

Lurking – an Underestimated Human-Computer Phenomenon in Closed Online Courses

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In this paper the authors discuss whether the voluntary participation in virtual interaction improves the learning outcome in the field of Civil Engineering on the basis of their experimental evidence. The focus of this study concerns the students who never took an active online part, the so-called lurker.

The experiments have taken place three times since 2001 during the study of the subject Structural Concrete, which is the largest part of the Civil Engineering Master Degree course. For this purpose the authors evaluated the passive participation within online discussion forums and proved that lurking can be considered a natural process of human communities.

Introduction

According to Laurillard [1] e-Learning could be greatly improved by achieving the following three goals, towards which teachers in higher education should strive:

- Development of better ways of searching for information;
- sharing ideas and resources amongst learners; and
- the improvement and practice of techniques of communication with others.

Although learning is an active cognitive process on the part of the learner, it is also a social process and **develops through conversation** [2], [3], [4], [5].

Online conversation can also take place via public posting and this is just one way in which an online group can benefit from the knowledge of its other members. However, we have to bear in mind that many group members do not take an active part in this online conversation but nevertheless reportedly make up the majority of members in discussion lists and thus it is necessary that the behavior concerned in this phenomenon is also considered.

Much research has been made on online communities [6] concerning the active, visible, online learners but less is reported about the hidden participants. Some have argued that learning, even in this seemingly passive and less visible mode, is still occurring [7].

Consequently, the authors started this case study on both the active learner **and** the passive learner in 2001. For this purpose, a *blended* nine hour lecture, supported by the e-Learning project *Interactive Visualizations in Civil Engineering*, iVISiCE [8] and running for four months every year, was examined three times.

The subject is structural concrete, the largest part of the Civil Engineering Master Degree course. The basic content of the lecture is the design and construction of reinforced or pre-stressed concrete structures using the European Standard Norm (EC2).

In November 2001, the project iVISiCE was founded to investigate the possibilities of internet use in Higher Education, a so-called blended learning scenario was created. The project stands on three pillars:

- Interaction;
- Visualization; and
- Communication.

These were found to be crucial to the support of successful e-Learning.

The advantages of e-Learning cannot only be summarized through the expression A³ (anytime, anywhere and anybody) but must also include interaction [9] as a very important, social element of deep, effective learning. Consequently, all interactions between learner and learner (collaborative learning) and between learner and instructor (Computer Mediated Communication, CMC) have been tracked to examine the relationship between the interactivity and the learning process. In this paper we focus on communication.

Theory, Background and Previous Work

Interaction and Learning

Traditional classroom settings are well researched and show that increased interaction actually improves student achievement. Vygotsky emphasized the role of interaction in learning, which can be summarized in three sentences [10]:

- Learners achievement level depend on what they already know (previous knowledge);
- the mechanism that delivers learning is actually interaction;
- the goal of all learning is autonomy, aiming for independent problem solving.

The key concept is based on Vygotsky's theory of the zone of proximal development (ZPD), which is the site

where learning occurs. This zone is defined as the distance between the actual developmental level, as determined by independent problem solving, and the level of potential development, as determined through problem solving under adult guidance or in collaboration with more capable peers [10].

This concept has influenced educators into viewing learning as a **collaborative process**. Dividing large numbers of students into small groups (less than 10), providing specific tasks, and setting deadlines to help learners become **actively engaged** in collaborative work. The fundamental idea underlying such group work is that students become meaningfully engaged in a variety of learning activities such as student or teacher led discussion groups, debates, projects, and collaborative learning groups [4].

However, it is commonly known that interactive modalities have facilitated the connectivity between students and teacher, between student and other students, and between student and content, as a result, attention to **online interaction** has gained increasing interest for research in teaching/learning processes at a distance [7].

Lurking

Lurking is a widespread occurrence in nearly every online discussion group. Lurkers are generally learners who are bystanders to course discussions. Usually the lurkers lack commitment to the community, and receive benefits without giving anything back.

A good example is the study of Nonnecke & Preece [11], they conducted an experiment involving 77 online health support groups and 21 online technical support groups. They determined that 46% of the health support group members and 82% of the technical support group members were lurkers.

Experimental Setting

Data collection

The primary aim of this work was to understand how much online communication and online work assists the learning process of each student, with specific emphasis on Civil Engineering - particularly structural concrete.

The lecture lasts for four months from November to February every year.

