

EFFICIENT COMMUNICATION STRATEGIES FOR ONLINE TRAINING IN GEOINFORMATICS

T. Kastler, B. Grendus,

University of Osnabrueck, Institute for Geoinformatics and Remote Sensing (IGF),
49076 Osnabrueck, Germany - (tkastler, bgrendus)@igf.uni-osnabrueck.de

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ABSTRACT:

Online training in geoinformatics has been used at the University of Osnabrueck for several years in 2 projects: UNIGIS_eXpress (comprehensive online course in GIS) and FerGI (online tutorial in geoinformatics). Learning efficiency mainly depends on the quality of the course material, learning styles and skills of the students, the reliability and quality of the computer system and online connection, and interactions between students and instructors. There are many advantages to e-learning in geoinformatics, and even the potential disadvantages (i.e. high complexity, self-directed motivation, dependency on technical infrastructure, isolation) can be alleviated with a properly designed communication strategy. Based on experience in UNIGIS_eXpress and FerGI scheduled discussion sessions with the group and individual chats (with Skype etc.) are a useful obligatory supplement to improve communication efficiency and students' motivation. Requirements are small groups, adapted course material and starting points for open controversial discussions and joint group tasks. Our experiences show, that there is no communication tool that fits for all needs but an adapted mixture of synchronous and asynchronous techniques shows high impact on the stimulation of learning activities.

1. INTRODUCTION

E-learning presents a viable solution to meet the increasing requirements in higher education to enhance the knowledge and skills in geoinformatics by adaptable and effective training and education courses (König and Schiewe, 2006). A variety of international distance learning courses for academic teaching is offered for under graduate level, post-graduate level students and for professionals in GIS (König, 2009).

For students and also for teachers e-learning has lead to a significant change from classical learning environment at a university with lectures, books, lab experiments and face-to-face communication to a dynamic virtual learning space including web-pages, multimedia clips and social networks with online communication (Groenendijk and Markus, 2010). Attention is mainly focused on e-learning tools, environments, applications and presentation techniques. All experiences show that effective communication is one of the most important prerequisites for learning success providing competent support and the supervision of the student's activities.

The interactive elements to involve the learner in a communication process at different levels can be classified into asynchronous elements (i.e. e-mails, discussion boards, blogs, and wikis) and synchronous media (chat, video conferences, virtual classrooms, live streams etc.). There is a variety of technical tools and applications along with e-moderation methods which can be used for synchronous and asynchronous teaching. However, communication in e-learning can suffer from some of the same pitfalls as communication in classroom training, such as too little opportunity for interaction, no immediate feedback on questions, and social isolation of the students.

In this paper the authors present their experiences using an adapted combination of synchronous and asynchronous elements to optimize learning efficiency and students' success and contentment.

2. PROJECTS

The Institute for Geoinformatics and Remote Sensing (IGF) at the University of Osnabrueck offers two academic course programmes in geoinformation science:

2.1 UNIGIS_eXpress

The project 'UNIGIS_eXpress' is closely connected to UNIGIS Salzburg which is a member of the joint network UNIGIS international, the world's premier initiative for e-learning courses in GIS. UNIGIS is a worldwide multilingual network of universities offering internationally recognized post-graduate study programmes and qualifications (Traun and Fally, 2007). The aim of UNIGIS_eXpress is to promote the professional career of graduate students by application-oriented skills and conceptual understanding of geoinformation. Certificates are given to participants who take part in a 7-month fulltime-course which is available for a fee.

Each UNIGIS_eXpress course starts with a two-day face-to-face workshop in Osnabrueck. Participation is compulsory (except for participants who are not able to travel or live too far abroad). Workshops focus on introducing into online learning, communication infrastructure and contents of the course. Each course is designed to make participants familiar with practical geoinformatics through step-wise introduction of knowledge and program functions.

