Learning by gaming: facts and myths

Tobias Vaegs*

RWTH Aachen University,
Distributed Systems Group,
Chair of Computer Science 4,
Ahornstraße 55, 52074 Aachen, Germany
E-mail: Tobias.Vaegs@RWTH-Aachen.de
*Corresponding author

Darko Dugošija, Stephan Hackenbracht and Anna Hannemann

RWTH Aachen University,
Informatik 5 (Information Systems),
Ahornstraße 55, 52074 Aachen, Germany
E-mail: Darko.Dugosija@RWTH-Aachen.de
E-mail: Stephan.Hackenbracht@RWTH-Aachen.de
E-mail: hannemann@dbis.rwth-aachen.de

Abstract: Gaming has undergone a transition from a niche hobby to a part of everyday culture. This transition, along with the advance in the use of the internet, has created a new kind of social environment, commonly known as virtual life. This paper presents the survey results of over 1000 gamers worldwide, in which they tell us how gaming affected their lives – both virtual and real – with regard to their career, relationships and social life. The analysis of the answers disproves common stereotypes about gamers, shows areas where gaming can very well be beneficial and where there are still problems.

Keywords: video games; online games; learning by playing; soft skills; transferable skills; motivations; conflicts; social skills; career; relationships; communities; technical competence.

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Biographical notes: Tobias Vaegs is a graduate student at the RWTH Aachen University, Germany. He is a thesis student at the Distributed Systems Group at the Department of Computer Science of the RWTH, where he is developing a framework for adaptive vector-based routing protocols for wireless sensor networks implemented in TinyOS. TinyOS is a common operating system for sensor notes and other devices with low capacities. During his studies he took part in a lab course, together with the other authors, called 'Gaming Communities', where they realised the survey for this paper.

Darko Dugošija is a graduate student at the RWTH Aachen University, Germany. He is a student assistant at Information Systems of the RWTH, where he works on the PROLEARN project. PROLEARN is a 'Network of Excellence' financed by the Information Society Technology

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(IST) programme of the European commission dealing with technology enhanced professional learning. Within the PROLEARN project he is working on analysis of cross-media digital discourses in the field of professional learning. During his studies, he took part in a lab course, together with the other authors, called 'Gaming Communities', where they realised the survey for this paper.

Stephan Hackenbracht is a graduate student at the RWTH Aachen University, Germany. He was a student assistant at Information Systems of the RWTH, where he worked on a project overseen by the Cairo University E-Learning Centre (CUELC), whose aim is to bridge the currently existing gap between the advanced, technology enhanced teaching and learning methods in Europe and Egypt. During his studies he took part in a lab course, together with the other authors, called 'Gaming Communities', where they realised the survey for this paper.

Anna Hannemann is a PhD student at Information Systems of the RWTH Aachen University. She holds a Diploma in Computer Science from RWTH Aachen University. Within the DFG-founded cluster project "Context Adaptive Interaction in Cooperative Knowledge Processes" (CONTici, www.contici.org), she works on the project part "Traceable Requirements Engineering for Communities of Practice". Her research interests include analysis of digital social networks and design of innovative social engineering and learning techniques. She was a supervisor of the lab course 'Gaming Communities' and a coordinator of the presented survey.

1 Introduction

> "Man only plays when in the full meaning of the word he is a man, and he is only completely a man when he plays."
>
> Schiller

Today, the increasing availability of affordable technology has opened up the big field of a virtual counterpart to real life. Some people only use this technology for problems they used to solve with classic means before, but many do much more. From having an odd 'Internet friend' to people rarely acting outside virtual reality we can encounter every degree of commitment. People crossing the borders between real and virtual life find themselves in genuinely new situations, which are also very much worth exploring from a scientific point of view.

Gaming is particularly interesting in this regard, as it not only offers faster ways to exchange information, but also simulates a virtual reality with 3D graphics and sounds, to the point of approximating the real world very closely. At the same time gaming is also an activity to which many people happily commit time and effort, sometimes even more than they would on any 'serious' activity (Aupers, 2007), and thus can be well used as support tool to achieve certain educational goals (Graven and MacKinnon, 2006; (Mysirlaki and Paraskeva, 2007).

Our research focuses on the areas of career, relationships and social groups in the new suspense between real and virtual life. A common assumption about gaming is that it is detrimental to a steady progress in career, while many researches show that it also can have many assets like stress relief and learning if performed – like any other

hobby – in proper quantities (Morsi and Jackson, 2007; Mysirlaki and Paraskeva, 2007; Graven and MacKinnon, 2006; Squire et al., 2008; Von Wangenheim and Shull, 2009). The stereotype of the lonely gamer at home is also no longer true, as many of them today use playing as a very natural part of their social life, effortlessly crossing the borders between the real and virtual world up to the point of finding new real life friends and partners from online acquaintances (Coates, 2004; IGN and IPSOS MediaCT, 2008). The initial anonymity of online contacts offers possibilities for genuinely new group interactions, like new ways to experience team play in clans and guilds.

The natural way to explore all this in a quantifiable way with as little bias as possible is to conduct a survey on that matter and thoroughly analyse the acquired data. However designing such a survey is a very challenging task as there is very little research done in this area and no established scientific culture; it is especially lacking in established language and definitions.

Hence, we tried to use many established methods from social sciences and psychology to fill the methodical gaps, while using terminology commonly found in the gaming community where necessary. Moreover, it is hard to even gather evidential data because the gaming community in itself is very diverse, covering all ages, genders, cultures and interests. Furthermore, listening only to the most vocative posters and bloggers is usually ill advised, as often the unsatisfied customers are the loudest, while the satisfied prefer spending their time on a product they well enjoy.

The rest of the paper is organised as follows. Section 2 first offers an overview over the already existing related research as well as the situation in the game industry. In Section 3 the design and execution of the survey is presented. Section 4 consists of selected results of the study while Section 5 concludes the paper concentrating on particular consequences for Technology Enhanced Learning (TEL) and offering ideas for future developments and further research.

2 Related works and state of the industry

The first and most remarkable thing to note when dealing with edutainment (Rapeepisarn et al., 2006) is that the two areas, gaming and learning, which both on their own are important and old, seem to rarely come together on a broad basis, although both are considered to be ‘a growth industry’.

