SOME THOUGHTS ON A BODY OF KNOWLEDGE FOR DIFFERENT PURPOSES IN GI EDUCATION

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Introduction and Background

The UCGIS consortium has recently developed a Geographic Information Science and Technology (GI S&T) Body of Knowledge (BoK, see fig.1) [Johnson et al, 2006, http://www.ucgis.org/priorities/education/modelcurriculaproject.asp]. This valuable work can be used for many purposes like curriculum development, curriculum review, program evaluation and assessment as well as professional certification and employee screening, just to mention a few examples.

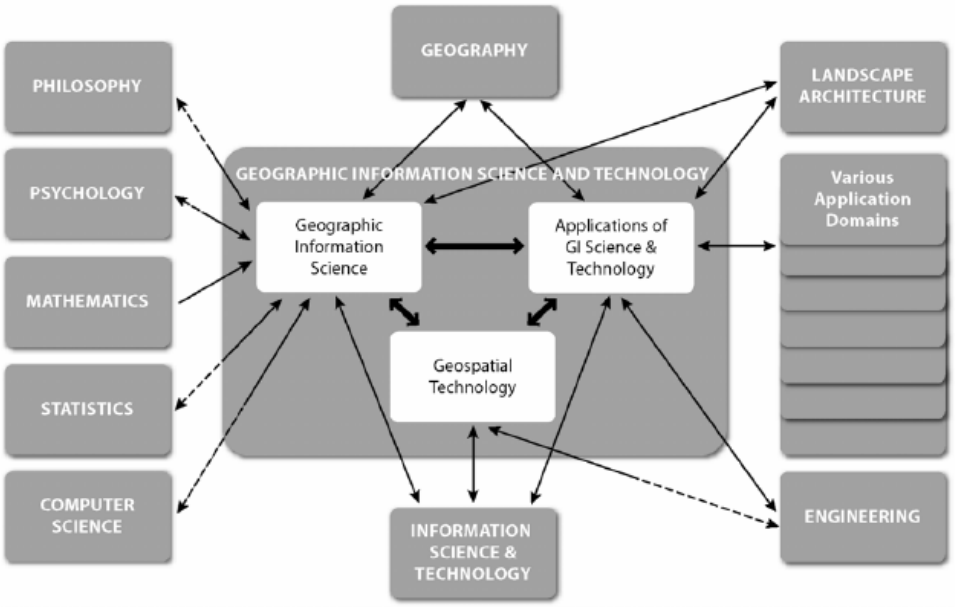

Figure 1: The three sub-domains comprising the GI S&T domain, in relation to allied fields. Two-way relations that are half-dashed represent asymmetrical contributions between allied fields.

The Body of knowledge is organised in a top down approach and includes the levels knowledge area (KA), unit and topic. At all more than 350 topics in 75 units are included in 10 KA. The authors emphasis that they would appreciate any comments especially from outside the US. As the author of this paper is involved very much in AGILE, the Association of GI labs in Europe [www.AGILE-online.org], the comments are intended as a trigger for further discussions on the topic within AGILE but also within other communities. Without any doubt the BoK is of immense value but of course there are always some wishes for changes and extensions; some of them are outlined below.

The BoK is a follow-up initiative of the famous NCGIA GIScience core curriculum [http://www.ncgia.ucsb.edu/giscc/]. Curricula development is still a task in this field. For example the German Society of Geoinformatics recently published a draft of a core curricula for Geoinformatics (in German language). [http://www.gfgi.de].

As a curricula more concretely defines the contents and coals of a study program, the BoK lists what is relevant for the field and can be a base for curricula development and other tasks as mentioned before.

As the Bok relates to GIScience and the German core curricula relates to Geoinformatics the differences of the terms and/or fields should be shortly discussed.
We again refer to NCGIA [http://www.ncgia.buffalo.edu/giscidefn.html]:

"Geographic Information Science (GI Science) may be defined as the basic research field that seeks to redefine geographic concepts and their use in the context of geographic information systems (GIS). GI Science also examines the impacts of GIS on individuals and society, and the influences of society on GIS. GI Science re-examines some of the most fundamental themes in traditional spatially-oriented fields such as geography, cartography, and geodesy, while incorporating more recent developments in cognitive and information science. GI Science also overlaps with and draws from more specialized research fields such as computer science, statistics, mathematics, and psychology, and contributes to progress in those fields. It supports research in political science and anthropology, and draws on those fields in studies of geographic information and society."

Geoinformatics is defined in Wikipedia in a similar way as by several other authors:

"Geoinformatics is a science which develops and uses information science infrastructure to address the problems of geosciences and related branches of engineering. Geoinformatics combines geospatial analysis and modeling, development of geospatial databases, information systems design, human-computer interaction and both wired and wireless networking technologies.

Geoinformatic technologies include geographic information systems, spatial decision support systems, global positioning systems (GPS), and remote sensing. Geoinformatics uses geocomputation for analyzing geoinformation".

Both definitions say that it´s the "science behind GIS" but in easy words one can say that GIScience is a term developed and shaped from the Geographic Society in the US while Geoinformatics expresses the European view, that GIS is build on three pillars (Computer Science, Geodesy/Surveying and Geography, see fig.2).

