Continuing Professional Education Requirements and Offers in GI within Europe

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Abstract

The paper presents results of a pan-european study conducted within the VESTA-GIS network project (www.vesta-gis.eu). It gives an overview on current conditions and constraints of vocational education and training in GI from the perspective of offering institutions as well as from the perspective of GIS- practitioners looking for an adequate offer.

1   Background

As geospatial technology is a rapidly growing and changing field, vocational training and education plays an important role to serve workforce needs within Europe. The speed at which new fields are adopting GI-technology, the new challenges the INSPIRE directive brings in and the rate at which equipment and software are modified and updated make it difficult for many institutions offering vocational education to keep current. Since geospatial technologies are used in a variety of economical sectors, vocational education in GI is offered from the perspectives of such different disciplines as ecology, health care and marketing. Together with a heterogeneous vocational education market lacking standardized offers and certification, it is difficult for employees to find adequate offers of vocational GI-education.

VESTA-GIS (a network on vocational education and sectoral training on GIS & GI-Application domains within the EU Lifelong Learning Programme "Leonardo") - tries to improve this situation by setting up a multilingual training catalog combined with a training package builder to help GIS practitioners to find the right educational offer for their individual needs.

One of the first activities of VESTA-GIS was the assessment of training needs within GI technology users, the resulting requirements for professional skills and the evaluation of the training market situation at a European and thematic level. To achieve these goals a survey was carried out among the market's stakeholders of GI. Two online questionnaires addressing the demand and the supply side of the GI-training and education market were accompanied with several qualitative interviews. The survey results reported here helped in producing a feasible structure for the description and validation of courses to be included in the VESTA-GIS training catalogue. For more information on VESTA-GIS and possibilities for participation see www.vesta-gis.eu.

2   Survey method and target audiences

Two online questionnaires, one for each target group, form the quantitative basis of the survey which was conducted between April and July 2008. On one hand institutions offering GI vocational education were invited to describe their educational offerings, on the other hand GI-employers from private companies as well as from governmental institutions were asked to identify needs, constraints and conditions of their employees in-service-education and training in GI. The first version of both questionnaires was discussed within the project core partners and improved by core partner contributions, especially in the field of the three application domains and INSPIRE. The resulting version was discussed, tested and finally approved.

An invitation to participate in the questionnaire was distributed by email to all GISIG member-organizations and around 60 associated network partner-organizations. In addition the six VESTA-GIS core partners used their networks to identify and invite suitable organizations or key-persons all over Europe to participate in the questionnaire and/or qualitative interviews. Questionnaire responses were validated by checking on duplicate entries and plausibility. In ambiguous cases answers were clarified by email, or - if there was no contact address given - the record was removed. In total the survey resulted in 104 valid responses – 36 on educational supplies and 68 on the demand situation. Although higher return numbers would be favourable to improve statistical significance, the amount of data - together with 14 qualitative interviews of trainers' and trainees' organizations and fresh graduates looking for a job - seems sufficient to extract the "big picture".

3   Conditions and constraints of vocational GI-education

Attitudes towards vocational training

In general "lifelong learning" is not just a buzzword anymore: over 90% of the responding employers rate in-service training of co-workers as important or very important. In general larger companies or institutions have more possibilities to require vocational training for their co-workers, providing a budget and giving education during the working hours. In smaller businesses/institutions, because of the lack of time and the costs of training activities, less education is provided. Especially small private companies often consider in service training as a "waste" of time and money, instead of a great investment. If training is provided for their employees it is mostly limited to occasions when new software or instruments were bought or upon a specific demand, for example when special knowledge is needed to complete a certain project. In these cases the training focus often lies on technical aspects or software skills which are mostly taught in a 1-3 days short course format in house or at the location of the training provider.