Education is an important field of research in psychology and sociology today, and there is a large commercial sector offering seminars, courses, consulting and more, much beyond the classic public school/university range. Games however might not have been a research topic on a broad basis yet, but have a long history from the famous ‘Bread and circuses’ (from Latin: panem et circenses) in Roman times to becoming a substantial part of the entertainment industry in the late 20th century.

But we found that gaming and learning are rarely seen to come together. Even more noticeable is the fact that the little niches, in which they exist, do not even seem to cooperate with each other in research and commerce. In this chapter we want to give an overview about some papers and developments from these two areas.

In an interesting paper Oliver Uschmann (2008) details his personal insight into how differently we often behave in games compared to regular life outside. He points out many qualities like exploration, love for detail or tenacity that players often show in games but lack in their everyday lives. These insights cannot only tell where TEL

will likely be strong and effective and should encourage gamers to carry over things from virtual reality to actual life, but can also tell which qualities TEL can expect a gamer to bring to the table when dealing with the factual subject of learning.

Rice (2008) provides an active blog called "Education Games Research", which is noteworthy because he tries to incorporate new developments from science and industry while still not losing connection to application, which he has to deal with on a regular basis as technology director for a Texas school district. The blog serves not only as good tap for ideas on the subject, but also as a starting point for particular research.

At last the successful ELEKTRA (2009) project is worth mentioning, being a non-commercial project and having developed an actual and complete game, which integrates learning in a game living up to today's standards. The site provides information about the game itself, as well as much experience gathered during the project and a profound theoretical background to games and learning.

On 16 October, 2008 IGN Entertainment, a division of Fox Interactive Media, and IPSOS Media CT released "Are You Game?", a series of research findings from a comprehensive study examining the growing diversity, consumption patterns and social activity of video gamers (IGN and IPSOS MediaCT, 2008). The study – which included a quantitative overview as well as focus groups and in-home interviews – investigates many aspects, which were also addressed by our study.

On the industry side we can observe that something like real TEL is a niche at best, usually ignored by the big companies and only satisfied in the area of education for children by small companies. The two areas where learning still features a prominent role are on the one hand the very classic area of simulation games, from the old 'Civilisation' to new top-sellers like 'The Sims' (Morsi and Jackson, 2007; Squire et al., 2008). While they do not feature learning as a primary topic, each simulation will have the concrete side effect to increase the knowledge of the player about the particular subject of the simulation, although the quality of learning directly depends on the quality of the game. On the other hand, there exist digitalised versions of non-video games connected to logic and puzzles, with a prominent example being "Dr. Kawashima's Brain Training". When reviewing sales figures these games seem to experience a surge in recent times.

This often goes hand in hand with the more widespread availability of consoles, which are not tucked away in a home office or kid's room like most regular PCs, but stand in the central living room, available for everybody equally and especially available for a shared experience. Nintendo's Wii seems to become a particularly successful version, enhancing its input over the old gamepad or mouse/keyboard combinations. These alternative input devices are, again consulting sales numbers, very appealing to people with few prior experience in the video game area, the first hit here being 'Guitar Hero' for the PlayStation 2 (cf. IGN and IPSOS MediaCT, 2008). These games often offer a practical learning experience for their particular areas or, like for many Wii games, offer some kind of sports or fitness experience, although the quality can again be of doubt.

At last it should not stay unmentioned that actual TEL is not beyond the view of the whole industry, as the example of the Game Developers Conference (GDC, 2009) shows, which can be well considered important. In 2009 the conference featured two out of nine summits concerning TEL.

3 Survey design

During the survey design phase the first step was to identify areas of strong influence to people's everyday life. The factors we considered most interesting and suitable for an evaluation for both real and virtual life were interdependency of gaming on career, influences on relationships (both to friends and partners) and differences between social groups in real and virtual life.

Hence, we gathered common assumptions about gamers from both gamers themselves as well as non-gamers and then employed our own experience inside the gaming community to sketch rough hypotheses based on a more objective approach towards those assumptions; for example, figuring out which amount of gaming marks the point where negative influences begin to show. Afterwards we added some questions which we felt were interesting, but not yet answered in any other work done so far in this area, like differences of team play in the real and virtual worlds. All that then led us to design sets of questions for each of the three aforementioned sections, which we partitioned into further subsections for better structure for both us as well as for the interviewees. A header to gather the common basic information concerning both the general as well as the gaming biography of the interviewee was added.

The questions were ordered and formulated according to common principles in questionnaire design found in Schnell et al. (1999) and Survey Design (2006). Multiple choice, rating and agreement scales were used over open questions. The most notable exception was the free statement for feedback and especially personal stories, which allowed us to connect full text information about the life of a person directly to the quantitative data we collected from him/her in the survey and which let us assign him/her to a particular group. Furthermore, the principles of neutral, clear formulation of questions as well as the order of filtering were adhered to and the usual pre-test was conducted.

As interview method we chose a web based questionnaire because it was not only the cheapest and fastest way, but also in this particular case exactly suited our target groups of online multi-player gamers. The promotion of the survey was done via big community sites, based on their (ALEXA, 2009) statistics, both for gaming in particular as well as social networking tools like Facebook (2009), with the additional request to spread the word. Thereby we tried to reach a group of gamers as diverse as possible, but of course the problem of bias remains – both bias in answers as well as bias in choice, as especially many gamers do not frequent general purpose sites, and game specific sites are most of the times closed to survey promotions.

To publish the survey we built our own platform (Dugosija et al., 2008) based on a common MySQL/PHP/HTML/CSS combination for a couple of reasons. First and foremost, none of the existing survey platform sites like Survey Monkey (2009) fulfilled all of our requirements and was available without limitation. Especially, allowing the interviewees to fill any between one and all three sections, while only having to fill the header once and permitting us to still pertain the connection between the data for later cross-section analysis were only available in highly priced professional systems. Furthermore, we gained better and further control about the data as well as having full log access.

4 Selected results

The Survey Dugosija et al. (2008) was closed on 02/08/2008 after running for two months and has garnered answers of more than 1000 participants in that time. We present here only a selection of the results possible with our data. We are sure that there are more interesting findings one could discover by examining the collected data, but this would clearly not fit into the scope of this paper. For the interested reader we provide our data ready to be used for further analysis on the website of the survey (Dugosija et al., 2008).