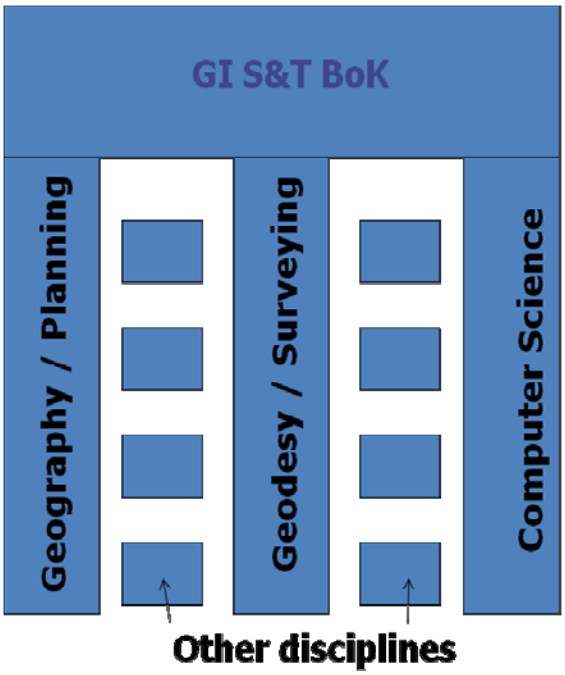

Figure 2: Disciplines contributing to GI science (authors perspective)

In the following we give some further comments on the BoK and we will discuss a few questions related to this issue, like:

- Is the GI S&T BoK complete?
- What to we have to define within the curricula?
- What topics/modules should a Geoinformatics curricula include?

Unfortunately there are still more questions than answers!

Further comments on the BoK

The comments of this section not only represent the authors opinion but partly also the outcome of a discussion session on this topic held at the EUGISES 2008 conference [http:/www.eugises.eu/] where around 30 people involved in GIScience education in Europe attended:

- The BoK in general is seen as a valuable work of a large number of well known colleagues, it is very important and helpful for quite a number of tasks

- GIScience should not represent primarily a Geography point of view because we believe that mainly Geodesy and Computer Science also play an important role within GI Science. This leads to the request to add Computer Science, web based services, Geodesy and GPS more explicit to BoK, preferable on the top level.

- The definition of topics related to basics in Natural Sciences, Mathematics, Computer Science etc. is as important as the definition of GI Science topics

- The core knowledge e.g. for a Master of GI Science should be defined more explicit.

- Laws, directives, initiatives like INSPIRE, Galileo, available data like ATKIS, Data given policies, facts that combinations like GI + Geodesy are usual in some countries lead to the fact that regional perspectives (like Europe) have to be considered in a Bok.

- An indicator for the depth of teaching should be added to the topics, e.g. Blooms taxonomy

- The support of the usage of the BoK by a suitable (software) tool is seen as very important

- The European Community would be eager to contribute to the further development of the BoK

More details about these issues can be found in [Reinhardt and Toppen, 2008]

Is the GI S&T BoK complete?

Completeness is hard to check because it probably depends on the personal view. For this check we used the methodology to compare the BoK with a number of existing curricula.

With regard to the necessary shortness of this paper only two points are mentioned here which of course expresses the view of the author:

- It represents primarily a geographic view. Relevant computer science related topics are too weakly represented,
- Especially the relevant work of ISO TC 211 and OGC as well as the basics for modelling, services etc. have to be considered more extensively and explicitely.

More details related to the question of completeness where presented by [Reinhardt, 2006].

What do we have to define within the curricula?

Professional competences have never been changed that fast as nowadays. Compared to that, the basics in mathematics, physics and other natural sciences are almost stable but without any doubt of very high importance in university education. Also accreditation guidelines stress the importance of basics in these fields.

As a consequence we believe that we have to define also the basics in mathematics, physics and computer science, economics, geography, etc. when we design the curricula for a GI course. That means the BoK in GI S&T is only one component to be used for curricula design and also for accreditation. Another important component would be the necessary basics as mentioned.

For the definition of the GI related module the BoK of course can be a very suitable tool.

As also mentioned above it might be helpful to add an indicator for the depth of teaching to the topics. Related to this many discussion have shown that an open question is, if a core curricula should require that a certain module is treated with a specific depth or should it foresee that a specific curricula defines the depth for the modules.

The author believes that for certain key modules the depth should be defined in a core curricula. But these key modules still have to be defined.

What should a Geoinformatics curricula include?

Why is the development of such a curricula difficult?

As mentioned above Geoinformatics includes modules from different fields. These are Computer Science and Geography as well as Geodesy, Surveying, Photogrammetry and Remote Sensing and Cartography. For most of these fields complete study programs are defined which leads to the question how much of these fields have to be included in a Geoinformatics program? Some examples from the draft of a core curriculum of the German society for Geoinformatics illustrate the problem; they define:

- Basic competences in data capture
- Basic competences in Remote Sensing
- Basic Competences in cartography

The author wants to emphasise that these are specifically selected examples. Many others are more concrete. But these examples show that a lot is left to the concrete curricula definition. The key question in this conjunction is:

What is the role of a core curricula? Should it define the “must have” modules or should it just list options? But what does the term “core” stand for in the latter case?

As the author has worked as an expert in quite a number of accreditation processes he would appreciate very much if a list of “must have” modules would exist, also defining the depth of teaching, because that would make accreditation more easy and study programs would be easier to be compared by students and teachers.

Future work:

Different communities like UCGIS, ICA and AGILE should cooperate to discuss the issues raised in this paper and to develop a future version of the BoK and/or a Geoinformatics core curricula.

References

THE UCGIS GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY (GI S&T) BODY OF KNOWLEDGE (BOK), ONLINEVERSION AVAILABLE AT:

[HTTP://WWW.UCGIS.ORG/PRIORITIES/EDUCATION/MODELCURRICULAPROJECT.ASP].

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(All web sites have been visited last in early July 2009.)