eLearning – The Possible and Impossible

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ABSTRACT

eLearning means knowledge acquisition via new media, primarily via Internet. Politically, the approach is strongly pushed and financially supported. However, the investment is done, because in the long run the user is expected to pay for eLearning services. Moreover, a financial gap opens with respect to operation of the systems including updates. Commercially, industry understands eLearning as a big new market. This view certainly overestimates the opportunities. Standardisation of the products is a "must" for any successful technical mass product. This holds true for eLearning, too and will take time. In the professional domain, eLearning is often considered to be in contradiction to conventional teaching. This cannot be confirmed, because blackboard, chalk and convincing lectures will generally be more attractive to the students than even well prepared new media. Technologically, eLearning provides indeed strong tools. The paper refers particularly to the Federal Programme on "new media", the GIS project, in which 14 big modules have been developed (free download: www.geoinformation.net). Finally, the human should be the principal player, which is generally not yet the case. New media in the context of teaching is not at all enthusiastically accepted as evaluation from students show. eLearning experts, especially from the technical domain should more carefully study the phenomena of "learning" which basically is not changed when applying new media. eLearning is a new tool and must consequently lead to completely new opportunities. It would be a big mistake to "just substitute" blackboard and chalk by screen and mouse. An example is given to fully use the new opportunities by integrating augmented reality systems in photogrammetry lectures at Karlsruhe University. A final suggestion is made to translate eLearning material into local language in order to meet the needs of the clients worldwide.

1. INTRODUCTION

eLearning is the transmission of knowledge through new media, especially the internet. Web-based learning is a result of the everyday use of computers (ubiquituous computing). The fact that computers are being networked more and more nowadays, has led to an explosion of development in this new area. The Magazine "eLearning Journal" listed over 1500 providers of eLearning producers and Project Executing Organizations in German-speaking areas in their first edition in 2005.

Explosively growing new areas, such as Geoinformation Systems (GIS) are characterized by unchecked growth. Standards and especially quality assurance are often missing and this is above all true for solid and long term experience with the new tool. In such cases, development of content proceeds in an interdisciplinary way. The methodical development, however, reveals frequent structural similarities between the different disciplines.

eLearning is being developed in all different fields of learning and life in general, whereby, here, I will concentrate on my own field of work, namely, photogrammetry and related areas

2. POLITICAL DIMENSIONS

The challenge of education is of primary importance to almost all political parties worldwide. Thus, one must recognize that overall, only those who make learning and knowledge a priority will have a future. On the macro level, it is societies who must be properly prepared in order to compete in the global economy. However, even on the micro level, a good education and lifelong learning are unconditionally the best protection against professional failure and crises in life.

In an interview in the "eLearning Journal," the Federal Minister for Education and Research, Mrs. Edelgard Bulmahn, emphasized technical competence as a basic necessity today. "In the coming years, information technologies will definitely lead to many structural changes in our education system." Since 2001, the Federal Ministry for Education and Research (BMBF) has provided 310 million Euros of funding for the development of modern techniques for teaching in universities and vocational schools.

The massive advancement of eLearning in schools and higher education has changed the political understanding of it and shown that it is indeed an important investment for the survival of schools. The corresponding reports on student experience (e.g. "GIS für Teenager," Seuß., 2005) have also shown a very positive response.

These political visions and dimensions are admittedly very costly. However, furnishing all the necessary equipment and the corresponding learning environment is relatively easy in comparison to finding competent teachers, developing appropriate software packages and above all, the long term continuation and updating of the materials.

Public investments in the future, like in the expansion of eLearning, will cost a lot of money. These costs should increasingly be funded by the learners themselves. This is in accordance with the political concept of *Grundversorgungen*, or primary care, whereby the State only maintains a justifiable minimum free of charge. This goes for healthcare as well as education..