Course types

For employees of larger companies or governmental institutions it seems to be more easy to get individual support for a more sustainable long-term vocational GI-education in the form of part time, comprehensive courses held as evening classes or via distance learning. This type of education is mainly offered by institutions in the tertiary education sector, hardly by private companies. In contrast to the "short intensive course type" dealing with specific (often technical) issues and having a "tool-perspective" of GI in mind, within this more academic type of vocational education a broader view of the science and theory that build the foundation for the discipline is taken. Typical examples of this type of education like the UNIGIS courses (www.unigis.net) use a variety of e-learning tools to establish a stable distance learning environment enabling collaborative and tutored forms of learning. Doing so has proved to be a crucial factor in long-term distance education. At the very other end of the timescale qualitative interviews showed demand for so called "nano-learning" elements – small junks of context related information, which can be absorbed within a maximum of 15 minutes time length and which are delivered on handheld devices.
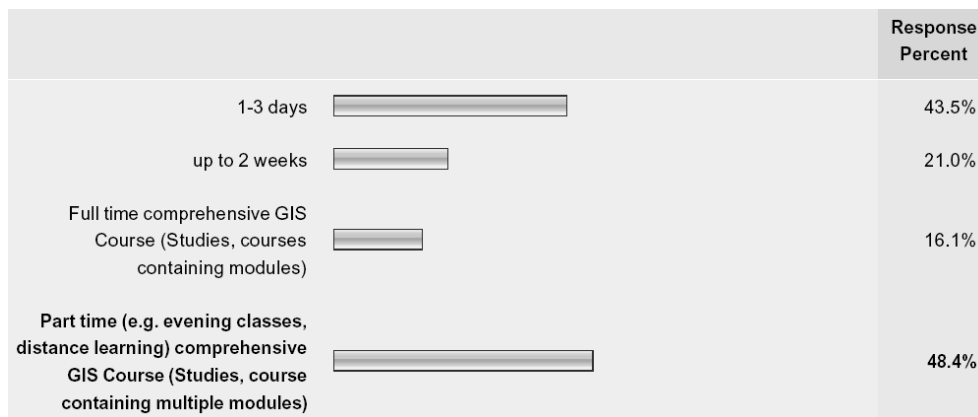

Fig. 1: Which kind of continuing professional education – in terms of duration - would you prefer for your co-workers ? (multiple selections possible, n=62)

About one third of the asked deliverers of vocational education mainly offer tailor-made courses upon request. Especially public institutions tend to request such courses for their GI-staff. In countries of former eastern Europe this kind of vocational education for special audiences was supported by joint EU TEMPUS projects like OLLO (Open Learning for Land Offices) or SDiLA (Staff Development in Land Administration) (for both see MARKUS, 2001), but also in western Europe "custom made" education upon request by public authorities is quite common. Again, more task oriented GI-training within this segment is offered by both private companies and academia, while GI-education with a more conceptual view (for example a general SDI-introduction for the heads of regional surveying departments) is still the domain of universities.

The VESTA-GIS course catalogue is a great chance for educational institutions to reuse quite specialized, individually tailored courses, by making them visible to a pan European GI-public. From a consumer perspective seekers of vocational GI-education might find specialized offers that match their needs better than expected.

Employer support and constraints

In about 60% of the responding companies/institutions vocational education is financially supported. In 45% of cases working time can be set aside for education. As the needed amount of vocational GI-education is highly variable, depending on working field and individual job descriptions there is high variation in the given numbers reaching from 2 up to 60 educationally used working days per year with a median of 10. Thinking about these numbers one has to keep in mind that a considerable amount of vocational education is not formally organized in courses but acquired individually by retrieval of new knowledge through literature or the internet. This is especially true for relatively new and/or fast evolving knowledge-domains within GI, where the educational offer almost always lags behind recent developments.

From an employer perspective the main constraints for vocational education (Fig. 2) are seen in education costs and lack of time (77% each), a complex and unclear continuous professional education market in GI (29%) and missing course offers (27%). As the term "missing" could also be interpreted as "hard to find", the last two constraints mentioned strongly support the VESTA-GIS project goals of providing a catalogue as an easy to use gateway for vocational training in GI.

	Response Percent
Lack of time because of professional / private overload	76.9%
Cost factor	76.9%
No appropriate course offer	27.7%
Complex and unclear continuous professional education market in GI	29.2%
Personal reluctance	10.8%
There are no difficulties	3.1%
There is no need for continuing professional education	0.0%

Fig. 2: Where do you see the greatest difficulties in in-service continuing professional education in GI? (multiple selections possible, n = 65)

Measuring training success

When it comes to cost/benefit evaluation of certain training offers, qualitative interviews as well as results from questionnaires showed that the most important quality-benchmark of continuing professional education is the successful application of the acquired skills/knowledge in the job. For this reason employers prefer software training and applied skills over conceptual issues for short-term co-worker training. Nevertheless academic titles gained in long-term vocational education programmes are valued much higher by employers than non-academic, rather skill-oriented certificates. This is especially true, when it comes to the assessment of job applicants´ knowledge and skills. Here previously acquired postgraduate degrees like an MSc. are considered important. The required GI-qualifications of job applicants vary considerably, depending on the type of the vacant position. At one hand the GI-industry is looking for GIS developers with a strong background in informatics; at the other hand thematic experts with profound GIS user-skills are needed within specific application domains.

