

Collaborative e-learning - an opportunity to identify and to overcome gender barriers

Rainer Kuhlen

UNESCO Chair in Communication

Department of Computer and Information Science - University of Konstanz,
Germany

www.kuhlen.name - rainer.kuhlen@uni-konstanz.de
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1. Gender mainstreaming in politics in Germany

The gender concept in general, different from the bi-polar sex concept, considers differences between male and female behavior and their norm/value system as socially and culturally constructed. To establish equality between women and men is not a moral imperative only but „a worthy goal that is central to progress in human development“ and a „way to promote prosperity and well-being for all“².

Gender mainstreaming, as a consequence of the gender concept, means that there is no such a thing as gender-neutral policies. Gender politics cannot be restricted to special domains such as family politics, and the challenge to overcome gender barriers cannot be managed by isolated measures such as establishing women's representatives in organizations [Metz-Göckel/Kamphans 2005]. According to the gender mainstreaming approach all measures taken in politics and in all kinds of organization have an influence on gender-related problems and questions. Gender mainstreaming is not the same as promotion of women or a politics of equalization of women, but rather a politics of equalizing the opportunities for the development of both for men and women. „Contrary to existing policies for the promotion of women, gender mainstreaming intends to make the principles of equal rights the basis for all policies and a duty for all managers. Thereby, gender mainstreaming has become a central managerial task“³.

Since 1999 the German government has followed a politics of equality of treatment in order to achieve equal opportunities both for men and women in all public administrations from the community to the federal government level. A special application of this gender mainstreaming can be found in the federal program „Innovation and work place in the information society of the 21st century“. The following targets were intended to be reached by the end of 2005:

¹ A shorter version was presented at the UNESCO Beijing Conference on Media and Gender 12-14 January 2006

² <http://www.undp.org/gender/>

³ http://www.bmbf.de/pub/women_in_education_and_research.pdf

- equal Internet access for men and women (slogan of the federal government: „Women go online“ and „women give new impetus to technology“) – according to the latest data this target has been a realistic one; male and female Internet user distribution is almost the same; in the group of people up to the age of 19 even 82,9 % of women use the Internet, compared to 82,4 % of men. The older Internet users people are, the smaller is the percentage of women.
- a 40% contingent of women in IT-related professional training and in the first semester in computer science – this target is far from being achieved. The percentage of women in computer science in the seventies (30%) was even higher than today (below 20%). „The percentage of women in technical occupations is still too low. Many companies complain about the low application rate of women, and industry is already suffering from a lack of qualified ed personnel in the IT sector. Only 14 % of all apprentices in the IT occupations are women, while the overall percentage rate in IT and media occupations is 26 %. In 1999, only 17 % of first-semester computer science students were women“⁴ . Today, the situation has not changed significantly, at least not in Germany.
- a significant consideration of women in other government programs, such as media and e-learning (it is hard to tell whether this objective has been achieved)

The Federal Ministry for Education and Research (BMBF) has established „the Equal Opportunities in Education and Research division“ to implement equal opportunities for women in education and research. The division's task is to implement gender mainstreaming by means of its own budget“. Within the framework of the gender mainstreaming strategy, the BMBF contributes by means of targeted projects to increasing the percentage of female scientists up to the management level at institutions of higher education⁵.

The BMBF has also established a special program „New Media in Education“ and within this program has given special attention to gender-related aspects. In a special gender mainstreaming project for the new media in education, a handbook for gender main-streaming in e-learning was developed [Wiesner et al. 2004]. One of the main objectives of this handbook is to anchor gender justice and gender equal opportunity as main targets of all organizations and in all e-learning projects⁶.

2. Gender mainstreaming in e-learning

Considering gender as the social and cultural construction of sex, gender mainstreaming in e-learning takes into consideration the gender perspective for all aspects and processes of e-learning. Gender mainstreaming in e-learning thus aims at establishing equal opportunities for men and women not by ignoring differences between the sexes but by taking into account the distinctive features which have been developed over time and under social and culture-related circumstances.

The basic assumption is the concept of potential (developed by Metz-Göckel and Roloff 1995): Men and women have the same potential for most aspects of development at their disposal, but, according to the gender concept in general, the realization of these potentials depends on social circumstances and culture-dependent value systems. Therefore gender-specific behavior in e-learning (such as taking initiatives in group processes or having preferences for specific domain-specific knowledge and programs) is mainly not sex-related, but is permanently constructed in social interaction.