3. COMMERCIAL POTENTIAL

The huge commercial potential of eLearning can be seen in a variety of ways: through the advertising of eLearning products above all via the internet, through the advertising in Magazines and last but not least, through the development among higher education institutions themselves to use it to advertise their own fields of study. Unlike commercial firms, technical universities often offer their software packages free of charge and try to attract attention for their area. In the 90s, an example of this was the "GIS Curriculum" from the University of California, Santa Barbara (Author: Michael Goodchild 1990). Commercial providers of such focus on high rates of growth. eLearning education in the USA should reach a 17.7 billion dollars in 2005 and 23.7 billion the year after (Glowalla, 2005). However, predictions of extreme growth should be handled with caution. Encarnacao, Leithold and Reuter (2000) predicted that by 2005, 50% of all Students would be enrolled in so-called virtual universities. This vision of the Club of Rome predicts that the entire education system in its current form will be dissolved by eLearning and the internet. Even if these extreme predictions do not come true, the international market is nevertheless moving in this direction, however, slower than predicted.
New possibilities are usually overestimated. That new tools lead to new products is merely a rule of technology. For many developments, one can already see new tools will only be used to restitute new ones. One good example from the field of surveying and mapping is the introduction of digital terrain models which initially was a new tool for producing old products like contour lines. However, only some time later was the full potential discovered which led to the development of new products.

The consequence for the commercialisation of eLearning should be that new products are found in the context of only later education. Learning modules, that unlike Germany, are normally paid for by the user, could be an example. This would naturally mean that this new product will have to be worth its price. For eLearning, this means a contemporary updating of its content in contrast to con-

ventional media such as books. This updating relates not only to the quality of the content but also the form, which must make use of the newest Sensor and Computing techniques to assure that the product finds acceptance, i.e. is widely bought.

In principle, society must become used to the idea that life long learning is necessary and that they will have to pay for it. However, eLearning products must be able to demonstrate that they are of high quality and conform to high standards. "Standard" is an important term in this context. Technical mass products and eLearning belong to this category, where success can only come through standardization. A work group at the Institute for Commercial Information Technology at the University of Bern is currently working on the standardization of eLearning. At this point, it is important to note that the product itself must be standardized. One example of a successfully standardized product is photogrammetry. The standardized mass product, which made photogrammetry so strong, is the topological map. The detailed agreement of this cartographic product led also to the standardization of photogrammetric instruments and methods. This is true for aerial photogrammetry and not for terrestrial photogrammetry for obvious reasons (compare Bähr 2000).

Successful commercialisation of eLearning on a large scale requires urgent standardization also in order to improve market transparency and quality assurance which has thus far been missing.

4. CHALLENGES FOR THE PROFESSION

eLearning will encompass all branches of the photogrammetry profession, not only faculty in higher education institutions or vocational training in businesses, but also the practician in the field in connection with advanced vocational training as well as the technicians and engineers who will work with this new medium (see Chapter 7.1). The situation for professors and teachers in higher education should also be illustrated. Considerations from this circle tend to be, also in order to save money, that teachers will largely be replaced by eLearning These worries are not completely unfounded as it indeed seems that the acquisition of knowledge and practical problem solving can be accomplished through eLearning. However, these worries can be easily dispelled by looking at the growing market for education which is also shaped by supply and demand. In the worst case, the number of instructors in the public sector (professors, teachers, etc.) would be stagnant and the increasing demand for education would be compensated by eLearning. But even in such a case, the development of new continuing education techniques and commercial providers is so strong that such concerns cannot be maintained.

Real teachers, with blackboard and chalk, have not lost popularity when compared to new media according to a survey in Karlsruhe, if they teach in an interesting and convincing way (see Chapter 5). The competition to be a professor on this level rests rather with Thomas Gottschalk than with eLearning.

It's a pedagogical rule that the form and content of academic instruction must be adjusted to each other. Reports about surveying in the Algerian Kabulei are best as a lecture rather than on the internet whereas drawings, three dimensional objects and derivations thereof in the form of mathematical equations are usually better with the help of the newer media.