We first present some of the hypotheses we formulated beforehand and which we could confirm or had to deny. We performed all the tests using a fitting standard statistical method, and relevance was confirmed by using the α-method (Schnell et al., 1999). Only actual valid answers were considered for each question (to which any given N in figures or tables will refer). The expectable positive bias of the participants was considered, but we found no case where it would significantly skew our result beyond the usual statistical fluctuations.

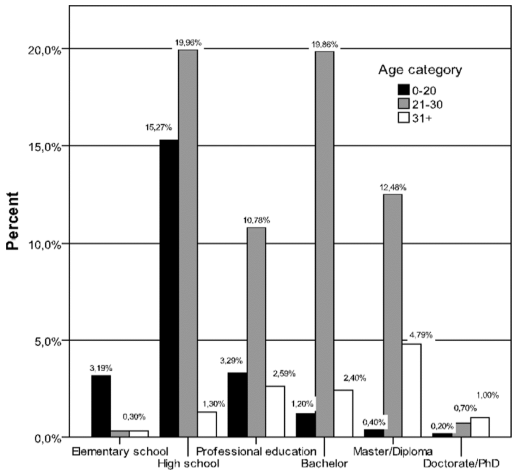
Afterwards, we also present more findings, which came to our attention and were considered interesting by us but for which a formal hypotheses test was either not necessary or not well suited.

4.1 Demographics

> "Married for 24 years, husband and sons (21 and 17) game together with me frequently." (Dugosija et al., 2008)

The majority of the participants (male as well as female) of the survey are male (80.97%), between 20 and 30 years old (approx. Gaussian distribution: $\varnothing = 24.1$ years; $\sigma = 6.7$; 2% > 40 years) and usually well educated for their current age, as can be seen in Figure 1. To point this out, we divided our participants into three age groups: 0–20 years (people normally still attending high school), 21–30 years (people normally working on their first academic degree or professional education) and 30+ years (people normally having finished their education). These results are similar to those found by other studies like Project Massive (2009).

Figure 1 Participants relative education



The most favoured genres of our participants are strategy and action shooters with over 70% and Role-Playing Games (RPGs) with still over 60% (Table 1), which are perceived as the most typical multi-player online genres. Still, about half of the participants play adventures and action arcade games regularly, although it should be noted that most of the titles in these genres are either single player games or non-online multi-player games.

One can see that our participants averagely selected between four and five genres out of the choices given by us.

Table 1 Preferred genres

	Responses	*Percentage*
Action (arcade)	495	47.8
Action (*shooter*)	*714*	*69.0*
Adventure	570	55.1
Simulation	426	41.2
RPG	*656*	*63.4*
Sports	372	35.9
Strategy	*755*	*72.9*
Board games	246	23.8
Other	213	20.6
Total	*4447*	*429.7*

Table 2 Positive influence vs. number of skills (Ø = 4.8; σ = 2.7; median = 5)

	Always (*N = 9*) (%)	*Often* (*N = 67*) (%)	*Sometimes* (*N = 219*) (%)	*Rarely* (*N = 276*) (%)	*Never* (*N = 256*) (%)	*Total*
0	0	1.49	0.91	3.26	14.06	48
1	0	0	1.37	4.35	8.2	36
2	0	1.49	4.57	6.52	14.84	67
3	11.11	4.48	11.42	13.04	16.4	107
4	0	11.94	16.89	21.38	17.57	149
5	22.22	7.46	21.46	20.65	9.37	135
6	0	10.45	11.87	12.32	10.93	95
7	0	19.4	10.05	7.61	3.12	64
8	0	10.45	5.94	3.62	3.51	39
9	0	17.91	6.39	2.54	0.39	34
10	33.33	4.48	2.74	2.54	0.78	21
11	0	5.97	2.74	1.45	0.39	15
12	33.33	4.48	3.65	0.72	0.39	17

4.2 Learning by playing

> "Games like Final Fantasy VII/VIII allowed me to use advanced strategies from a young age, again, helping me in a way school never could. I would say in my first five years of gaming, I learned at least twice as much as I did when I attended school." (Dugosija et al., 2008)

> "Video games had much effect on my creative and I might say artistical side. It is because of them that I am now on graphical design university, and studying and learning programs like Maya and 3ds max." (Dugosija et al., 2008)

One of our primary goals was to find out if gaming – aside from the well-known bad reputation of video games – can also have a positive effect on the life of a gamer. Being usually one of the most important and dominant parts of someone's life, we chose to examine the influence of gaming on the career of our participants, meaning on their achievements in their job or (for younger participants) in their school.

A good way to measure the impact of an activity on someone's career is to investigate how many transferable skills he/she learned during that activity. We provided a selected choice of these general competences to the participants found in Tuning Report (2008), to which we added a number of typical gaming and computer related skills ('hand-eye coordination', 'programming' and 'graphic/video design') and let the participants tell us which of them they have acquired. Additionally we asked them about their own impression about the influence gaming had on their career.

Hypothesis: Players, who acquired more transferable skills by gaming, noticed a positive influence of gaming on their careers.

Obtaining a correlation of 15.8% between a higher number of learned skills and a more frequent positive influence on the career (Table 3, based on Table 2), we observe that the hypothesis can be considered significant even on an $\alpha = 1\%$ level.

Table 3 Correlation between positive influence and number of acquired skills (based on Table 2)

	Spearman's rho	*Positive influence*
Number of acquired skills	Correlation coefficient	0.340
	Sig. (2-tailed)	0.000
	N	827

It is interesting to note, that not only the two expected skills for computer gaming ('hand-to-eye coordination' and 'strategical thinking') score high with over 60% (Table 4), but also 'foreign language skills', being a manifest to the new interconnected virtual world. 'Team work' with ~50% and 'communication' with ~35% prove the importance of the multiplayer aspect. 'Coping with stress' with again ~35% and no skill being below 25% are both surprising facts. Intriguingly, the distribution of skills is similar for all different kinds of genres.

The players acquire those skills either by playing itself, or by playing and some related activities like clan or guild management or website building, rarely only by related activities (Figure 2). That, together with the fact that most of the participants believe they could have learned only some or none of the skills easier by other means (Figure 3), clearly shows that gaming can serve as a valuable activity beyond only an

entertaining hobby, better than TV consumption (Hedley et al., 1995) and comparable to sports (Richman and Shaffer, 2000).