⁴ http://www.bmbf.de/pub/women_in_education_and_research.pdf

⁵ <http://www.bmbf.de/en/474.php>

⁶ http://www.medien-bildung.net/gender_mainstreaming/gender_mainstreaming_uebersicht_db.php/spezialthemen/

Therefore the collaborative-learning paradigm (which will be explained later in more detail and which is the basis for the research findings we would like to present here exemplarily) provides an excellent testbed for gender-specific investigations, in particular when collaboration takes place in gender-mixes groups, as it is the case in the K3 environment – the Konstanz e-learning system (cf. sect. 4.1). Before we elaborate in more detail on our own research based on the K3 experience we would like to summarize some of the general research findings with respect to gender and e-learning (without any claim to representativeness or completeness).

At the end of these preliminary remarks I would like to emphasize that, because of social and culture-related dependency of gender differences, also in e-learning, it is difficult, if not impossible, to claim universal validity for most of the research findings summarized in the following section and for the data collected from our K3 courses (cf. sect. 3 and 4). What seems to be true or at least plausible in a highly developed country need not necessarily be true from the perspective of developing countries [Hafkin/Taggart 2002]. [Lemone 2005], with respect to countries with different reputations of masculinity, suggests that the degree to which societies support the traditional masculine work role model of male achievement, control, and power influences the degree of gender differentiation:

„A High Masculinity ranking indicates the country experiences a high degree of gender differentiation. In these cultures, males dominate a significant portion of the society and power structure, with females being controlled by male domination. A Low Masculinity ranking indicates the country has a low level of differentiation and discrimination between genders. In these cultures, females are treated equally to males in all aspects of the society.”

3. Gender differences with respect to ICT – some findings from research

Here are some of the key questions that are being addressed in the emerging literature on gender and e-learning⁷.

- What are some of the differences in communication styles between men and women in online environments?
- Men and women have different ways of "knowing" and learning. How does this translate in an online environment? Does an online environment facilitate or hinder women's way of learning?
- Is gender important in online learning? How do we manage our identity online?
- What motivates women to learn online? Are these the same things that motivate men?
- What are the characteristics of women who are successful as online learners? Are success factors different between men and women?

Some findings from research:

1. *Gender – a factor in e-learning* - Gender - among other categories such as age, race, personality type, degree of expertise and computer literacy – is considered one of the major reasons for learning style differences [Passig 2001; Calvert et al. 2005]. Gender is clearly a factor affecting online e-learning. According to a case study “Student Attitudes and Perceptions on Computer Assisted Instruction” at Nankai Institute of Technology, gender makes a significant difference on user behavior: for example, female students were online more often than male students, while male students spent a longer time learning online.

⁷ Barbara Fillip - <http://www.knowledgefordevelopment.com/Teaching/gender.htm>

2. *Gender perspectives and distance education* - The literature tells us that men and women tend to view distance education from different perspectives. Men tend to see distance education as a way to allow more people to get access to education across vast distances. Women tend to see distance education as a way to connect people and work towards a common agenda.
3. *Differences in self-assessment of ICT competence* – women tend to underestimate their computer competence compared to men even if they have a higher competence profile than that of their male colleagues. [Dickhäuser 2001] gives an instructive example: If there is a problem to open a file from an external storage device, most of the men think there is a bug in the file or the device whereas many women put the blame for this dysfunction upon their own incompetence. This low self-estimation is one of the reasons for the low degree of participation of women in ICT-related jobs (Projects "fit-in-e-business" and „leaNet – women in school and education“)⁸.
4. Self confidence – [Beyer et al. 2003] collected and analyzed survey data to assess factors like cultural stereotypes, confidence levels, and personal support on the enrollment and retention of women in a CS major. Interestingly, confidence levels of the female CS majors were lower even than the male non-majors (according to [Henderson 2005])
5. *Commitment towards computer science* - In a longitudinal study at three different points in time (1976-1978) (Pascarella and Terenzini - 1983), students were asked about their freshman year experience in computer science. „While both genders reported that initial commitment positively influenced subsequent commitment, differences by gender suggested that social integration more strongly influenced female persistence than did academic integration“ [Henderson 2005].
6. *Attitudes towards computers* – [Solvberg 2002] found that females’ attitudes about the computer are largely shaped by their families, their schools and the larger cultural context (according to [McNeese 2005]).
7. *Differences in attitudes towards professional ICT training* - Women tend to relate training in ICT-related topics not only to their professional career (just as most men do) but consider it as a means for the development of their personality and with influence on their private life as well [Derichs-Kunstmann/Auszra 1999].
8. *Gender differences in the culture of learning* [Derichs-Kunstmann/Auszra 1999:184]