One frequently heard criticism of university teaching is that it is too theoretical and far away from reality. Thus, education through new media has the possibility of increasingly being need based, though in principle, this is not dependent upon the teaching method as eLearning could also be very theoretical. However, here exists not only the chance to integrate new things (which is also possible

in traditional teaching) but also to develop totally different skills for the student through interactive learning which are not possible through conventional teaching methods. In universities, more emphasis is placed on the fundamentals and methods of natural science than at vocational schools. If the learning modules of eLearning prove to be of a high quality, then they will also be in the position to teach methodology stimulated through interactive learning and self-initiative.

5. TECHNICAL POSSIBILITIES

The initial political financing of eLearning by the BMBF has already been mentioned (Chapter 2). Meanwhile, teaching and learning modules with the new media have been developed at all the higher education institutions which generally occurred within the scope of partner projects like "Distance learning materials for Geo-Information technology" (*Fernstudienmaterialien Geoinformatik*) or FerGI (Schiewe et al, 2004). Below the program "Geo-Information – New Mediums for a new Interdisciplinary Subject" which was funded by the BMBF within the scope of the "New Mediums" from 2002-2004 (Plümer, Asche, 2004). For a number of reasons, Geo-Information Systems (GIS) as a subject is predestined to be transposed into a form suitable for the media. This is due not only to the volume of content and relevance for the present but also to its very nature as an interdisciplinary subject. Above all, space-oriented information rises and falls in graphic cartographic depictions. This interaction between the view or model on the one hand, and the scientific and mathematic background on the other, makes it an ideal test field for eLearning. The possibilities of this new medium in the context of eLearning are challenged by forming and processing the data and finally through the possibility of connecting different subjects and benchmarks. The homepage of this program offers three different products: learning modules, the Geo-café and the Project Portal. The core of these products are the learning modules, which are separated into lecture slides and self-learning modules. More information can be found at http://www.geoinformation.net.

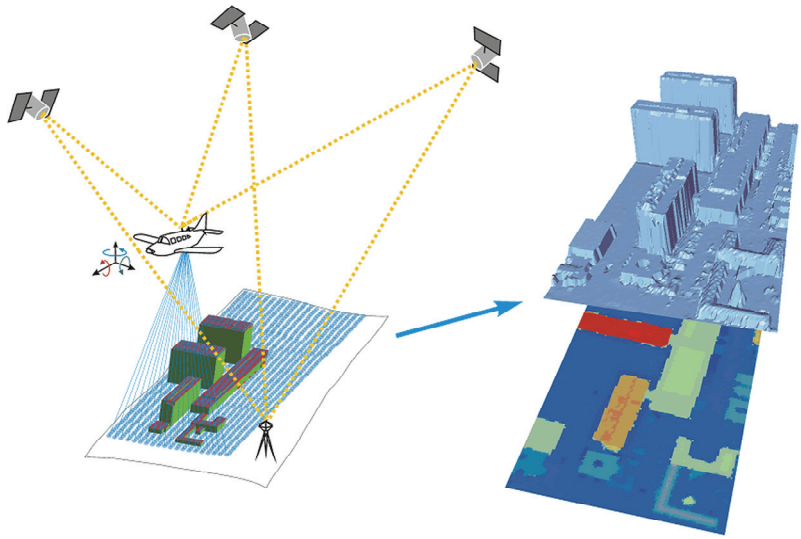

Figure 1: Aerial laser scanning from the eLearning program "Remote Sensing" from the IPF Karlsruhe (see also E. Steinle, Dissertations Karlsruhe, 2005)

Of special note is that the project is also supported by the University of Munich with whom the Geo-Café was designed which allows its users to communicate with one another. This helps to break the isolation of eLearning users. Of additional note is the Project Portal which allows small projects to be undertaken using Geo data-records integrated into the system. An example of the abundance of the possibilities this program offers is shown in Figure 1 below from module laser scanning. In the online version, a flash animation shows the surveying of concealed areas dependent on the altitude of the aircraft and angle of recording.

User experience with the aforementioned program has been collected and evaluated according to six subjects of lecture slides over 76 hours in total. Additionally, three learning modules were evaluated by 22 students. From the survey, only three aspects were singled out and dealt with, namely, acceptance, learning success and motivation. However, the difference between the evaluation of the lecture slides and the self-learning modules was insignificant. Students were asked to evaluate it on a 6 point scale with the minimum being 1 (does not apply at all) to a maximum of 6 (completely applies). Acceptance and learning success were both between 4.1 and 4.8 while the motivation came in just under 4. The margin of error was 0.9%.