Table 4 Distribution of skills acquired

	Response	*Percentage*
Foreign language	550	63.1
Communication	309	35.4
Team work	430	49.3
Leadership	257	29.5
Intercultural awareness	235	26.9
Strategical thinking	580	66.5
Hand-to-eye coordination	561	64.3
Stress coping	321	36.8
(Self) critical abilities	230	26.4
Acting independently	211	24.2
Programming	214	24.5
Graphic/video design	202	23.2
Total	*4100*	*470.1*

Figure 2 Ratio of skills acquired while playing

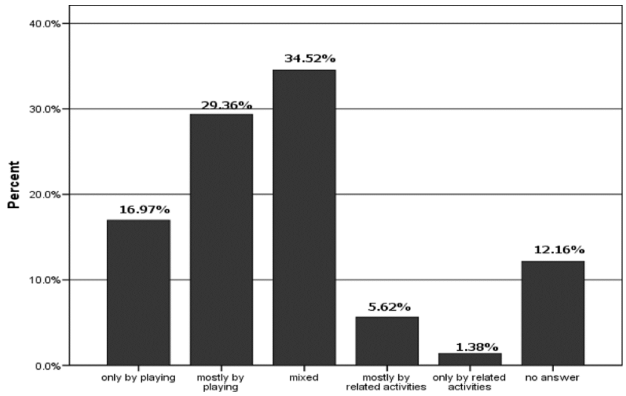
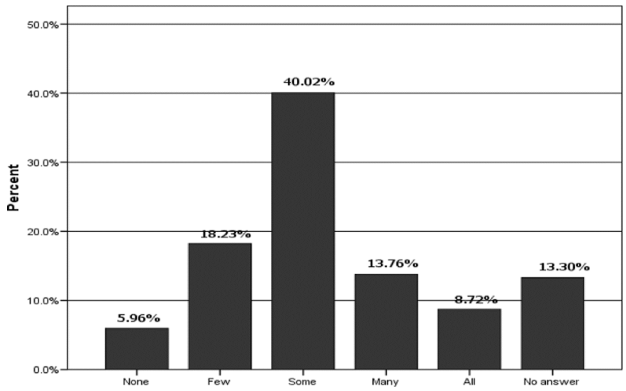


Figure 3 Skills easier acquired by other means



4.3 Play time and career effect

> "I skip class in my bachelor for one year because I played multiplayer game. Half year for Diablo II & half year for Counter Strike. Unique experience, but I donot want to do that mistake again." (Dugosija et al., 2008)

We proved that, according to the opinions of our participants, gaming can very well have a tangible positive influence on the career of the players, which can be manifest by acquisition of skills; for example, stress relief (Games Press, 2007) or social networking, just to name some. Furthermore, it can be seen that gaming itself is not the problem, but that gaming like any other hobby can suffer from misuse (Cover, 2006). The amount of time to play we consider still reasonable is no more than 20 hours a week, which is the amount of time of a part time job. If properly distributed throughout the week, 20 hours per week should not impair any other life needs.

Hypothesis: When playing only reasonable amounts of time (<20 h), gaming will have no bad influence on the career of a gamer.

Comparing the given χ^2 value to the χ-distribution yields that the hypothesis can be considered significant even on an $\alpha = 1\%$ level (Table 6, based on Table 5). We explored a similar hypothesis to evaluate whether any more than 30 hours per week would still not impact the career of gamers negatively in a significant manner. This is not the case and gamers, who play noticeably more than 20 hours per week, endanger their career progression, which is in line with Trymedia (2006).

Table 5 Overall career influence against gaming time in problematic periods

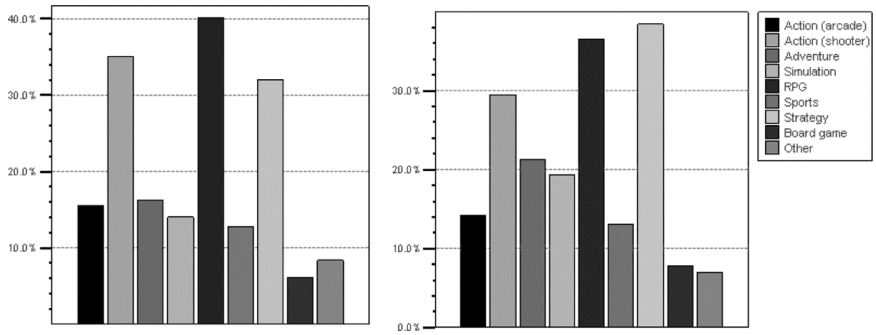
		Overall influence on career/school					
		Very negative	*Negative*	*None*	*Positive*	*Very positive*	*Total*
Unreasonable (>=20 h/week)	Count	19	104	124	106	13	*366*
	Percentage of Total	5.2%	28.4%	33.9%	29.0%	3.6%	*100.0%*
Reasonable (<20 h/week)	Count	3	48	117	63	5	*182*
	Percentage of Total	1.3%	20.3%	49.6%	26.7%	2.1%	*100.0%*
Total	*Count*	*22*	*152*	*241*	*169*	*18*	*602*
	Percentage of Total	*3.7%*	*25.2%*	*40.0%*	*28.1%*	*3.0%*	*100.0%*

Table 6 Chi-Square test regarding the influence on the career and the time spend playing (based on Table 5)

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson chi-square	19.819	4	0.001
N of valid cases	602		

An interesting observation is the difference when considering which genres the participants play when noticing a positive or negative influence. While RPGs seem to have both positive and negative influences, being almost 40% in both cases, action shooters drop by about 5% when comparing the negative to the positive influence. At the same time strategy, adventure and simulation games seem to have a distinctly more positive influence, all of them rising by at least 5% compared to their negative influence values (Figure 4).

Figure 4 Comparison: games played during times of positive and negative influence on career



4.4 Social activities

> "Pro: I met one of my best friends through Counter Strike at college, and have had numerous bonding experiences through other games (Mario Kart 64, Vice City). Con: Too much of my life has been spent on Sid Meier games." (Dugosija et al., 2008)

When looking at the effects of gaming we did not want to focus on acquiring skills only, because something that helps you learning but has a negative influence on the rest of your life cannot be considered a useful learning tool. So we also asked our participants about their friendships and relationships and how those have developed during their lives as gamers. According to Suler (2004) questions about whether activities in cyber space are disrupting one's relationships or lead him or her to neglect important things in his or her life present important criteria to identify addiction. The results show only a low noticed negative influence, as seen in Table 7. Furthermore, we were interested in an impression about the overall influence of gaming on the friendships and relationships of our participants. It was rated as 'neutral' by over 60%, mostly positive by more than 30%, and only less than 10% experienced a negative influence.