Male learning culture	Female learning culture
Tendency to dominant behavior in educational situations	Tendency to cooperative behavior and orientation
More frequent take-over of monitoring discourse	Willingness to be responsible for ongoing discourse

⁸ http://www.frauen-ans-netz.de/fan05/wissenswertes/genderorientierte_mediendidaktik_anspruch_und_wirklichkeit

Longer and more frequent contributions in discourse	Shorter contributions in discourse
More often involved in the development of enforcement strategies	Open for proposals of other people and for cooperative work in general
Desire to impress others and competitive behavior	Willingness to discuss topics, supportive of others
Development and maintenance of competitive relations	Care for a just distribution of learning tasks; preference for group work

9. *Individual vs. group work* - Studies suggests that male students prefer individual work whereas female students like group work.
10. Studies which compare female-to-female interactions to female-to-male-interactions in online debates [Jong/Davidson-Shivers 2003] suggest „that females were just as likely to engage in an argument (with another woman) as they were to talk about topics unrelated to the debate; but they were less likely to engage in criticism of one other“ (according to [Davidson-Shivers/Ellis/Amarasing 2005]).
11. *Computer games* – [Follier 1986] contended that teenage females enjoy computer use less than their male counterparts because educational and games software is more male than female oriented (according to [McNeese 2005]).
12. *Usage of computers* – [Doppelt 2004] and [Follier 1986] found that males used the computer more than females in their study of the impact of gender on computer usage. By contrast, [McNeese 2005] found that females use the computer more for school work and that males use it less.
13. *Trust* - Research suggests trust is a key issue in online distance learning environments. [Sousa/Lamas 2005] shows “that trust ... is equally distributed across gender. This confirms that there is no gender bias towards trust“, at least in their sample.
14. *Experience, motivation and culture* – With respect to undergraduate women in computer science [Fisher, Margolis and Miller 1997] examined attachment (persistence) and motivation. With their ethnographic based methodology they found that men reported intrinsic interest as the single motivating factor for motivation, while women reported two factors: class experience and professional potential (according to [Henderson 2005]).
15. In a study of male students´ and the female students´ behavior in their information commitments [Wu/Tsai 2005] found that male students and the female students only had significant differences in terms of ‘match as searching strategy’⁹. Compared with the female students, the male students in this study were more oriented to utilizing a match strategy when seeking information in Web-based learning environments.

⁹ Match as searching strategy scale: investigating the extent to which students will be eager to find only a few Web sites that contain the most fruitful and relevant information when they search for Web information. Their strategy is oriented to match searching purposes. A sample item of this scale is “When I need to search for information on the Internet, if I find the first relevant Web site, I will not search others.” [Wu/Tsai 2005]

4. Findings from a virtual course in information ethics

4.1. K3 in a nutshell

K3 and its didactic background is described in more detail in [Kuhlen 2005 et al.]. K3 is an e-learning system according to the paradigm of collaborative knowledge management (suggested by [Kuhlen 2004]). Students in K3 acquire knowledge by working collaboratively (and according to given work assignments/order, tasks, and objectives) in (primarily) virtual groups. To summarize some of the main ideas of K3 in a nutshell:

- Collaborative e-learning, even when designed in a highly constructivist fashion (as in K3), needs to be supported by a strong instructional component. In the K3 case – K3 courses are both technical, e.g. “Information retrieval”, and discursive (discussion-oriented), e.g. “Information ethics” - discourse will be structured by well-defined work assignments, specified by concrete tasks, defined and given by the course manager¹⁰.
- Collaborative e-learning in K3 has a twofold general objective: Firstly, to help virtual groups (and in them, of course, individual learners) produce content and acquire knowledge in the special course domain, and, secondly, to help them acquire information and communication competence [Griesbaum 2004]. With respect to raising information competence, students are encouraged to attach so-called reference objects (web links, bibliographic references, external files) to their contributions in K3.
- Collaborative e-learning and discourse can be effectively supported by the usage of roles. K3 suggests four roles – the first two intended to raise communication competence, the second two to raise information competence: moderator, presenter, researcher, summarizer. The roles are defined as follows:
 - The moderator – this is a role for a student, not for the course teacher (who, of course, also has a general moderating function). The moderator is responsible for monitoring the discourse and for giving individual and group incentives and recognition.
 - The presenter’s role is to prepare the final presentation (normally in Power Points) and to present it in the plenary. S/he gets her/his main input from the summarizer, but should pay attention to all contributions.
 - The researcher’s role is to provide the group permanently with new information, not only by using the Internet search engines but also the professional domain-specific on-line data bases. The students have access to these data bases and most of them have retrieval background from other information-science courses.
 - The summarizer’s role is to produce a résumé of the discussion when a thread seems to have come to an end. At the end of a virtual round, s/he must provide a final summary of the main arguments and results achieved.
- Discourse is not only a sequence of commentaries, but also needs to be structured, for example according to types of discourse objects. K3 offers a set of well-defined discourse typed objects, such as question, thesis, new topic etc., which students are encouraged/obliged to use in order to specify their contributions/commentaries. Discourse objects facilitate orientation (navigation, browsing) in complex communication networks, in particular when these types are displayed in the graphic interface K3VIS, and they also enable effective, selective retrieval of K3 objects. Discourse objects as typed objects are defined in Sect. Xyz and will be needed for the analysis of gender-specific discourse behavior.

