Will E-Learning Become the Predominant Method of Teaching at Universities? Experiences with Different Forms of Teaching

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Abstract—The University of Applied Sciences (UAS) Technikum Wien is one of the largest UAS in Austria. Around 3000 students are enrolled in 16 bachelor and 11 master degree programs. Some 1600 different courses are offered, about half of them are traditional courses organized mainly as face to face teaching. Approximately 46% of the courses are organized partly or fully as distance learning courses. In many cases the distance learning courses and face to face learning courses have similar study content and are thus comparable. In particular, we also made distance learning materials available in full time (presence) courses and evaluated how those materials are utilized by the students of the full time courses in addition to on-campus lectures. It is interesting only around 58% used the distance learning videos in addition to the presence lectures and all videos were viewed after the presence lecture, but never before a lecture.

In the distance learning course all students used the videos in addition to a book which is used in the lecture and covers the entire course content. It is interesting to see, that students enrolled in face to face courses use the content prepared for distance learning in only about 50%. This might indicate that different learning preferences determine the way students like to study.

Index Terms—Approximately four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

Universities of Applied Sciences (UAS) have been founded in Austria in 1994. The UAS Technikum Wien was among the first institutions being in operation. Today UAS Technikum Wien is the largest purely technical university of applied sciences in Austria. Today around 3,000 students are currently taking its eleven bachelors’ and sixteen master’s degree programs; it offers a large range of bachelor’s and master’s degree programs. All of the programs are based on a solid theoretical foundation, while also being practice oriented. Most of them are offered as full-time and/or part-time degree programs. Two of them are entirely held in distance learning. The UAS Technikum Wien concentrates on the four following technical areas:

- Communication Technologies & Electronic Engineering
- Information Technologies & Business Solutions
- Engineering & Environmental Technologies
- Life Science Technologies

At UAS Technikum Wien, emphasis is not only placed on providing a high-quality technical education, but also on language training and subjects with a focus on business and personal development. The department of Computer Science organizes almost all lectures in information technology related fields in most bachelor and master degree programs. In Austria industry and economy are looking for more graduates of engineering study programs as are available. One possibility to enable more people to study these fields is to provide courses for part time students and even for remote students as many potential students find it impossible to start a degree program due to a location or time conflict or a non-compatibility with their work. Online courses also can play an important role in the lifelong learning approach.

Online degree programs are offered in different settings, with no on-campus phases or with limited on-campus phases.

II. DETAILED STRUCTURE OF DEGREE PROGRAMS

Study degree programs of the University of Applied Sciences Vienna follow the European Bologna structure. We offer three year bachelor (11 programs) and two year master degree programs (17 programs). All students have to pass a placement test; a predefined number of students are taken into the different programs. The number of students is defined by the demand of the industry.

Programs run either in full-time (55% of students) or part-time mode (45%). In total some 3000 students are studying in courses grouped into four areas:

- Communication Technologies & Electronic Engineering,
- Information Technologies & Business Solutions
- Engineering & Environmental Technologies
- Life Science Technologies.

More details can be found elsewhere [1].
All study programs use to a certain amount e-learning.

The distribution between presence-phases and distance learning phases are different according to the programs execution:

- Full time: 90% presence – 10% distance
- Part time: 60% presence – 40% distance (blended learning)
- Distance: 10% presence - 90% distance

Blended learning is structured in a way, that the presence phases concentrate on three evenings per week, allowing students with demanding jobs to visit these programs. Students in the distance learning programs have to attend presence phases five times per year, each lasting for two or three days.

At the moment 1600 individual courses are in operation, 46% are prepared for blended or distance learning.

III. Didactical Considerations

Besides the regular study programs with presence of the students in all lectures the University of Applied Sciences Technikum Wien offers special programs for professionals supported by elements of e-learning and two special distance learning programs.

The idea is to offer different programs for different target groups with different needs. The e-learning supported programs should allow professionals to combine their work with a degree course. But studying online is a difficult task. In many cases students tend to assume that online degree programs need less effort than similar traditional programs. This misbelief can lead to very early drop outs. Therefore sufficient information about the demands of the program and a well elaborated didactic design are necessary for successful learning in an online course.

A. Online Courses

When designing a course much care has to be taken to present the content in a motivating way and not to overload the course. A clear structure, not so much topics, well drafted notes for the work in the particular units, exercises which correspond to the content and the possibility of self-tests are the base of a good online course concept.

But learning is not only an individual process, also an active and social one. In contact with others, in discussions, in working together the students share their knowledge, deepen it, get to know some new points of view, talk about their problems in the learning process and get help to find solutions. To be member of such a learning group has impacts on the motivation, the learning success and the drop out rate.

Therefore it is not sufficient to prepare only content for the students. It is necessary to design a learning scenario which demands high cooperation and activity between the students. At Technikum Wien every distance learning course is intensively accompanied by a professor and an e-tutor. They have different duties in the online support. While the professor is responsible for all questions regarding to the content, the e-tutor keeps close personal contact to the students, supports them by problems in their cooperation and in the case of technical problems. The separated roles allow a very personal guidance of the students and a comprehensive online support.