Table 7 Negative influences of gaming on the social life

	None (%)	*Few* (%)	*Some* (%)	*Many/Much* (%)
Impaired friendships	59.65	30.77	8.63	0.94
Impaired relationships	65.25	24.63	8.32	1.79
Lost friendships	86.18	9.94	2.80	1.09
Lost relationships	90.95	6.14	2.58	0.32
Other activities	0.77	15.16	38.44	45.64
Hobbies cancelled	57.21	25.61	14.11	3.07

Putting aside all other activities and concentrating only on playing video games could be considered another negative impact of gaming, so we investigated if our participants are spending their time with leisure activities other than gaming and if they had ended any hobbies since they began their lives as gamers. We were positively surprised by our results which show that gaming seems to play an important but not the only role in the life of our participants. The vast majority (>80%) has cancelled none, or only few, of their hobbies because of gaming and about the same amount of gamers do spend at least some time with other activities aside from gaming (Table 7).

4.5 Social skills

> "I'm not really one for a grand amount of social interaction in real life, but in video games I can sorta do an alterego kinda things, since those people will never meet me, and my actions will have no negative consequences." (Dugosija et al., 2008)

Coping with conflicts is a very important skill that one has to acquire during his or her life. And the only way to learn how to deal with conflicts is by engaging and solving them. We asked what the participant would consider a reason to engage a conflict in real life and in virtual life, with special interest in those answers that were given exclusively for virtual or real life.

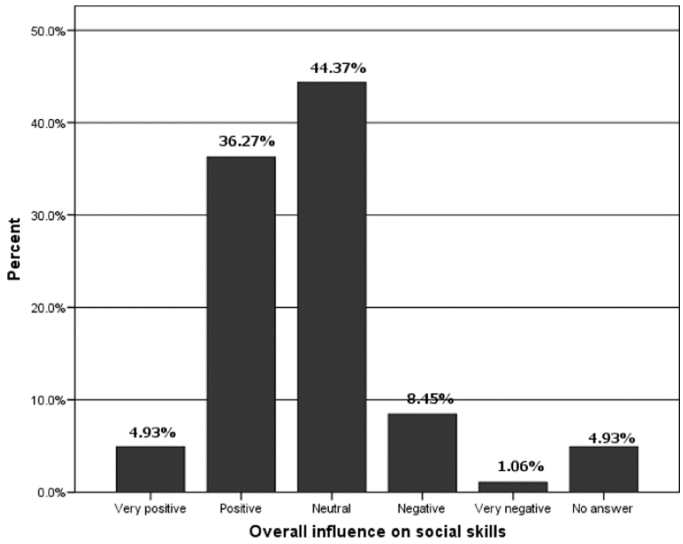
It can clearly be seen that the reasons differ quite a bit (Table 8). In real life the need for justice is the main reason to engage in a conflict, while in virtual life challenge and victory are the ones mentioned most. It fits with the fact that in contrast to real life in video games you can easily match yourself with someone, without real consequences. Hence, video games may present a good opportunity to learn to deal with conflict situations, because they are much more easily engaged in virtual life. The column 'ratio' of Table 8 shows that the reasons are very distinct for real and virtual life.

Table 8 Reason to engage in a conflict in real and virtual life

	Both (%)	*Real life* (%)	*Virtual life* (%)	*Ratio* (*both vs. RL + VL*)
Challenge	28.17	6.86	*31.51*	0.7 : 1
Seeing others lose	4.75	2.64	*16.37*	0.2 : 1
Justice	21.47	*35.73*	5.81	0.5 : 1
Victory	18.83	3.69	*33.62*	0.5 : 1
Blow of steam	6.69	6.86	*14.78*	0.3 : 1
Dislike of someone	12.67	*15.31*	8.97	0.5 : 1
Other	7.04	7.04	4.22	

So we saw that video games may improve certain skills of the players and – if used with care – can have an overall positive influence. When asked about the influence of gaming on social skills in general, the feedback was largely neutral or positive (Figure 5). This stands in contrast to common opinions about gaming and is likely related to the anonymity of online gaming providing a safe environment to develop these skills.

Figure 5 Overall influence of gaming on social skills



4.6 Motivations

> "I'm a terrible sport player, so I enjoy most teamwork in games. Teamwork, especially in large group, is much more accessible and easier in virtual world than in real life. Large team raid rocks when everyone is trying their best." (Dugosija et al., 2008)

> "I enjoy social gaming but know that it's not reality. I can switch off myself when I switch off the computer." (Dugosija et al., 2008)

Asking for the motivation for playing video games, we found out that the number of people who play to educate themselves is really low (~10%); in fact, it is by far the least named one of the concrete reasons (Table 9). People mostly play to relax (~80%) or to simply enjoy it (>90%), but some also play for the challenge, to get away from their lives, because they are bored or for social interaction. So, with the prospect of learning something most people will not start a game that fast, but it has to promise a lot of fun and must not stress the player.

Table 9 Motivations by gender

	Male (%)	*Female* (%)
Education	9.8	12.3
Fun	*94.0*	92.5
Relaxation	*79.1*	78.3
Social interaction	26.4	41.5
Boredom	41.2	45.3
Challenge	54.4	48.1
Get away from life	33.3	48.1
Other	7.2	9.4

Table 10 Important aspects of team play in real and virtual life

	Both (%)	*Real life* (%)	*Virtual life* (%)	*Ratio* (*both vs. RL + VL*)
Comradeship	37.85	*16.72*	9.33	*1.3 : 1*
Joint effort	39.96	*13.2*	10.21	*1.8 : 1*
Not letting others down	38.38	*15.49*	8.45	*1.5 : 1*
Shared victory	40.66	9.15	*15.49*	*1.6 : 1*
Overcoming conflicts	23.41	*16.19*	9.85	0.8 : 1
Rely on each other	39.96	*16.02*	7.92	*1.5 : 1*
Identification	13.38	*9.5*	8.45	0.7 : 1
Defined responsibilities	20.95	*15.14*	14.96	0.6 : 1
Other	7.92	5.45	3.52	

The second fact worth mentioning is that the motivations to play do not differ much between male and female players, although we observe that men prefer challenges while women have a little stronger focus on social interaction and getting a change from every day's life.