¹⁰ A typical K3 course (6 European transfer credit points) such as “Information ethics” is divided into 6 main topics. A virtual group in K3 (working between 2-3 weeks on a work order) is composed of 4 students, according to the four roles (cf. sect.4.2.1). Therefore for each topic 5-6 work orders need to be defined, and in such a way that the extension of the main topic is covered by these orders. Each work order is normally specified by six specific tasks – partly content – or discourse-oriented and partly result-oriented or of an organizational nature, such as organizing the work, assigning the roles, etc. (to be done by the students themselves) and preparing the final summaries and the presentation in the plenary which regularly follows the 2-3 weeks of virtual work.

4.2. Main K3 architecture

K3 provides the discourse environment needed for collaborative work in a five-level architecture (cf. Fig. 1).

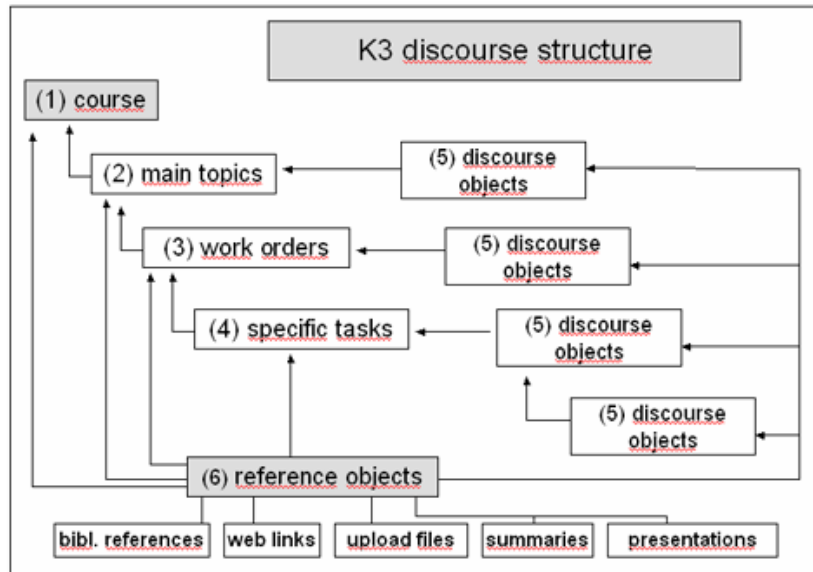


Fig. 1 K3 5-level discourse structure

K3 courses, just as traditional courses, are subdivided into main topics (cf. Fig. 1, No. 2; Fig. 2, No. 2). The definition of these topics, as well as the definition of the objects on levels 3 and 4, is normally the task of the course manager.

Fig. 2 K3 course structure (overview)

Topics are specified by work orders (cf. Fig. 2, No. 3), in general between 3 and 5 assignments (work orders), each corresponding to a virtual group. These assignments are on a generic level and are intended to guide respective K3 collaborative groups. The assignments are in turn subdivided into specific tasks (in the form of questions,

problems, theses), in general between 4 and 6 tasks, which the students in their groups should work on and which specify what the course manager expects the students to elaborate on. The assignments and tasks are the most important instructional elements. Although they are not absolutely binding for the students – students are encouraged to modify (and even delete or add new) work orders and tasks -, experience shows that students both welcome a pre-structured discourse and almost never define their own assignments and tasks. The real art of combining a constructivist approach (letting the students find their own way of problem solving) with a strict instructional approach (pre-structuring and informationally backing up the discourse in order to avoid unproductive detours) is, of course, to find an appropriate balance between the two extremes. Or to put it differently: to avoid both unproductive chaos and restrained creativity.