These numbers can still be seen as good, even if it was not hugely successful overall. The high margin of error shows a great deal of insecurity on the part of the evaluators with regard to the ability to make absolute judgements about the materials. The survey was developed in 1997 by Reinmann-Rotmeier, Mandel and Prenzel (S. Dvorak et al., 2005).

In Karlsruhe the remote sensing module is given to students of geodesy, geoecology, meteorology and economics (around 40 per semester) from the very beginning, however, only around 50% use the material for studying after lectures whereas the self-learning material for test preparation is used by almost all of the students.

The lecture slides are used in traditional teaching of remote sensing only in exceptional cases. Such exceptions are usually subjects which are difficult to work with on the board or on slides like chromatics. Here, the learning materials have animations for things like the mixing of colours which is much faster and easier to explain with new media than with other alternatives.

6. WHERE IS THE HUMAN BEING

During the work on the Geoinformation program depicted in Chapter 5, it became clear that almost every author concentrated solely on technical questions. However, too few considerations for eLearning are being made for engineers and natural scientists as well as people in general. These new media could surely be adapted for other uses. Outside of engineering, there is some work being done on this subject, for example, see M. Franzen (editor) “Mensch und eLearning,” Articles on eDidactics and beyond (Sauerländer Verlage AG, 2003).

The material is prepared didactically as well as methodologically, however, even experts can confuse such terms. Didactics refers to how the content is chosen and methodology the presentation of it. Both are not necessarily completely separable but eLearning is primarily concerned with questions of methodology.

At the beginning of this essay, we already discussed the subject of eLearning to some extent. The meaning of “e” is perhaps much easier to understand than “learning.” What exactly does “learning” mean? To answer that question, we would need to consult a great deal of pedagogical literature (e.g.

Apel, H.-J., 1999), however, interestingly enough, the accounts of eLearning have hardly been discussed. This is quite astounding as new media do not immediately invalidate old principles. Just as the recognition of the psychology of perception in the context of cartography and the presentation of GIS results on the computer screen are valid so too must the principles of pedagogy also be valid for eLearning. This has seldom been the case to date, at least not in eLearning material in Photogrammetry and related fields.

Learning means the intake or absorption of knowledge which also involves understanding and the ability to recall the information Makato Nagao uses the following formula for knowledge:

Knowledge = Recognition + Logic (M. Nagao, 1990)

Recognition implies understanding and logic implies the structuring of the ability to recall.

Yet, we still have not said much about the nature of knowledge. Modern pedagogy sees the learning process as active, constructive and self-steered. Thus, it is insofar a sociological process. The content of learning can be divided into facts and rules according to the diction of artificial intelligence (AI). Even if both are not easily separated, the differentiation between the two for the purpose of analysing the learning process is beneficial. Facts are lexical knowledge which can be shown as lines or waves in graphs whereas rules appear in the relations between facts. Both are inseparable. Learning, or the acquisition of knowledge, is related to the structuring and weighting of knowledge in the neural networks of the human brain. This process depends on a variety of parameters like the reception of knowledge, acceptance and motivation. What controls this process is an unsolved and age old problem.

What can eLearning do for us in this context which is of obvious benefit for the student? Firstly, it can provide a differentiation of the speed of learning with the possibility to repeat individual learning steps. Additionally, eLearning is also not dependent on time or place. However, on the other hand, it could also be dependent on time and place in cases such as topography or geography where one is on sight and using "augmented reality." There are still many possibilities for further development in this area

7. VISIONS

7.1. Integration of Research

Figure 2: Students from the University of Karlsruhe during a immersion course in Photogrammetry using Augmented reality during summer semester 2005.