To pass their finals, the students have to pass three written and one oral examination, at the end of each study year, with intervals of approximately three weeks between each examination. The content of each examination is strongly defined. For the online communication, one discussion forum, concerning the expertise to be learned by the students, was offered for each mid-examination period. Here all postings, which were relevant and interesting in terms of their content, were tracked.

Characteristics of the researched user group

In this chapter, the “typical” student of this Master Degree course will be described. In 2003/2004 an evaluation took place to address the question of the characteristics of the learning population. In Table 1, the questions put to

the students for the evaluation, together with the average results, are shown.

| Question | Average |
|---|---------------------|
| 1) Concerning my computer knowledge, I am a ... (Beginner = 1; Expert =5) | 3,07 |
| 2) Concerning my internet knowledge, I am a ... (Beginner = 1; Expert = 5) | 3,08 |
| 3) How long have you been using the Internet? (... years) | 5,14 |
| 4) How many hours do you spend using the Internet in a typical week? (... hours) | 6,88 |
| 5) I have used the Internet for learning before this course. (yes/no) | 87%(yes) / 13% (no) |
| 6) I am very enthusiastic about the possibilities of the Internet (yes = 1, no = 5) | 2,4 |

Table 1 Evaluation of results concerning the user characteristics

The average age of the students is approx. 22 years (the range lies between a minimum of 21 to a maximum of 30 years) and about 15% of the course participants are female.

This data appears to be very consistent since similar evaluations in the years before have shown the same result. The number, gender and previous knowledge of the lecture participants are nearly the same as in previous years; the lack of significant diversification in the student population is ascribed to the long tradition existing in the study of civil engineering.

Research Question 1

In 2001/2002 and 2002/2003 all relevant contributions were counted. 110 students participated during the first year; 102 students during the second year and 128 students during the third year. About 30% took an active part in the online communication offered during the first and second year and more than 30% during the third year. Considering the voluntary nature of the participation, this was a very high attendance. This means that in 2001/2002, 39 and in 2002/2003, 30 students posted **at least** one fundamental statement for the online community to the discussion forum. Whilst researching the behavior of the online community the authors' first hypothesis was developed as follows:

A higher level of online interactivity leads to a better learning result.

For this hypothesis interactivity level is defined as the amount of relevant postings and the learning result is measured by the grade.

| Year | N | Correlation coefficient | Significance <i>p</i> |
|--------------------|----|-------------------------|-----------------------|
| Postings 2001/2002 | 39 | -0.321 | 0.047 |
| Postings 2002/2003 | 30 | -0.261 | 0.163 |

Table 2 Relationship Research Question 1

In Fig. 1 and Fig. 2 the relationship between the postings and the grade (on a scale ranging from 1 to 5, whereby 1 = very good and 5 = fail) is shown. With the application of the Spearman-Rho Test (Table 2) it could be pointed out that the amount of the statistical significance in the year 2001/2002 was $p = 0.047$ and in the year 2002/2003 $p = 0.163$. The correlation of the data will be significant if p is less than 0.05. It can therefore be summarized that there is **no relationship** between interactivity and learning results.