This K3 mixture (or better: balance) between independent, self-organized, constructivist learning and pre-structured, task-oriented and instructional learning is a new and formidable challenge for the traditional teacher (who we have called course manager): In addition to permanent moderating and feedback work during the course there is an amazing amount of preparatory work to be done

5. Some findings from an information ethics course in summer semester 2005

The following data are related to a course in information ethics which was carried out in SS 2005 between students in information engineering at the university of Konstanz and students in library science at the Humboldt University in Berlin. The course statistics and gender distribution was as follows:

23 participants, 12 from Berlin (library science), 11 from Konstanz (information engineering)

11 male (7 Konstanz, 4 Berlin)

12 female (4 Konstanz, 8 Berlin)

The course was carried out according to the blended learning paradigm, but in a somewhat unusual way. At the beginning, there was a classroom introduction in seminar style over 3 weeks, which was held separately in Berlin and Konstanz. The course did not require any pre-knowledge in ethics, not to mention information ethics. Therefore the general idea of information ethics, basic ethical concepts and theories of philosophical schools in ethics were presented by the lecturer or acquired by the students themselves in F2F group work.

After this introductory phase, in which students were also made familiar with the K3 e-learning system, the course was divided into virtual groups for three weeks. Each group was supposed to have four members – with 23 participants altogether this worked out almost perfectly. After a period of three weeks working with K3, the results of the virtual work were presented and discussed via video-conference (between the two universities in Konstanz and Berlin), where each group presented their findings to the other groups. This phase was repeated two more times so that each student took part in three different virtual groups. In the first two phases the groups were composed of students from one single university (Konstanz or Berlin), only in the third phase were the virtual groups mixed with students from both universities. The last video-conference was extended so that there was time left for a general course summary.

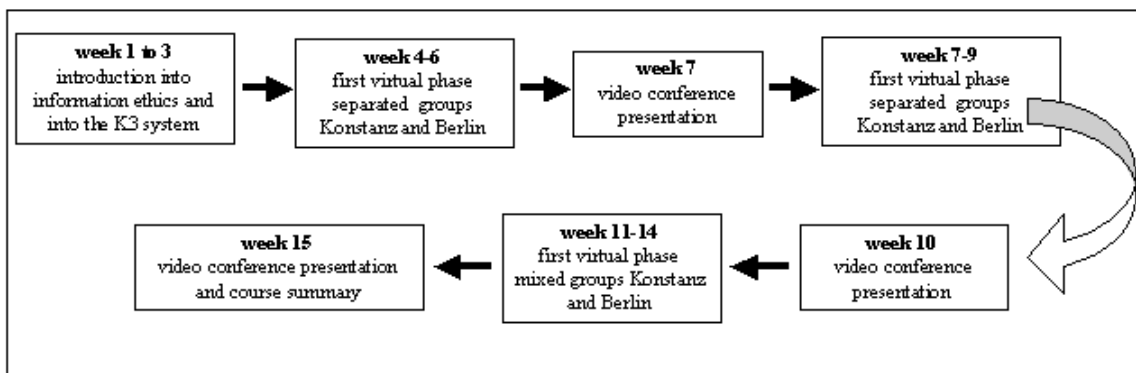


Fig. 3 Blended learning – Phases in the information ethics course

The composition of this course – students with a more technical background (information engineering) in Konstanz and with a more social/human science background (library science) in Berlin – allows the formulation of many several hypotheses. And whereas the provenance of the students was almost uniformly distributed, this is not true for the gender distribution. It is no surprise that there were only 3 female students in Konstanz (because information engineering with a high portion of computer science elements is still, as mentioned at the beginning, a men’s domain) and only 4 male students in Berlin (library science is traditionally chosen mainly by women). It is unclear (no data are available for this question) whether the topic of the course (information ethics) influenced the gender participation. In a follow-up study we will compare data from other courses, such as on information retrieval, communication models, and business models in information markets/e-commerce and e-publishing, which have used K3 as an e-learning platform for their virtual basis, too.

We do not have time or space to present all the results from our research on K3 courses. We will, however, suggest the following hypotheses review them in the remaining part of this text.

H1 There are gender- and domain-specific differences in course activity (firstly measured by the number of contributions in the virtual discourse, but then also specified by the type of contribution)

H2 Men, independently of their domain of study, tend to take over more prestigious roles in virtual group work, whereas women are willing to take over the remaining, more service-oriented roles such as collecting additional external information for group work.