Each participant needs access to the internet (min 56K) and a web browser; GIS software also has to be installed. UNIGIS_eXpress courses consist of 7 core-modules covering basics in GIS and elective subjects "Applied Geoinformatics", a free choice combination of additional special modules, summer school, and training courses/seminars successfully completed at other institutions (figure 1). Learning material used by eXpress students is mainly provided in German and partly in English. Approximately 25 working hours for an average student equate to 1 credit point according to the European Credit Transfer System (ECTS). Typically participants have to complete one module every 3 weeks. Each module has the same structure: Introduction, overview, text and multimedia materials, exercises and tests (Kastler, 2005). For an overview on the course structure see www.unigis.at and www.unigis.uos.de.

NR	Module	ECTS	Type
1	GIS Introduction	6	BS
2	Data Modelling and Data Structures	6	BS
3	Data Sources and Data Acquisition	6	BS
4	GeoDBMS	6	BS
5	Visualisation and Cartography	6	BS
6	Application Development	6	BS
7	Geographical Analysis	6	BS
8	Elective Modules "Applied Geoinformatics"	18	BS/SS/PR
	Total	60	

Figure 1. Modular structure of UNIGIS professional/eXpress (BS – mentored self-study; PR – project work; SS - short intensive program or summer school). Source: <http://salzburg.unigis.net/professional/structure>

2.2 FerGI

FerGI (Fernstudienmaterialien Geoinformatik = distance learning material for geoinformatics) established in 2003, consists of 36 self-learning e-learning modules developed in a cooperation of 5 universities of Lower Saxony, Germany. The IGF at the University of Osnabrueck as the main coordinator is supervising 16 modules. An overview of the available modules is given in figure 2.



Figure 2. Overview of current FerGI modules

The FerGI modules focus on special subjects of geoinformation science and do not cover a whole curriculum like UNIGIS_eXpress. Typical modules comprise 0.3 to 1 ECTS points. Modules are in German and/or in English depending on the subject and target group. They are primarily used in blended-learning scenarios at universities as an addition to face-to-face learning in university lectures. Modules are also employed as self-learning tutorials at administration, industries, schools, and universities. For 8 weeks access is free-of-charge after registration (Brinkhoff and Garrelts, 2009). In recent months a special training programme for small companies has been developed which is partly based on FerGI-modules (FerGI@KMU, see www.fergikmu.de) (Grendus, 2008).

3. COMMUNICATION: TOOLS & STRATEGIES

Studying online provides a new context for learning (Salmon, 2004). The role of the instructor has changed from giving lectures and supplying facts to being a guide or facilitator, with emphasis on helping students to construct their own knowledge (Strobl, 2004). This requires appropriate communication strategies to instruct, support and motivate learners:

3.1 Asynchronous

The particular advantage of e-learning is the high flexibility of the courses allowing students to study where they want and when it best fits into their portfolio of activities. Communication tools used in e-learning processes should therefore be also highly flexible. Asynchronous communication meets these requirements to a large extent and forms the basis for information exchange in e-learning.

3.1.1 E-Mail:

Contact via e-mail is widely used in all our e-learning courses to establish and maintain direct and personal contacts between students and instructors. Students' feedbacks show that e-mail is still important for personal information and can also helpful to support and motivate students in problematic stress situations in an individual and appropriate way. Questions about general subjects concerning the whole learning group have to be redirected to the discussion boards.

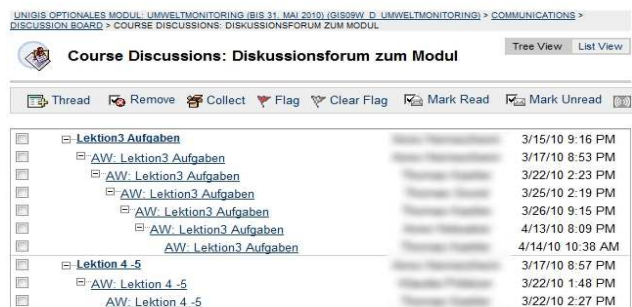


Figure 3. Discussion board in Blackboard (UNIGIS Salzburg)

3.1.2 Discussion boards:

Discussion boards in UNIGIS_eXpress are part of the Blackboard learning management system used by our cooperation partner at the University of Salzburg. In Blackboard messages in a discussion board are hierarchically sorted by thread, author, and date (Coopman, 2009). To post a message, students either start a new thread or reply to an existing previous thread.