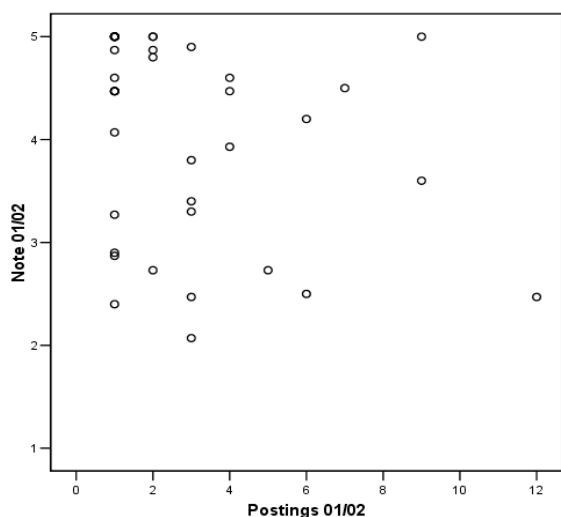


Fig. 1 Postings/grade 2001/2002

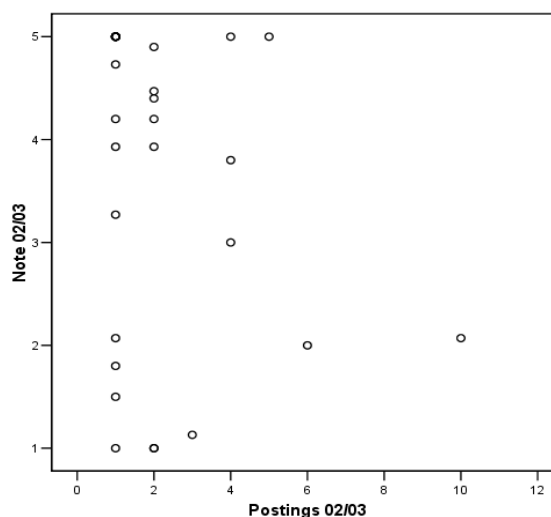


Fig. 2 Postings/grade 2002/2003

Research Question 2

Concerning the result of Research Question 1, it was obvious that the online activity of each student was insufficient to account for the learning results. After rethinking this process, it was decided to also track the so-called lurking population. This meant that not only visible interaction, i.e. writing a contribution, but also the hidden interactions, such as reading a contribution, were tracked. In 2003/2004, 128 students participated. Of these, 49 took an active part in the online communication (this was a little bit higher than the years before).

Consequently, to confirm the results of Research Question 1, the relationship between the visible interactions and the grade was determined once more (Table 3).

| Year | N | Correlation coefficient | Significance p |
|--------------------|----|-------------------------|------------------|
| Postings 2003/2004 | 49 | -0,022 | 0,879 |

Table 3 Relationship Research Question 1 2003/2004

In Table 3, it is shown that the amount of the significance $p = 0,879$. Also, Fig. 3 shows that it is impossible for

any *calculable* relationship to exist between contribution writing and learning results. This means that the first research hypothesis has been confirmed.

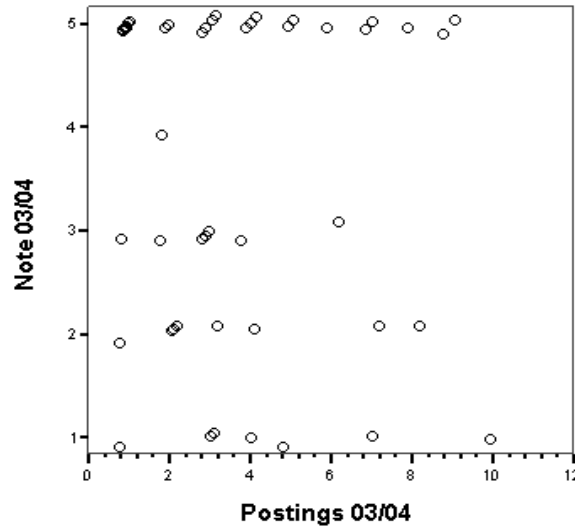


Fig. 3 Postings/grade 2002/2003

The observation of the students showed that only 49 learners took an **active** part in the online discussion and that every one of the 128 students **read** at least one contribution. Thus, it can be pointed out that 79 (62%) of the participants were lurking, only reading and not contributing anything.

Concerning the high lurking rate (close to two thirds of the participants) the following hypothesis has been researched:

A learner who writes a contribution automatically reads more postings than a comparable lurking learner.

In other words, an active learner is also very active in getting information. It should be shown that the members of the lurking population are not as busy as their writing colleagues.

| Year | N | Correlation coefficient | Signifikation |
|-----------|-----|-------------------------|---------------|
| 2003/2004 | 128 | -0,040 | 0,654 |

Table 4 Relationship writing/reading posting

In Table 4, a significance $p = 0,654$ is shown. This confirms that there is **no relationship** between the writing and reading behavior of an online student. Fig. 4 demonstrates very explicitly that there is no trend visible.

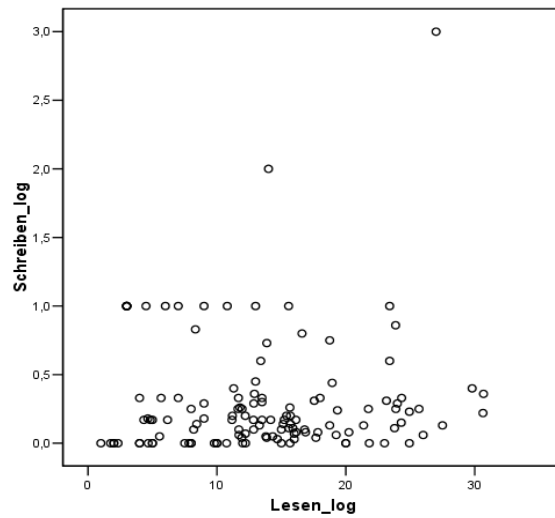


Fig. 4 Reading (German: *Lesen*)/ Writing (German: *Schreiben*)

Research Question 3

At the end of their research, the authors needed to look not only at the learners and their learning processes but also at the lecturers' behavior. How extensive is their effort in such an e-Learning scenario? This question caused the authors to formulate hypothesis 3:

The effort of the advisors for such an online course, represented by the writing and reading of postings, is higher than that of the learners themselves.