H3 Men tend to be more initiative and critical in discourse, whereas women act more cooperatively by reacting to other people’s comments

H4 The gender composition in virtual group work has an effect on the performance of the virtual work.

Tab. 1 shows data that can be used to give some evidence, in particular for H1-H3.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	question	thesis	new theme	addendum	critique	result	organization	total disc	types	hyp link	upload	lit ref	total reftypes
female	29	29	124	372	7	39	82	682	256	50	34	340	
mean/f	2.64	2.64	11.27	33.82	0.64	3.55	7.45	62.00	23.27	4.55	3.09	30.91	

median/f	1.00	3.00	11.00	33.00	0.00	3.00	8.00	61.00	18.00	3.00	3.00	29.00	
male	34	54	71	301	41	52	94	647	163	61	20	239	
mean/m	2.83	4.50	5.92	25.08	3.42	4.33	7.83	53.92	13.58	5.08	1.67	20.33	
median/m	2.00	4.00	4.50	23.50	3.50	4.50	8.50	51.00	12.00	4.50	1.50	18.00	
Konstanz	30	41	73	338	29	32	98	641	165	50	15	230	
mean/KN	2.73	3.73	6.64	30.73	2.64	2.91	8.91	58.27	15.00	4.55	1.36	20.91	
median/KN	2.00	1.00	7.00	30.00	1.00	2.00	8.00	59.00	14.00	4.00	0.00	19.00	
Berlin	33	42	122	335	19	59	78	688	254	61	39	354	
mean/B	2.75	3.50	10.17	27.92	1.58	4.92	6.50	57.33	21.17	5.08	3.25	29.50	
median/B	1.50	3.00	8.00	28.00	1.00	5.00	6.00	58.00	18.50	3.00	3.00	26.50	
KN/male	28	31	45	226	29	32	75	466	103	34	10	147	
mean/KN/m	3.50	3.88	5.63	28.25	3.63	4.00	9.38	58.25	12.88	4.25	1.25	18.38	
median/KN/m	3.00	1.00	4.50	26.50	2.50	3.00	9.50	58.50	12.00	4.00	0.00	18.00	
KN/female	2	10	28	112	0	0	23	175	62	16	5	83	
mean/KN/f	0.67	3.33	9.33	37.33	0.00	0.00	7.67	58.33	20.67	5.33	1.67	27.67	
median/KN/f	0.00	3.00	10.00	39.00	0.00	0.00	8.00	59.00	18.00	3.00	2.00	29.00	
B/male	6	23	26	75	12	20	19	181	60	27	10	97	
mean/B/m	1.50	5.75	6.50	18.75	3.00	5.00	4.75	45.25	15.00	6.75	2.50	24.25	
median/B/m	1.50	6.00	4.00	17.50	3.50	5.50	3.50	36.00	12.50	5.50	2.50	19.50	
B/female	27	19	96	260	7	39	59	507	194	34	29	257	
mean/B/f	3.38	2.38	12.00	32.50	0.88	4.88	7.38	63.38	24.25	4.25	3.63	32.13	
median/B/f	1.50	2.50	11.00	29.50	0.50	5.00	8.00	65.50	19.00	2.50	3.50	27.50	
	1	2	3	4	5	6	7	8	9	10	11	12	13

Tab. 1 Data for discourse types (columns 2-8 and 9) and reference objects (columns 10-12 and 13)

Before interpreting these data we need to explain in some more detail what reference objects and discourse types mean in the K3 system.

5.1. Reference objects (cf. columns 12-14 in Tab. 1)

Reference objects are supposed to be added to comments. It is highly desirable that students add as many reference objects as possible to their contributions. The number and quality of reference objects are an indicator for the information competence of the students.

- Hyperlinks are reference objects that normally refer to information from the WWW.
- Uploads are reference objects that students (or lecturer) add to the KR knowledge base (paying attention to copyright rules). These can be external files, summaries or presentations as the results of students' work.
- Literature objects are reference objects that relate to published literature

5.2. Discourse objects as typed objects (cf. columns 4-9 in Tab. 1)

Discourse types are not uncommon in e-learning systems, as well as elsewhere [Jeong/Davidson-Shivers 2003] have developed a message coding system with momentarily 5 overarching message codes and 9 embedded codes [Davidson-Shivers/Ellis/Amarasing 2005, Tab. 1]. Among the first category are „structuring“ - these are statements that initiate discussion; „soliciting“ - content-related questions that seek additional information. Among the embedded codes are „evidence“ - statements that offer examples; „elaborate“ - statements that expand or enlarge upon ideas provided by others; or „critique“ - comments that identify limitations or flaws in another's responses.