Replies to a thread are not visible on the default view of the main discussion board page unless the user switches to “expand all” in the “tree view” (figure 3).

FerGI offers a personal contact among students and to the module authors by e-mail and in discussion boards provided by Moodle. FerGI modules are used as a supplementary addition to a course so discussions concerning the course contents are mainly answered in live seminars rather than in the discussion boards.

Results of evaluation reports by students and instructors show the advantages and disadvantages of these asynchronous communication tools:

- Questions and answers of individuals are available for the whole learning group; they can be posted and read anytime at any place with computer access.
- Asynchronous communication usually needs less technical requirements (in terms of internet connection and multimedia hardware).
- Postings can be archived.
- Group size can be high, depending on the capacity and availability of the instructors.
- Discussion quality and efficiency depends on the structure and moderation of the boards (i.e. rules for creating threads, sorting and selection of relevant messages).
- Asynchronous communication can level students’ skill levels (technical, language, internet communication etc.) and learning types and paces (Flacke, 2009).
- A disadvantage of asynchronous communication is the lack of facial expressions, gestures and intonation. Questions and statements have to be written well-formulated and precisely to be understood by everyone.
- Time between questions and answers is a critical aspect. Intervening too quickly may result in too little input from students. However responding has to be at reasonable interval (several hours, max. 1 day) too avoid frustration while waiting for answers. Instructors should arrange time intervals learners can expect a reply.
- Working in asynchronous mode can create feelings of isolation (separation from the group, feeling lonesome) by spatial distance and also by psychological distance.

3.2 Synchronous

As the reliability and bandwidth of internet connections is increasing, limitations for the usage of synchronous communication techniques have been reduced.

In UNIGIS_eXpress synchronous techniques are scarcely used to simultaneously distribute lectures via webcast but they are commonly implemented as a communication media promoting interactions between students and instructors and for maintaining group work. Learning in synchronous sessions is often very intensive: students and instructors can immediately ask questions and give direct feedback.

However, synchronous learning may in general result in a loss of flexibility especially in time because it requires real-time interactivity amongst learners and the instructor.

3.2.1 Skype: Skype is a voice over internet protocol (VoIP) application which offers features such as text based chat, voicemail, call forwarding, conference calling, and video chat. It functions as a peer to peer (P2P) network rather than a centralized resource. Skype is free of charge, easy to use and requires scalable bandwidth depending whether you perform text, audio or video transmissions. It opens up a lot of possibilities for live communication and allows frequent contact between instructors and students (Pan and Sullivan, 2005).

As a result of individual students’ evaluation reports, we found out that the communication with Skype mainly has a positive impact on the learning atmosphere and efficiency:

- Time constraints and technical complexity of the course material strongly demand the possibility to get just-in-time clarification and support.
- Sharing knowledge and experiences with other participants’ help students stay on task and motivate them to learn productively.
- Synchronous interaction with instructors and other students empower students to take a more active and efficient learning role.
- Interaction and affirmation by instructors and peers and makes students overcome difficulties and even deadlock situations to prevent frustration or panic reactions.
- Controversial chat discussions via Skype often give students better understanding of asynchronous discussions on Blackboard panels.
- Social interactions promote group building processes and avoid isolation.
- Skype discussions facilitate coordination of group projects.

There are also some disadvantages of learning and teaching via Skype:

- The communication efficiency depends on technical requirements (network connection, multimedia equipment: headsets and microphone).
- The productivity for learning is closely connected to discussion style and discipline, group dynamic processes and personal activity and attitude of the instructor and the students. For group sessions it is strongly recommended to publish an agenda and rules („nettiquette“) for discussions.
- Group sessions are only successful when properly organized (scheduling via Doodle.ch, propagation of a fixed agenda via e-mails).



Figure 4. Skype chat with text and video

3.2.2 Virtual Classrooms: Skype is also used for presentations via instant desktop sharing to perform small webinars presenting small coherent learning units (see figure 5).

The extra tool Teamviewer adds more functionality i.e. application sharing and interactive collaboration for proactive online student support in virtual classrooms. The tool which is free of charge for non commercial use can help to solve individual software problems through remote control operations.