Team play is a crucial part of multi-player games as one normally not only plays against other players but also allies with them. We asked what the participant would consider important aspects of team play in real life and in virtual life, again with special interest to those answers that were given exclusively for virtual or real life (Table 10).

We discovered that most of the aspects were considered important more often in both virtual and real life than in just one of them (Table 10, column 'ratio'). We had expected that virtual teams had some distinct differences from those in real life, but that hypothesis was refuted by our results. Furthermore, among the exclusive answers for only real or virtual life, usually real life was elected much more often, which means that, according to our participants, for real life teams there are more important aspects to consider than for virtual teams.

4.7 Gender issues

> "In addition to gender-specific questions: I never lie about my gender, but it doesnot matter because people rarely believe me I'm a girl xP." (Dugosija et al., 2008)

Gender issues are always an import aspect to consider when creating a learning community, especially concerning the technical competence of the players and the anonymity of an online community.

In video games the gender of a player's avatar does not have to concur with the real gender of the player. For several reasons people sometimes choose an avatar of the opposite gender to play. We asked our participants how often they do this (Figure 6), why, if they ever experienced problems because of their true gender during play (Figure 7) and of which kind (Figure 8).

Figure 6 Frequency of pretending to be of the other gender

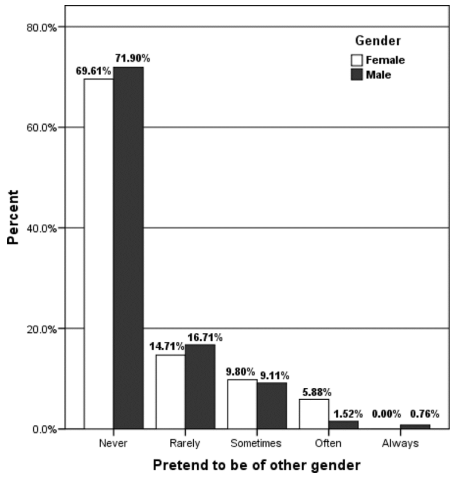
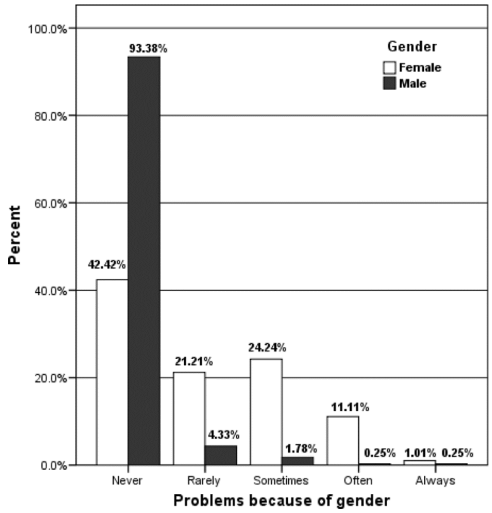
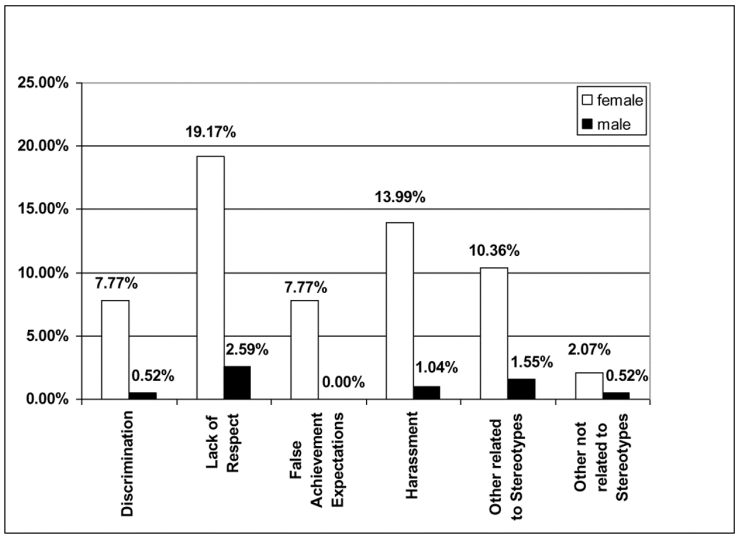


Figure 7 Problems because of gender



It turned out male and female players do not differ significantly in their behaviour regarding pretence of false gender and the majority of the participants (~70%) do not practice this while playing at all. However, regarding problems resulting from the true gender of the player the situation looks quite different. Although nearly all male participants stated to never have such problems (>90%), not even half of the female players can say this about themselves (~40%). We gathered about a fifth of answers for 'Rarely', a quarter for 'Sometimes' and even a noticeable amount of more then 10% of 'Often'. Being asked about the kind of problems they have women considered "Lack of Respect", 'Harassment' and "Others related to Stereotypes" the most frequent ones (10–20%).

Figure 8 Kinds of problems because of gender



4.8 Technical competence

> "I started with the C64. Because I liked gaming an programming on the C64, I decided NOT to work in the computer-business – probably a mistake." (Dugosija et al., 2008)

A common prejudice states that men have a better understanding of technical devices and processes than women; that men always have to help women with their computer problems or with handling their technical devices in general. One could assume that it is no coincidence that the majority of video game players is male, since, in order to play you need certain computer skills, meaning, among others, installing games or fixing some hardware or software problems that might arise.

Our results show that the technical competences of our male and female participants do not differ significantly. We wanted to know how often they have to ask someone else for help with their computer issues (which inevitably arise in the life of a gamer) and we did not experience drastic differences between the genders, observing a high overall competence with only about a 15% total advantage for the men (Figure 9). If we keep in mind that the need for help is more likely to be underestimated by males' pride and overestimated by females' modesty, the difference is even more negligible.

Furthermore we asked our participants for which tasks they use their computer regularly, and again men and women answered very similar (Table 11). The greatest differences can be seen with 'Shopping' (Female ~7% more) and 'Self-Organisation' (Male ~10% more).