We call these codes in K3 „discourse types“ and distinguish between four classes:

1. Organization of discourse

- organization - these discourse types are used for metainformation, for instance how organizing the group work and making arrangements, but they can also have a social function. Comments of this type do not contribute to the content production directly, but can be essential for the success of collaborative work. They should not be considered off-topic.

2. Initialization of discourse (to get discourse started): question, thesis, new topic

- Question - this discourse type normally opens a new thread, but it can also be used in an ongoing discourse.
- Thesis/hypothesis - using this discourse type should make the position of the contributor very clear. Normally a thesis opens a new thread, but it can also be used in an ongoing discourse.
- New Topic – using this discourse type it is expected that a new topic will be introduced into the discourse. This type has a discourse-stimulating function. It is highly desired that this type will be substantiated by a reference object.

3. Enhancement of discourse: addendum, critique

- Addendum – this discourse type relates directly to another comment in a discourse thread and appends new arguments. Addendum can be used for other discourse types such as modification, support, new argument etc.
- Critique – this discourse type is normally tied to another comment, often dismissive (but not hostile), but it is desirable for it to be constructive and add new arguments to the discussion.

4. Results of discourse: summaries, presentations

- Result – this discourse type is normally used (mostly by the moderator), summarizer or the presenter, but can also be used by all group members regardless of role function) to indicate that the discussion has come to a preliminary end. It will also be used by the summarizers and the presenters when they upload their summaries or their presentations.

The main difference between the two systems (K3 and the one above mentioned by [Davidson-Shivers/Ellis/Amarasing 2005]) is that in the latter the students' comments need to be coded intellectually afterwards by the lecturers themselves, whereas K3 provides a menu from which students have obligatorily to choose a discourse type. Comments without discourse characterization are not accepted by the system, and there is no default (neutral) type offered. K3 thus allows for continuous observation of the students' behavior. Discourse types are also helpful in analyzing the current state of discourse. By using the discourse in the visualization feature of K3, moderators or the course lecturer can, for instance, easily recognize whether questions have not yet been answered or new topics and critiques have not produced any reactions.

5.3. Validation of the hypotheses

ad H1 (reference to Tab. 1)

The median of the total number of gender-specific contributions shows clearly more activity on the part of the women. This is true both for the total number of comments (column 9 – median/f=61 vs. median/m=51) and for the number of reference objects (column 13 – median/f=29 vs. median/m=18).

It is remarkable that the men in the male-dominated Konstanz group are more active than the women (51/m – 58,5/m/KN), whereas the men in the female-dominated Berlin environment are dramatically less active (58,5/m/KN vs. 36/m/B). The same is true for the women's behavior (but not as significantly as for that of the men): (61/f – 65,5/f/B; 65,5/f/B – 59/f/KN).

Some more specific results with respect to the distribution of discourse typed objects:

- It makes sense that the discourse type chosen most often is “addendum”. These comments keep the discussion going without changing the topic of discourse. It is obvious that this discourse type needs to be split up into more specific types.
- The two gender-mixed *groups* in Berlin and Konstanz show similar behavior. Also the average number of contributions of each member was almost the same (59-58). There are minor deviations. The female-dominated Berlin groups produced on the average significantly more theses (5.0 – 2.0), whereas the male-dominated Konstanz groups were more involved in organizational matters.
- Significant differences can be seen with respect to the reference objects. All female-related values are much higher than those of the male-related ones: d/total vs. m/total; b/total vs. KN/total; B/f only vs. B/m only; K/f-only vs. KN/M-only. This corresponds to the gender-specific choice of roles: 63% of the women took over the researcher's role (cf. interpretation of H2).
- Women added significantly more new themes to their group work – this is true for all values in column 4, whereas the men (data in column 6) seem to be more willing to criticize other group members' contributions (without necessarily knowing the sex of the criticized person). This corresponds to the findings in [Davidson-Shivers/Ellis/Amarasing 2005].

ad H2 (reference to Tab. 2)

Tab. 2 displays some information about role distribution in the information ethics course. In general, women are more willing to take over role responsibility (54% vs. 46%).