When choosing an educational offer or evaluating the relevance of titles/certificates, the reputation of the delivering educational institution seems to play an important role too: 77 % of the responding employers find it increasingly difficult to evaluate the quality of a continuing professional education course in GI. Therefore they only accept courses offered by distinguished or certified educational institutions they personally know. Related, a severe problem is a missing system of certification for the level of vocational training. The variety of offering institutions (private companies, universities, associations etc.), different target dimensions, audiences and levels of training make it difficult to pick a training offer yielding the desired results. Within VESTA-GIS an entry into the training catalogue should ensure a certain quality standard by cross checking the courses by the VESTA-GIS core partners. A validation against the UCGIS Body of Knowledge (DIBIASE, 2006) could be another approach. In the US the GIS Certification Institute reviewed the Body of Knowledge and its relevance to certification of GIS professionals to determine if the Body of Knowledge may serve as the backbone for an exam-based certification program. Results indicate that the Body of knowledge is quite well accepted among GIS professionals. On the other hand it is perceived as too academic / far away from the real world GI-problems in certain knowledge areas (BUTLER, 2007).

Cost of vocational education in GI

One third of the responding institutions offer vocational GI-education (in most cases just the learning material but no tutoring) for free. Often these kinds of courses are outcomes of funded educational projects. Typical fees for a basic introductory in-class course per trainee and day are around EUR 300 (median). For advanced topics the median price is slightly higher (EUR 350). The typical fee for a long term comprehensive GIS course/studies (distance learning) per trainee/student and month is around EUR 300-600. Because of different organizational and didactical models (blended learning, different intensities of tutoring) and country-specific price levels, the comparison of prices has to be treated carefully.

Distribution of e-learning content

More than a half of answering training institutions use a learning platform like Blackboard/WebCT or Moodle to distribute their content. As an alternative to online content printable respective printed teaching material is still a common and also requested form of delivery. E-learning standards do not play an important role for training institutions. Only 12% use standards like the Sharable Content Object Reference Model (SCORM - ADL, 2009) or Learning Object Metadata (LOM – IEEE, 2002) to structure content. In general education providers have a positive attitude towards catalogue building efforts. 72% you want to include their courses / programme in GI into a European database that can be accessed by persons seeking continuing professional education in GI. If given, reasons not to do so can be summarized as "we would need to know more about the conditions before deciding" and "since we only offer tailor-made training there is no course list available". With prolonged dissemination of the project, pointing out benefits for educational institutions and potential users remaining doubts will hopefully be resolved and course metadata for tailored offers generated.

4   Demanded and Offered contents

VESTA-GIS focuses on basic GIS technology plus GI-application issues in three initial application domains (Water Management, Natural Environmental Protection and Coastal Management and Landscape). Considering the actual European challenges, there is a strong need for qualified education on INSPIRE, another important issue VESTA-GIS has to deal with. Other than surveys investigating needs for traditional BSc or Master-GI-curricula (BRONX and PIRES, 2004), the VESTA-GIS survey was limited - from a thematic perspective - to the topics mentioned above.