B. Three Levels in Online Degree Programs

The didactic design of the online degree programs at Technikum Wien takes place on three levels [1]: the Macro-, Meso- and Micro-level.

At the first level, the Macro-level - the curriculum is designed regarding to the statutory provisions [2] [3] and the requirements of e-learning. Besides the close connection to the vocational field and the practical application it is necessary to ensure the possibility to finish the program in the given time.

The didactics at Meso-level design the courses of the particular terms. It is important to make sure that the students gain the wished competences in the courses and that their workload is reasonable. The methods and tools used are chosen and adjusted.

At the Micro-level the contents of the online courses are developed. A topic should be liable to the following quality criteria:

- The content comes up to the most important competences, is up-to-date and related to practice.
- A variety of different didactic methods are used and a high interactivity between the students is guaranteed.
- The sequence has an attractive animation and design.
- In every sequence is a (self)evaluation for the learning outcome of the students.
- The learning platform is user-friendly.

The design of the learning scenario should be motivating for the students to arise and share constantly their knowledge and to apply it on concrete examples.

C. Didactic Goals

Through the adequate design of the curriculum on the Macro-, Meso- and Micro-level the following didactic goals should be reached:

- Just-in-time learning for the students
- Support of self dependent learning
- Enhancement of the ability to challenge, criticize, reflect and argue complex contexts
- Increase of the professional competence at academic level and of the problem solving skills
To get the idea instead of memorizing by using multimedia tools
- Support of the learning process and motivation by coaching on demand by the professor and/or e-tutor
- Creativity in the learning process and discussion, work in new forms of e-cooperation (virtual rooms and virtual teams)
- Better Time and Self-management and increased social and communication competences
- Self-dependent information search and interpretation
- Tracking the performance of the students and their learning results

To reach these broad goals a mix of knowledge transfer, active learning with exercises related to the professional field, intensive communication with the other students and constant coaching is necessary.

In conclusion, learning and teaching in distance learning courses require high engagement from students and lecturers and a good financial support from the university. But it’s an interesting and useful supplement to traditional taught programs. At the University of Applied Sciences Technikum Wien the combination of different organized degree programs helps students to find the right kind of study for their individual needs and personal life.

IV. LEARNING AND TEACHING

Learning is a complex issue. This is especially true, because learning is a very ambiguous verb. One might think of learning and actually mean the ability to remember facts, whereas somebody else might think of the ability to solve problems. The third person thinks of the ability to understand complex coherences and the fourth person focuses onto internalization of complex movements like dancing.

The complex mechanisms of learning is done by the brain itself and evolved in millions of years. Learning can be seen as a mechanism to strengthen the human ability to react on challenges of life by acquiring new knowledge, behaviors and skills or by modifying existing knowledge, behaviors and skills. Progress over time tends to follow learning curves.

Thus effective teaching can be seen as a process to dramatically steepen the learning curve of students.

Much research has been done to find the most effective way of teaching. There is so much literature (e.g. [2 – 16]) on that subject available, that it becomes difficult to find suitable principles for the application in everyday teaching.

Maybe the most important issue for teachers is to make learning simple and effective. Everybody knows how difficult it is to learn something one is not “interested in”, or how easy it is to remember something perceived as “important”. This simple example shows that the learning curve will be steeper if a given subject is being perceived to be “important”. Consciousness and unconsciousness processes in the brain are responsible for the subjective feeling that “something is important and therefore has to be remembered”.

Man principles can be applied when one is creating study material [6]. The simplest principle is the principle of repetition. If somebody needs to remember a fact because the fact is needed again and again and again, unconscious processes put that specific fact into medium or long term memory without any need of conscious interaction.

Learning material therefore has to be structured in way which implies repetitions. For example, important facts can be put into audio files. The same facts can be repeated in texts and a third time in a short video sequence.

A second important and simple principle is emotional activation. Testing ones knowledge or games in which people compete are possibilities to utilize this principle.

V. COMPARISON OF PROGRAMMING COURSES FOR PRESENCE AND DISTANCE LEARNING

We offer courses on introduction to programming in bachelor studies for full time presence and distance learning. The courses have similar study content and are thus comparable. We made distance learning materials available in full time (presence) courses and evaluated how those materials were utilized by the students of the full time courses in addition to on-campus lectures.

In the presence courses we offered videos, which were used in the distance learning course as optional material by the students. This material contained the same information as used in the lecture materials. In the videos the same slides are used. The main difference to the distance learning course is that no live lecture is given. In contrast, in the distance course only the videos are made available. Although the videos were offered just as an add-on to the students of the presence course, 58% used the distance leaning videos in addition to the presence lectures. Of those 58% all videos were viewed after the presence lecture, but never before a lecture. It is important to note here, that the videos were prepared by the same lecturer and are similar in additional explanations for the slides in comparison to the live lectures. The evaluation of the distance learning course revealed that all students used the videos in addition to a book, which is used in the lecture and covers the entire course content.