Through ubiquitous computing, a field in which eLearning can be applied, former borders between various areas of work disintegrate. The reason for this is the possibility of using faster forms of communication at any time in any place. In academics, this provides the chance to integrate research work and results into teaching which leads to increased motivation on the part of the students. An excellent example of this is an immersion course on the subject of augmented reality for Photogrammetry IV in Karlsruhe. Using eLearning in lectures leads to better quality teaching and a faster pace of knowledge transmission. Together with the selection of things no longer current, one has the possibility to integrate research subjects of the institution into the scope of such immersion courses Figure 2 shows students in Karlsruhe during an exercise in "augmented reality."

7.2. A Plead for Global Competition

eLearning is in many ways a good image of today's society, not only in terms of technology reaching into all facets of life but also that information is now globally available. Countries and also languages now globally compete. English is without a doubt the lingua franca of international research and also dominates international communication in general (Bähr 2005). However, one should not ignore the crucial importance of other languages. Western countries often complain that English is not accepted in other countries for a variety of reasons. These reasons could be cultural in the broadest sense of the word but also because of a lack of motivation to learn it or the opportunity to so.

For this reason, among others, the IPF in Karlsruhe has begun to translate the material of "New Mediums" into other languages. Table 1 has an overview of the work. The translation of the remote sensing modules into Spanish was recently completed.

Language	***Translator***	***Place***
English	Vanessa Dolbé-Raffler	Portsmouth, Great Britain
French	Dr. Tania Neusch	Strasbourg, France
Portuguese	Dr. Jorge Centeno	Curitiba, Brazil
Romanian	Dr. Hans Neuner	Bucharest, Romania
Spanish	Anita Schwender,	Santa Fe, Argentina
Turkish	Dr. Zubeyde Alkis	Istanbul, Turkey

Table 1: International cooperation of IPF Karlsruhe with foreign universities for translation of eLearning material.

It is indisputable that students are learning and studying in a language other than their own more and more frequently these days. On the other hand, good marketing and new media are necessary to woo students away from their native language. This is certainly a gap in the market and demonstrates the opportunity for translating many high level German language eLearning programs.

In terms of the time required, the financial costs involved and the intellectual work necessary for these materials, translating them would indeed be possible in the context of a cost benefit analysis. A gap in the market can be seen where students are simply expected to learn English and thus eLearning materials in their native language could become a very successful export, especially in the booming international Geoinformation market (Bähr, H.-P., 2005). Education and training are often on the forefront of international economic cooperation.

8. SUMMARY: THE POSSIBLE AND IMPOSSIBLE

Reports on eLearning are often unrealistically positive and thus wrong. The presentation of and predictions for eLearning are far too optimistic, especially in the context of advertising. For this reason, it is necessary to look into the possibilities and the difficulties related to eLearning.

Here a report from the DPA from June 2005:

With the title "New Media Useless in Classroom" the DPA reported in June 2005: "The use of new media for learning has met with scepticism from teachers and parents...Also the publishing companies notice this trend towards ordinary school books... the Philologists Union believes the trend will be reversed back towards chalk and a chalkboard as the expected boom of learning software never materialized. "We only reached 5 to 6% of the students with our multimedia offers" said the head of the electronic media department of the Ernst-Klett publishing house."

The reaction summarized above is typical of the overestimation of new tools. After the initial euphoria comes a "sobering up" phase and it merely takes time until an balanced view is reached. Politically, these new media and especially eLearning are receiving a great deal of support. It can however, only be seen as the beginning as there will naturally be permanent costs in eLearning for software, hardware and updates. These costs would then fall on the students and it is questionable whether that would be politically acceptable.

Commercial providers are among those to blame the most for the overestimation of eLearning. As is true for every other technical mass product, broad standardization is needed and this will require a certain period of time before eLearning products can be marketed in such a way that potential users are in the position to able to accurately evaluate the possibilities of the product.

eLearning contains great challenges not only for teachers, but for professionals in general. One of the impossible ideas is that it would somehow be possible to replace teachers. On the other hand, eLearning offers many new possibilities for teachers. However, it can only be used to augment, not replace, the teacher (blended learning). One mistake would be to use the new media simply as textbooks. The new possibilities of the technical dimensions of eLearning contain the strongest arguments in their favour. Compared to well presented traditional teaching, eLearning does not fair well in the estimation of the students. Students are not highly motivated by it. In addition, the problems of continuing to write and update the software have not been solved yet.