Moderator Presenter Summarizer Researcher

<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>m</i>	<i>f</i>	<i>total roles/f</i>	<i>total roles/m</i>
7	11	13	5	7	12	7	12	40	34
38%	61%	72%	27%	37%	63%	37%	63%	54%	46%

Tab. 2 Role distribution

H2 was only partially confirmed. In other K3 courses the choice of roles was subject to open negotiation in the respective groups. In these courses there was a clear tendency for male members in virtual learning groups to take on those roles which supposedly have a higher prestige, such as moderators and presenters whereas female members were more likely to take on roles such as summarizer (producing summaries on the basis of the group discourse) and researcher (finding new

references – links, literature – for the collaborative work). The latter roles have a rather assisting, supportive or even passive function, whereas moderators in particular have active leading functions and presenters play the active role in the public.

In the information ethics course we have changed the rules so that each student was supposed to take at least 3 of 4 roles¹¹. With this stipulation there was still a clear preference for women to take the less prestigious researcher's and summarizer's roles and a clear preference for men to present the results of the group work in the "public" of the video-conferences. Women who had the choice between the remaining two roles (presenter and moderator) clearly preferred the moderator role. A more detailed analysis of the data would show that female moderators were on the average more active and cared more for a social and communicative group environment than the male moderators. The female moderators' ratings (by the lecturer) were on the average higher than those of the male moderators.

ad H3 (reference to Tab. 1)

This hypothesis, according to the data from the information ethics course, can only partially be confirmed and needs more detailed investigation. The three discourse types "question", "thesis" and "new theme" belong to the discourse class "initialization of discourse", and also "critique" can be counted to the active type. Here the average values for men with respect to "question" (column 2) and "thesis" (column 3) are slightly higher and with respect to "critique" (column 6) significantly higher compared to the ones for women, whereas the values for women with respect to "new theme" are significantly higher than the corresponding ones for men.

ad H4

This hypothesis could not be fully tested so far. We have already mentioned some relevant data in the discussion of H1 which show that men and women are in general more active in those environments where their sex is dominant. Other results support the interpretation (the data are not shown here) that both female-dominated virtual groups and male-dominated groups achieved better results (the female groups with slightly higher ratings) – "better" defined by the lecturers' evaluation - compared to gender-mixed groups.

But these data need to be interpreted very careful. Rating and evaluation normally take into account only the quality of the content which the group has produced as the result of the virtual group work. Knowledge production is normally to be honored. But according to the paradigm of collaborative e-learning the process (the communicative behavior) by which the results have been achieved is probably just as valuable and subject to rating as the result of the process. In K3 we have therefore introduced new rating measures for the evaluation of the process in virtual group work such as "reaction degree"; "participation degree", "interaction degree", and "degree of collaboration" [Semar 2005]. These data, which are now available for three K3 courses (Business models in e-publishing, Communication models, and Information ethics), still need to be interpreted from a gender-specific perspective.

¹¹ As mentioned above (cf. Fig. 3) there were three virtual rounds of group work in the information ethics course; the groups for each round were each time newly constituted.

6. Conclusion

There is no doubt that there are gender-specific differences in learning styles, group behavior and group success and in degrees of (information and communication) activity, and this is also true for e-learning in the virtual collaborative paradigm. The number of gender differences depends on the social and cultural environment in which e-learning is embedded. Cultures with a high level of acceptance for gender mainstreaming are likely to have developed a culture of gender awareness and can overcome many gender barriers, also in e-learning.

But still, there will be differences. What does it mean if there are gender-specific differences? Do we accept these differences, although we know that they are (widely) socially and culturally constructed and that they can be changed if the environment changes, for instance via gender mainstreaming politics? Is it desirable for men to be encouraged to reduce the extent of critical and dominating discourse behavior and to take on more service-oriented roles in group work rather than aspiring to roles which give immediate reward in the public? Should women be encouraged to be more aggressive and self-confident in their communicative style and to take on roles which make more activity in the public necessary?

There are no clear answers to these questions and to the many others which emerge in e-learning as in K3. Referring again to the concept of potential mentioned at the beginning of sect. 2, we support the postulate that men and women not only have the same potential but also that a learning environment should provide to both sexes equal opportunities to develop the skills and the behavior that they consider adequate (for them) and as well that the environment (in society, politics and professional life) expects from them. One example (cf. sect. 5.3) of how this can be achieved is that in the K3 information ethics course we have mildly *forced* the students to take on both more active roles (for instance the moderator and the presenter role) and more service-oriented roles for internal group work (for instance the summarizer or the researcher role) rather than letting them choose those roles they are used to according to their own and others' gender-specific expectations. Promoting individual talents and preparing students for a successful and rewarding professional and public life has always been a major objective in learning, and it should be in e-learning as well.

7. References

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