In the programming courses test cases were provided to the students before hand-in and the percentage of successful test cases was then used to grade the handed in projects. The use of test cases allowed students to evaluate their programs before handing in. At the end of the semester(s), we evaluated the students’ feedback with a number of questionnaires. In the following table selected feedback questions with the students’ rating on a normalized scale from 0-100 is shown. CS1 and CS3 are distance learning programming courses, with CS1 teaching introduction to programming in 1st semester and CS3 focusing on systems programming in the 3rd semester. GPR1 is an introduction to programming as presence course. CS3 covers advanced topics in systems programming, hence the test cases were of great help to beginners (Q1: 94.4 of 100 rating). In the presence course, discussions in the presence courses rendered the test cases less important (Q1: 73.8 rating). The compared exercises of CS1 and GPR1 were similar. Although not all test
cases, which would be used for grading the project, were provided before hand-in, students in all three courses did not create many test cases themselves (Q3: rating between 61 to 32), but the provided test cases were used by almost all students (Q2: rating 83-94). The additional test cases which were provided after hand-in, did not contribute much to a better understanding (Q4: 50-60 rating). The remaining questions, Q5-Q7, evaluated some quality parameters of the videos.

<table>
<thead>
<tr>
<th>Question</th>
<th>Distance</th>
<th>Presence</th>
<th>Rating : 0 - 100 (best)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: How much did the use of the provided test cases contribute to the understanding of the programming exercises?</td>
<td>83.3</td>
<td>94.4</td>
<td>73.8</td>
</tr>
<tr>
<td>Q2: Did you use the test cases to check your programs before hand-in?</td>
<td>88.9</td>
<td>100.0</td>
<td>93.7</td>
</tr>
<tr>
<td>Q3: Did you create your own test cases?</td>
<td>61.1</td>
<td>44.4</td>
<td>32.5</td>
</tr>
<tr>
<td>Q4: Did the additional test cases, which were provided after hand-in, help you to better understand the problems in your programs?</td>
<td>55.6</td>
<td>61.1</td>
<td>53.2</td>
</tr>
<tr>
<td>Q5: How do you grade the structure of the videos in general? (topics, sections, etc.)</td>
<td>95.8</td>
<td>87.5</td>
<td>71.4</td>
</tr>
<tr>
<td>Q6: Quality of video sound</td>
<td>100.0</td>
<td>100.0</td>
<td>96.4</td>
</tr>
<tr>
<td>Q7: Quality of video resolution</td>
<td>100.0</td>
<td>83.3</td>
<td>97.6</td>
</tr>
</tbody>
</table>

Considering that the evaluated ratings are quite similar, an interesting question arises: Is there any distance learning material which cannot also be used for presence learning? From our results we conclude that distance learning materials, in particular if they also allow self-training for students in their respective course, are also a solid basis for presence courses as they do not require a live lecture.

From that another question can be derived: do make distance learning course materials, those which are self-contained and allow a proper self-training for students, a live lecture superfluous? In all distance learning courses we always have a very strong activity of about 150+ messages per semester in the forum. The forum is a replacement for the lack of interactivity which is missing compared to a live lecture. The questions asked in the forum, and answered by the lecturer, mirror a large subset of questions which are also asked in the corresponding live lecture. Additionally we also use a forum in the presence course, but there the forum is mostly used for some organizational questions, but only rarely for discussions. Those take place in the lecture or in the courses where the exercises are discussed. Thus, even if course materials which have been prepared for distance learning are used in a presence course, either exclusively or additionally, they do not make the live lecture superfluous. Using other communication channels such as forums (or live chat) can be used to make up for the lack of interactivity, and are a replacement for them to some degree, but they do not replace entirely the impact a live lecture can have on the motivation on students for seeking new questions and diving deeper in a given field of a lecture. This also appears to be reflected in the higher drop-out rates of distance learning courses.

VI. CONCLUSION

E – Learning as a tool to provide learning materials already is the main way of distributing these materials. This is true for full time, part time and distance learning programs. A closer look onto the way how students utilize the materials shows important differences.

Students who have the opportunity to talk to teachers in a classroom seem to prefer in many cases the direct contact and do not use the provided materials. From their point of view it seems unnecessary to use additional time to study those materials. It is difficult to find out if the material could be helpful, because the students just don’t use it.

Not using the E – Learning material also could be caused by the existing institutional structures and customs [17]. Students maybe are very used to deal with all challenges which arise from these structures. They are used to struggle to be in class. Especially at universities of applied sciences it is compulsory to attend classes. This may cause enough pressure to focus the mind of these students away from the possibility to use the provided material.

However, humans tend to minimize work and in many cases students simply state it is easier to listen to a teacher and to ask questions rather than use material where no teacher is present or easily asked. The authors speculate that face to face teaching is for many students an easier and more convenient way to learn. These results however are preliminary.

REFERENCES

[1] University of Applied Sciences Technikum Wien, website www.technikum-wien.at


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