The data which has been collected is shown in Table 5. Each reading/writing activity of the lecturers and the students has been counted and compared to the number of log-ins.

| | Writing /log in | Reading / log in |
|----------|-----------------|------------------|
| Lecturer | 1.170 | 20.781 |
| Student | 0.298 | 13.576 |

Table 5 Comparison lecturer/student activity

Collected student opinions

With the help of an online and a traditional evaluation, what the learners themselves feel about the use of discussion forums during their learning process was discovered. Of course there are many statements and only some typically will be listed here, but it should be shown that there are negative reactions as well as positive ones.

“I lost track, because the numbers of postings increase very fast” (7 students)

“Horrible Mess in the discussion forum - there have to be more topics/trees.”(5 students)

“Discussion forum can`t replace a real office hour” (3 students)

“I can save time, because I do not need to go to the university for each question” (4 students)

“It is now possible to get an answer on the weekend to a short question during my learning process within a very short time. This supports me a lot.” (8 students)

It can be summarized that some students like the work with the forum. It could be assumed that this would lead to active participation but, as the previous chapters have shown, all learners have been lurking at some time, independent of their preferences. This leads to an interesting future research question: “How can we improve the discussion forums to support the natural impulse for getting information?”

Discussion

Does active interaction lead to a greater in-depth learning? Is there a difference in learning efficiency between lurkers and active participants? This paper aims to answer these questions.

It can be summarized that there is no coherence between interactivity and learning results, just as there is no relationship between the reading and writing of a number of postings.

It is shown that visible participation does not constitute the majority of a virtual community. Furthermore, it has been recognized that the lurking student, with no active participation in the discussion lists, is at least as active as his writing colleague with regard to reading the postings. The situation is comparable with the traditional teaching in the lecturing room; there also one can find both active students and information consumers. Additionally, we recognized that although the participation in a supplementary online information exchange is on a voluntarily basis, nearly all students who were present at the lecture took part.

Analyzing all the available data, a further very interesting phenomenon has become apparent. Every participant of the online community, active or lurking, reads more postings than they write.

Due to this fact, a simple equation has been developed:

$$\frac{R(t)}{p} - \frac{W(t)}{p} \geq 0$$

$R(t)$ = sum of postings read by a participant within a observation period

$W(t)$ = sum of postings wrote by a participant within a observation period

p = quantity of participation

Eq. 1: Online participation in discussion forums according to Ebner & Holzinger

This equation shows that within a certain time period, each member of an online community will read more

postings than they write. This is the beginning of the lurking process; activity tends to decrease whilst passive participation remains at its previous level or increases.

Research question 3 pointed out the new role of the online teacher. The traditional role of the lecturer is expanded in a more supportive, constructive manner (Shneiderman, 1998) which naturally increases the effort invested dramatically.

This is still a rare role for traditional German speaking lecturers. Successful learning-on-demand seems to need lecturers who are willing to accept a constructivistic attitude towards learning.

Finally, we should like to emphasize that the collected data seems to be *weighted towards* the study of Civil Engineering, because the research project was conducted *for this subject* three times during the years 2001- 2004. The average student population was 113 participants/year (comparable studies do not assess such a high number of students) and the experiments took place in a real life setting. It must be pointed out that, in our opinion, the experiences can also be applied to other technical studies, with a similar student population, with the exception of typical IT studies.

Conclusion

A higher degree of *visible interactions* is not a precondition for higher learning efficiency. We have to expand the term *interactivity* to include the lurking activity.

With a simple equation (Eq. 1), the authors demonstrated that the active participation in an online discussion list, based on passive lurking, is expressed by reading and reflecting the contribution of all the other members.

Although some students are less visible than others, this is not necessarily an indication that the learning benefits are being compromised. According to Dewey (1916) a critical element of the teaching process is to create conditions for *productive inquiry* similar to discussion forums – a culture medium for successful lurking and learning.

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