These rather small communication tools are freely accessible to everyone, easy to use and modest in network load. A combination can do nearly all that a commercial virtual classroom system also could do.

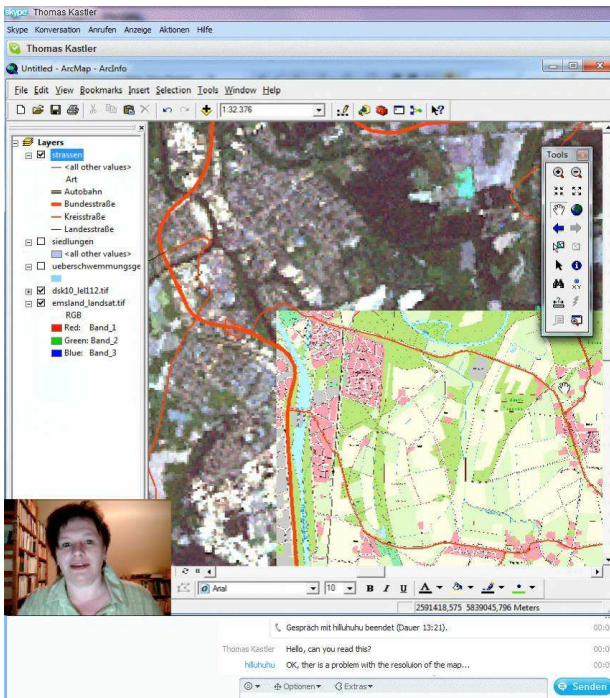


Figure 5. Webinar showing GIS functionality via Skype

To brush up efficiency clear rules have to be set (“netiquette”/“chatiquette”, Shea, 1994) and agreements about media and times for communication should be established.

4. ADAPTED COMMUNICATION

Salmon (2002) proposes a scaffolding model for e-learning processes (figure 6): participants need to be supported through a structured developmental process with adapted levels of interaction and group participation at each stage of the development of their skills. According to this model the classical role of the instructor being the coordinator of all communication processes to a coach focused to support cooperative learning processes (Olsen and Monty, 2006).

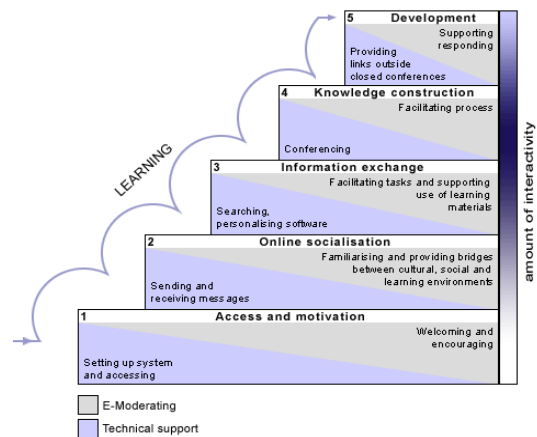


Figure 6. 5-stage model of interactivity in e-learning (Salmon, 2002)

This model was adapted and used as a guideline for our web-based online teaching since 2008 to increase interaction and improve learning in distance education:

4.1 Implementation in courses

In the UNIGIS courses main communication channels remain asynchronous (e-mail and discussion boards in Blackboard provided by UNIGIS Salzburg). We organize a small number of supplementary Skype chat sessions with the complete class. In addition numerous individual on-demand Skype meetings are performed allowing students to ask questions directly to the instructors.

Discussions can be easily organized and performed in small groups of 10-15 students. The moderation of course modules is adapted to the group learning situation presenting joint group exercises, discussion points with open results and links to supplementary (external) material for “hungry minds”.

For efficient communication with Skype the online availability of instructor has to be granted at working hours (and sometimes even longer!). However Skype makes it easy to detect if someone (student or instructor) is active or not available for communication.

At an early stage of the courses we carefully enable the students to find their way around the online learning platform and introduce them into the principles of online communication. Some participants might be insecure what expectations the instructor and the group might have about their participation in the discussions. In practice, a good moderators needs to judge when to “let the discussion flow” and when to guide students towards expected results.

