational projects in the field of the use of ICT in courses and curricula. Her focus lies in the field of modern ICT, such as web 2.0 (peer review, wiki, weblog and online collaborative learning). As a consultant, Judith supports teachers at the VU University Amsterdam in their courses and their use of ICT.

Furthermore she is a trainer in the educational use of the software, for example Blackboard.

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