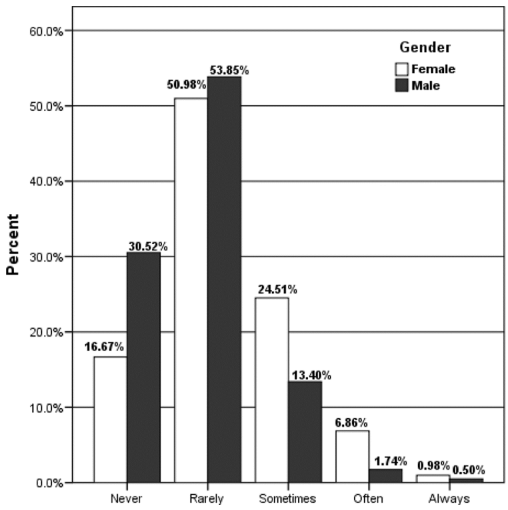
If in the 'real world' women really were less technically competent then men, we would have to explain our results by assuming that only women, whose technical competence is above the average for their gender, play computer games (and took part in our survey). The other possibility is that people can acquire technical competence by playing computer games (as part of general computer usage), which would then result in this skill being above the average for male as well as for female gamers. Our finding that

most of our participants are quite technically competent regardless of gender supports the latter hypothesis.

Table 11 Activities done with help of the computer

	Communication (%)	*Learning* (%)	*Shopping* (%)	*Research* (%)	*Self-organisation* (%)	*Entertainment* (%)	*Other* (%)
Female	91.5	81.1	59.4	84.0	56.6	78.3	33.0
Male	88.0	78.2	52.3	80.3	46.5	83.7	36.5

Figure 9 Need to ask for help with computer issues



5 Conclusions and outlook

We conducted a survey among players of video games to find out about the influences of virtual life on real life and vice-versa. Our study helps to enlighten the new social environments in the virtual world and their interaction with established ones in the real world, with particular focus on the interaction between gaming and the areas of career, relationships and social groups. The approach to employ the tools of social sciences and build on related works proved to be successful and helped to create a web-based survey, which provided inputs of over 1000 gamers worldwide. It helps to get an insight into what gamers think about the influences that gaming had on their lives, reflecting their subjective opinions and experiences rather than universal facts.

We showed not only how gamers experience a positive influence of gaming on their career if done in reasonable amounts, but also evaluated differences in social behaviour by the example of conflict engagement and team play and thereby were able to deduct conclusions for a better implementation of TEL.

The most important outcome of our study is that video gaming is not only a tool for "learn through play" (Angehrn and Maxwell, 2008; Bailey, 2007), but also holds merit in its own right to provide entertainment with additional benefits: 'edutainment' (Rapeepisarn et al., 2006). However, it is still important to keep the heightened addiction

problems in mind, as overuse of gaming will cause problems, as it is the case with any other activity, as well as to carefully evaluate the employed genres for possible problems. Due to our survey the impact of gaming on the social side of life also does not fit the common stereotype, and we only hear of rare cases, in which friends were lost or hobbies were cancelled.

Our investigations showed the relevance of considering the target group when creating educational games. The target group of online gamers differs not only clearly from e.g., regular internet users (Eimeren and Gerhard, 2000; Kolo and Baur, 2004), but also offers a chance to reach social groups that often have a hard time learning (Gibbon, 2008). At the same time our demographics show that most of the players have a comparatively high education level and, thus, will seek games designed for their particular demands. While learning through playing is perceived as an enhancement to education (McNamara, 2008), it is important to keep in mind that gamers do not play to learn, although they are likely not to mind the added benefit of learning through the educative and/or narrative aspect of it (Juul, 2001). As such, a game is still a game, first and foremost.

The focus of edutainment should be on transferable skills, as the connection between the game played and the desired learning successes, as in Angehrn and Maxwell (2008), is usually unknown. While some skills are already well supported by gaming, more are very well possible but will need facilitation to achieve. In particular, games can offer interesting conflict situations for the player to overcome as part or core of the gameplay.

Gender issues are an important aspect to consider when designing video games, since women experience problems because of their gender way more often than men. However, it is crucial to make games attractive for men and women equally, since the prejudice of women not having a sufficient technical competence according to our data is obviously not true and can be overcome by learning by doing.

All this hints at the fact that gaming and its community create a whole variety of new relations, especially in the social area and, with them, many new opportunities. Thus, the concept of a virtual life is truly merited.

The data we gathered in our survey provided many insights, which should find their way into future game design, hopefully in cooperation between science and the gaming industry to make these benefits available to the common gamer. Our survey may have helped to provide more information about the target group of game designers, like the need for hiding the learning effect of games behind the fun or using games as a means to cope with conflict situations by providing them in a (safe) virtual environment. We are looking forward to a sounder and broader integration between real and virtual life in the future, about which Onion News Network (2008) raises an interesting satirical vision.

References

ALEXA (2009) *Alexa, A WWW Traffic Meter*, Obtained through the internet: http://www.alexa.com/ [accessed 10/1/2009].

Angehrn, A. and Maxwell, K. (2008) *Games in Career Guidance: Effectiveness of using Smallworld Simulation to Develop Social Skills in the Work Place*, TENC: Publications and Preprints, http://dspace.ou.nl/handle/1820/1268 [accessed 20/4/09].

Aupers, S. (2007) 'A second job? The emergence of institutions in online computer games', Paper presented at *The Annual Meeting of The American Sociological Association, TBA*, 11 August, NY, New York City Online, USA, http://www.allacademic.com /meta/ p184522_index.html [accessed 20/4/09].

Bailey, K. (2007) *US Army Creates Office to Manage Videogame Training of Soldiers*, Obtained through the internet: http://news.filefront.com/us-army-creates-office-to-manage-videogame-training-of-soldiers/ [accessed 10/1/2009].

Coates, J. (2004) 'When bad people happen to good games', *Queue*, Vol. 1, No. 10, pp.92-91.

Cover, R. (2006) 'Gaming (Ad)diction: discourse, identity, time and play in the production of the gamer addiction myth', *International Journal of Computer Game Research*, Vol. 6, No. 1, obtained through the internet: http://gamestudies.org/0601/articles/cover/ [accessed 3/9/2009].