At later stages of the group development we focus on providing support for each person’s needs and objectives and triggering co-operation within the course learning group which usually culminates in establishing a common group identity.

4.2 Experiences

As the results of students evaluation reports of two UNIGIS_eXpress courses have shown, communication quality was rated predominantly “very good” or “good”.

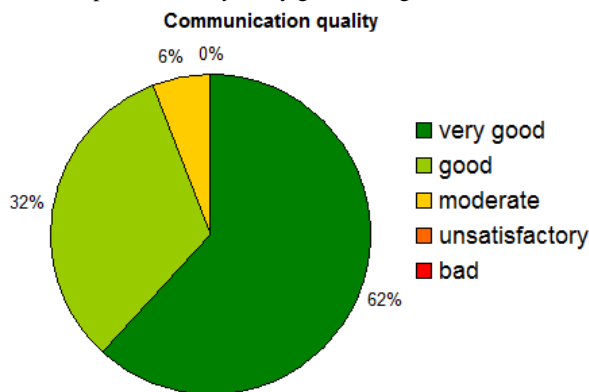


Figure 7. Assessment of communication quality of 34 participants in UNIGIS_eXpress courses (2008)

The preference in the usage of communication tools was also analyzed (figure 8): Communication by e-mail is used by all participants, whereas discussion boards were used by 74% of our students. 88% of the students were present at scheduled group sessions with Skype and nearly all of them (91%) used Skype for individual instant communication with other students and the instructors.

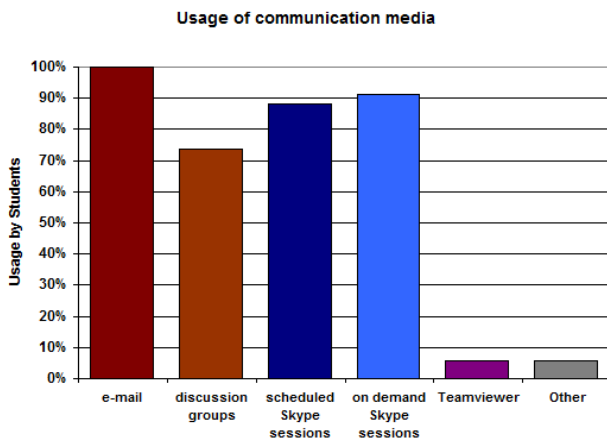


Figure 8. Communication preferences of 34 participants in UNIGIS_eXpress courses (2008)

The motivation of the students is generally high, especially directly after live group sessions or individual chats. It is stimulated by the instructors support and contributions of the group or individuals. Compared to previous courses there were no complaints about of isolation or even panic reactions. Problems of individuals and/or group are visible and can be detected and counteracted before frustration and delays occur. Students' feedbacks show, that instant (real-time) support is considerably contributing to an atmosphere which is very conducive to effective learning.

5. CONCLUSION

From our experience there is no communication strategy or learning management tool that fits for all. An adapted mixture

of synchronous and asynchronous techniques may better fulfil the specific needs of individuals and study groups at different learning situations. We found that the mixture depends on the study situation (intensity, aim of the course), structure of groups (size and composition), student's motivation, and the stage of the course. However, as in teaching at university lectures students reactions may make instructors change plans and strategies spontaneously to match with the actual learning pathway (Burnett, 2003).

Based on the positive feedback using Skype to support groups and individuals, we plan to maintain and develop this learning strategy and apply it to other distant learning courses. It may be problematical to use this method for courses with a short duration (social group development usually takes some time) or transfer it to groups of greater size (loss of opportunities for individuals to communicate).

Instead of Skype and Teamviewer as software for chat and web conferences the method could also transferred other instant messaging software supporting live video conferences (Ekiga, Windows Live Messenger, Brosix, Switchboard etc.) as long as it is free of charge for all users. It is also important to supply multimedia conference facilities and to have a reliable internet connection available.

In the future applications of the Web 2.0 such as social networks, blogs and Twitter may also turn out to be potentially useful additions to boost efficiency of e-learning communication processes.

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