GIS Core-Technology

Figure 3 shows that there is demand in every single field of GI-related vocational education, both for co-workers (second column) and even more so for job applicants (first column). An exception is the slightly higher co-worker demand for training on specific GIS software. This might be related to the training needs and adaptation of workflows for the existing staff, when a new software (release) is introduced. There is an according educational supply for all topics available (ref. to third column). The fields "GIS and IT systems design" and "Distributed GI" are the only topics, where the percentage of institutions offering education is lower than the percentage of people who see demand there. Nevertheless the supply situation seems to be sufficient in this aggregated view at first glance. Considering the language barriers throughout Europe, it turned out that the whole spectrum of above mentioned topics is only offered in German and English language. It is however hard to draw final conclusions on the actual amount of educational coverage within specific language areas due to the limited sampling of institutions offering in-service training on GI.
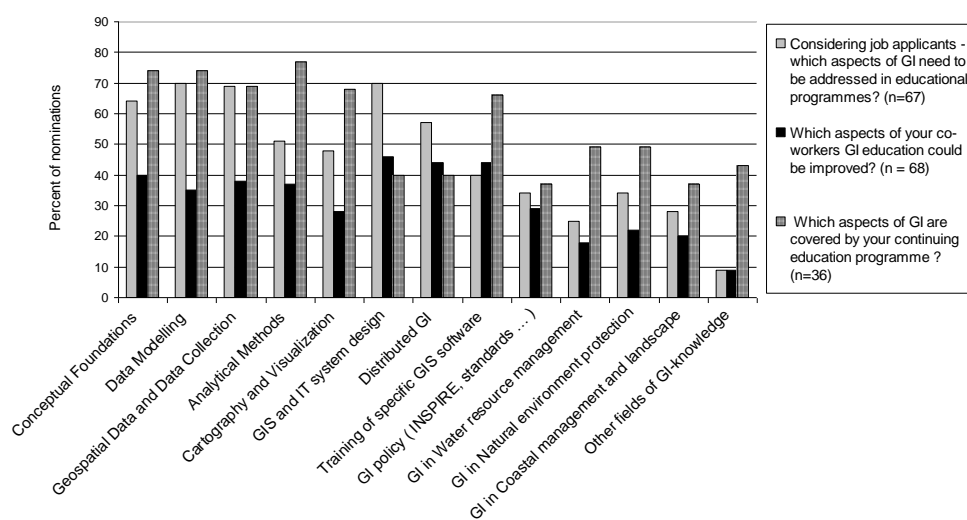
Fig. 3: Educational Demand and Supply based on VESTA-GIS questionnaire replies.

Application domains and INSPIRE

The three application domains (Water Management, Natural Environmental Protection and Coastal Management and Landscape) which were further divided into subtopics show a similar picture on an overall lower level of demand and supply. In general, both for the courses need and offer, a clear distinction between the subject areas of the VESTA-GIS project is not possible. In terms of INSPIRE almost everyone of the demand group rated knowledge on interoperability important or very important, but only less than half of the respondents believed that their organisations had the knowledge and expertise to apply INSPIRE principles. According to the change from traditional mapping to mass-market GI, Spatial Data Infrastructures are becoming more and more important to enable this revolution. With respect to this frame, to develop SDI inside to the organization and to co-operate with other subjects when creating a local SDI, both technicians and SDI users require additional training to improve their soft competences like communication skills, co-operative work forms and project management. Most of the 13 (out of 36) institutions offering vocational education on GI-policy topics work together with other disciplines like ICT or law when setting up training courses on INSPIRE. This can be seen as an indicator that the interdisciplinary implications of GDIs are accommodated in education as well.

Conclusions for the VESTA-GIS project

As a result of the survey the following aspects had been considered in the development of the metadata structure for the VESTA-GIS training catalog:

- This metadata structure must be capable to adequately describe vocational education offers of very different length and with different aims (skill-oriented training vs. sustainable, more conceptual education)

- There should be a description of target audiences as well as a

- precise description of content in the form of learning objectives and the

- mode of learning (short courses, blended learning, distant-learning)

- If there is a form of formal certification, it must be visible from the metadata

- Within the EU the clear definition of language(s) of material/instruction is an important issue. To enable searching in other languages than English the catalogue should have a multilingual user interface and (additional) metadata in the language(s) of instruction.

- This metadata structure should allow to reference a certain offer to more than just one of the three initial application domains.

Despite the EU's ambition to develop instruments like the European Credit system for Vocational Education and Training (ECVET) and the European Qualification Framework (EQF) to facilitate the recognition of knowledge, skills and competences gained by individuals in different learning environments, the practical application of these tools within the GI-domain is still a matter of discussion (RIP, 2009). Although it is possible to use ECVET to describe the scope of vocational training offers within the VESTA-GIS metadata structure, ECVET points primarily provide information on the relative weight of a specific learning outcome compared to the overall qualification which has to be defined "by the relevant competent institutions at national, regional, local or sectoral level" (Commission of the European Communities, 2008, p.9). Examples of such definitions already exist, but most of them mainly address traditional professions in the secondary economic sector at overall lower EQF-levels. The definition of a "standard qualification" within the heterogeneous GI-sector might not only be a research topic but also a challenge in terms of interdisciplinary diplomacy

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