Dugosija, D., Efe, V., Hackenbracht, S. and Vaegs, T. (2008) *Online Survey: Interaction between Real and Virtual Life*, Obtained through the internet: http://www.gamingrealities.net/ [accessed 10/1/2009]

Eimeren, B. and Gerhard, H. (2000) 'Gebrauchswert entscheidet überInternetnutzung', *ARD/ZDF-Online-Studie: Media Perspektiven 8/2000*, Obtained through the internet: http://www.ard-zdf-onlinestudie.de/fileadmin/Online00/Online00_Nutzung.pdf [accessed 3/9/2009]

ELEKTRA (2009) *The ELEKTRA Project*, Obtained through the internet: http:// www.elektra-project.org/ [accessed 10/1/2009]

Facebook (2009) *Facebook, A Worldwide Online Social Network*, Obtained through the internet: http://www.facebook.com/ [accessed 10/1/2009].

Games Press (2007) *Survey Reveals Playing Games at Work May Boost Productivity*, Obtained through the internet: http://www.gamesindustry.biz/articles/survey-reveals-playing-games-at-work-may-boost-productivity [accessed 10/1/2009].

GDC (2009) *Game Developers Conference 2009*, Obtained through the internet: http://www.gdconf.com/ [accessed 10/1/2009].

Gibbon, D. (2008) *Survey: Games more Beneficial to Disabled*, Obtained through the internet: http://www.digitalspy.co.uk/gaming/a99539/survey-games-more-beneficial-to-disabled.html [accessed 10/1/2009].

Graven, O. and MacKinnon, L. (2006) 'Exploitation of games and virtual environments for e-learning', Paper presented at the *7th International Conference on Information Technology Based Higher Education and Training*, 10–13 July, Sydney, Australia, pp.409–421.

Hedley, C.N., Antonacci, P. and Rabinowitz, M. (Eds.) (1995) *Thinking and Literacy: The Mind at Work*, Lawrence Erlbaum Assoc Inc., Philadelphia.

IGN and IPSOS MediaCT (2008) *IGN and IPSOS MediaCT Debut Research Study on the Changing Face of Videogamers 'Are You Game'*, Obtained through the internet: http://corp.ign.com/articles/920/920555p1.html [accessed 20/4/2009].

Juul, J. (2001) 'Games telling stories?', *International Journal of Computer Game Research*, Vol. 1, No. 1, obtained through the internet: http://gamestudies.org/0101/juul-gts/ [accessed 3/9/2009]

Kolo, C. and Baur, T. (2004) 'Living a virtual life: social dynamics of online gaming', *International Journal of Computer Game Research*, Vol. 4, No. 1, obtained through the internet: http://www.gamestudies.org/0401/kolo/ [accessed 3/9/2009].

McNamara, P. (2008) *Most Kids want Educational Video Games in School, Survey Shows. ... So?*, Obtained through the internet: http://www.networkworld.com/community/node/26782 [accessed 10/1/2009].

Morsi, R. and Jackson, E. (2007) 'Playing and learning? Educational gaming for engineering education', Paper presented at the *37th Annual Frontiers in Education Conference – Global Engineering: Knowledge Without Borders, Opportunities Without Passports*, 10–13 October, Milwaukee, USA, pp.F2H-1-F2H-6.

Mysirlaki, S. and Paraskeva, F. (2007) 'Digital games: developing the issues of socio-cognitive learning theory in an attempt to shift an entertainment gadget to an educational tool', Paper presented at the *1st IEEE International Workshop on Digital Game And Intelligent Toy Enhanced Learning*, 26–28 March, Jhongli, Taiwan, pp.147–151.

Onion News Network (2008) *Warcraft Sequel Lets Gamers Play a Character Playing Warcraft*, Obtained through the internet: http://www.theonion.com/content/video/warcraft_sequel_lets_gamers_play [accessed 22/1/2009].

Project Massive (2009) *Project Massive*, Obtained through the internet: http://www.projectmassive.com/ [accessed 10/1/2009].

Rapeepisarn, K., Wong, K., Fung, C. and Depickere, A. (2006) 'Similarities and differences between 'learn through play' and 'edutainment'', Paper presented at the *3rd Australasian Conference on Interactive Entertainment*, 4–6 December, Perth, Australia, pp.28–32.

Rice, J. (2008) *Education Games Research; a Blog*, Obtained through the internet: http://edugamesblog.wordpress.com/ [accessed 10/1/2009].

Richman, E. and Shaffer, D. (2000) 'If you let me play sports', *Psychology of Women Quarterly*, Vol. 24, No. 2, pp.189–199.

Schnell, R., Hill, P. and Esser, E. (1999) *Methoden der empirischen Sozialforschung*, 6th ed., Oldenbourg, Munich.

Squire, K., Duncan, S., DeVane, B., Wolfenstein, M. and Hunter, R. (2008) 'Gamer communities, design, and learning: panel proposal', Paper presented at the *3rd ACM SIGGRAPH Symposium on Video Games*, 9–10 August, Los Angeles, USA, pp.31–33.

Suler, J. (2004) 'Computer and cyberspace addiction', *International Journal of Applied Psychoanalytic Studies*, Vol. 1, No. 4, pp.359–362.

Survey Design (2006) *Questionnaire Design Tips; Excerpt from the Survey System's Tutorial*, revised July, 2006 by Creative Research Systems, Obtained through the internet: http://www.surveysystem.com/sdesign.htm [accessed 10/1/2009].

Survey Monkey (2009) *Survey Monkey, A Tool for Creating Web Surveys*, Obtained through the internet: http://www.surveymonkey.com/ [accessed 10/1/2009].

Trymedia (2006) *Casual Game Player Demographics; Macrovision's Trymedia Games Division*, Obtained through the internet: http://www.gamesindustry.biz/articles/survey-results-indicate-casual-gamers-spending-close-to-20-hoursweek-playing-games [accessed 10/1/2009].

Tuning Report (2008) *General Competences; Tuning Report about European Higher Education, Part of the Bologna Process*, Obtained through the internet: http://www.tuning.unideusto.org/tuningeu/index.php?option=content&task=view&id=173&Itemid=209 [accessed 10/1/2009].

Uschmann, O. (2008) 'Leben, wie wir spielen', *Gee*, Vol. 10, No. 8, pp.69–70.

Von Wangenheim, C. and Shull, F. (2009) 'To game or not to game?', *IEEE Software*, Vol. 26, No. 2, pp.92–94.