Learning is uncomfortable, at least for most students. Being able to study any time and any place, to repeat material and to control the pace of learning should prove to make eLearning a more attractive option. Only in these ways will it be possible to make learning more attractive but it seems impossible to ignore the effort and work associated with learning. The learning process as such remains unaffected.
One of the visions of eLearning is to enable learners to come much closer to the practical applications of their knowledge. One example of this is the integration of augmented reality in immersion courses on photogrammetry at the University of Karlsruhe and the challenge of meeting the needs of the global market for eLearning products in other languages.

9. REFERENCES

Apel, H.-J. (1999): Die Vorlesung: Einführung in die akademische Lehrform. Köln

Bähr, H.-P. (2000): Produktstandardisierung: ein Plädoyer für die Zukunft der Architekturphotogrammetrie. Festschrift Bernhard Wrobel, Schriftenreihe Universität Darmstadt

Bähr, H.-P. (2005): GIS und eLearning, ein Exportschlager. In: „Innovationen in Aus- und Weiterbildung mit GIS“, am 2/3. Juni 2005, GeoForschungsZentrum Potsdam

Bischoff, F., Bähr, H.-P. (2002): Didactic and Methodological Challenges in New Media Based Teaching and Learning for GIS. International Society for Photogrammetry and Remote Sensing.Commission VI, Sao José dos Campos.

Dvorak S., Kopp, B. und Mandl, H.: Evaluation des Projekts „Geoinformation – Neue Medien für ein neues Querschnittsfach“. In: Plümer, L., Asche, H. (Hrsg.) 2004: Geoinformation – Neue Medien für eine neue Disziplin. Herbert Wichmann Verlag, Heidelberg

Encarnacao, J., L., Leidhold, W. & Reuter, A. (2000). Szenario: Universität im Jahre 2005 (S. 17 – 19). In Bertelsmann Stiftung & Heinz Nixdorf Stiftung (Hrsg.) Studium Online – Hochschulentwicklung durch neue Medien. Verlag Bertelsmann Stiftung: Gütersloh

Glowalla, U., Kohnert, A. & Schneider, S. (2003). Entwicklung wissensdiagnostischer Module für E-Learning Anwendungen. In Bode, A., Desel, J., Rathmayer, S. & Wessner, M. (Hrsg). Mensch und E-Learning. Beiträge zur E-Didaktik und darüber hinaus (S. 39 – 51). Aarau: Sauerländer Verlage AG

Glowalla, U.: Einsatzszenarien für E-Learning-Angebote in der Geoinformatik – aus der Sicht der Instruktionspsychologie. In: „Innovationen in Aus- und Weiterbildung mit GIS“, am 2/3. Juni 2005, GeoForschungsZentrum Potsdam

Plümer, L., Asche, H. (Hrsg.) 2004: Geoinformation – Neue Medien für eine neue Disziplin. Herbert Wichmann Verlag, Heidelberg

Reinmann-Rothmeier, G., Mandl, H. & Prenzel, M. (1997): Modul 4: Qualitätssicherung bei multimedialen Lernumgebungen. In: Friedrich, H. F., Eigler, G., Mandl, H., Schott, F. & Seel, N. (Hrsg): Multimediale Lernumgebungen in der betrieblichen Weiterbildung, S. 267 – 333. Neuwied

Schiewe, J., Ehlers, M. und Grendus, B.: Fernstudienmaterialien Geoinformatik (FerGI) – Konzeption und erste Implementierungsbeispiele. In: Plümer, L., Asche, H. (Hrsg.) 2004: Geoinformation – Neue Medien für eine neue Disziplin. Herbert Wichmann Verlag, Heidelberg

Seuß, R.: GIS für Teenager – Erfahrungen eines Schulprojektes. In: „Innovationen in Aus- und Weiterbildung mit GIS“, am 2/3. Juni 2005, GeoForschungsZentrum Potsdam