

Connecting Second Life and Real Life: Integrating Mixed-Reality-Technology into Teacher Education

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Abstract: In this contribution we discuss the duties and responsibilities which are important within teacher education to qualify for teaching students in the 21st century at school for acting competent in their future by including contemporary media in their learning. Based on a practiced teaching module the authors' give an example, how to structure contemporary learning processes. This approach has been verified by the design, test and evaluation of a mixed reality learning environment. 12th graders and undergraduate students design and perform possibilities of identities in connecting Second Life and Real Life. The results of the evaluation of the teaching attempt are discussed und transferred in specific guidelines for teacher education in this area.

Introduction

Today employers expect more soft skills from young people – i.e. the ability to have learned to learn, to be creative, to work in teams, and to be able to use current technology – instead of the ability to accumulate factual information. But normally, teachers in training in the State of Schleswig-Holstein, Germany, rarely use contemporary digital media, like web 2.0 technologies. They use digital technology in a more traditional way: to search for information (i.e. Google and Wikipedia) and to write (i.e. with Word or Power Point), as the inquiry of Ide (2009) has shown. Few of the students studying education at university are prepared to fulfil the pedagogical demands of the 21st century. Therefore, they can hardly fulfil the requirements of the curriculum, regarding the implications of new technologies in the pedagogical process.

Teacher education should be extended insofar as it should be thought in relation to the already existing fundamentals of the curriculum of the State of Schleswig-Holstein (which are similar to the European Standards of Education). In accordance with these rules the usage of contemporary media should take place in context of today's life in interdisciplinary pedagogical projects. Therefore the authors developed, tested and evaluated the teaching project "Second Life vs. Real Life" (as one out of many). The intention is to put the possibilities of Second Life in concrete terms as a space for teaching inside the curricular context as well as to integrate them as an example within the scope of education modules.

Project History

Within the *Kids in Media and Motion* initiative (KiMM) of the Institute for Multimedia and Interactive Systems (IMIS) at the University of Luebeck in Germany and its partners, i.e. the Institute of Quality Development

at Schools in Schleswig-Holstein (IQSH), a team of university researchers and students together with researchers at institutes of teacher education and school teachers develop new scenarios and applications for technology supported learning and modules for teacher education. The aim of KiMM is to establish pedagogical models and technological tools to use for the acquisition of body- and space-related digital media literacy. The research- and transfer-oriented initiative promotes holistic, project-oriented, interdisciplinary learning, as well as creative and artistic use of digital media. New interfaces for human-computer interaction (HCI) specialized for a K-12 target group are developed in an iterative process by scientists, teachers and children at school together.

One of the aims the teaching scenarios focus on is to guide the development of the children's and youngsters' identity and self-perception. The core aspect in developing, testing and evaluating interactive 3D-internet worlds with non-standard interfaces in teaching scenarios for the above-mentioned purpose has shifted from a wide mix of applications to a single application: Adobe Atmosphere & Avatar Lab & AtmoRob since 2001 (Winkler & Herczeg, 2004), 3D-KiMM Studio & MiRI since 2004 (Winkler, Goldmann, Herczeg, 2007), to Second Life since 2007. With Second Life we found the most cost-efficient digital learning tool which is easily connectable to also cost-efficient body- and space related interfaces, such as the Wiimote controller or a dance mat.

Related Work

The main reason why we use Second Life for teaching is that we see the possibilities to create linked to the physical. Usually students are sent to use prefabricated rooms within a digital world (Antonacci & Modares, 2005; Dickey 2005; Crider 2006, Lim & Edirisinghe 2007). Looking at these rooms of virtual schools and universities in Second Life, it is obvious that it follows in almost any case the idea of ex-cathedra teaching, with students learning mainly passively, except talking to each other. Thus, only information is presented, predominantly in ways of language, text, image, video-tape, or 3D-animations. Consequently, innovative learning arrangements are lacking, such as multi-codal and multi-modal designing, self-directed research and exploring as well as collaborative, topic-oriented, subject-connected learning contextualized according to real, everyday needs.



Fig. 1: *Baywatch*, Pfarrplatz, Linz, Austria



Fig. 2: *Baywatch* in Second Life

Our main pedagogical aim is oriented towards artful and contemporary approaches to the phenomenon of systems like Second Life at the verge of the 21st century, as for example presented at *Ars Electronica* in Linz, Austria (2007), combine the physical with the digital realm in the sense of an interactive mixed reality installation (Winkler, Ide-Schoening, Herczeg, 2008). Concerning *Baywatch*, the physical reality of the urban sphere (Fig. 1) emerges with the virtual Second Life world (Fig. 2) designing an artificial scenario created within both worlds: the beach. The avatars moving around within the scenario are perceived in the real world by acoustic and visual signals; they move around in the virtual and the physical world simultaneously (Kuka, 2007). Traces of these movements can even be perceived in the physical world/reality, e.g. a wave in a basin triggered off by a hint of a movement at a market place in the town of Linz. At this beach event, it is even possible for people walking by to participate in Second Life via provided notebooks, closing this circle of communication between real and virtual space. Thus, Second Life was opened up to the physical sphere in order to allow people in the physical world to take part in Second Life. In the process of overlapping or intertwining of both realities a new space emerges - that of a combined reality.

Teaching in the 21st Century with Contemporary Media

Today's teaching

Learning constitutes itself from the intentional learning and the incidental and implicit learning. Learning is the individual or collective acquisition of spiritual, physical and social knowledge and skills or abilities. The ability to learn is also the pre-condition for education, which is a reflective relationship to one's own self, to other people and the world. *Mathetics* is the science of learning (Papert, 1997; von Hentig, 1985). Today, mathetics includes every kind of learning, with or without teacher.

As a consequence, the teaching person is not the leader of the student, but an adviser (guide on the side). In the foreground there is a social-constructivist understanding of learning, which is seen as an active and self-organized (autopoietic) process in which the individual realities are *constructed* in relation with the social communicative context by the people themselves. For the teaching person it is therefore important to commit himself to a relativistic point and to be asked to an attitude, which questions former pedagogical concepts critically. As a conclusion that means to see teaching especially as a structured and comprehensive chance for the learners.

New media and teaching

Modern and digitally extended learning environments (web 2.0 learning environments, i.e. Moodle, as well as mixed-reality learning environments, i.e. *Second Life* with tangible interfaces) allow the necessary differential experience of the student acquiring the world in the sense of a critical and constructive reflection towards her self and towards current societies. By integrating digital media in learning processes a change in the current learning culture follows which means that learning will be a decontextualisation of knowledge by multiple perspectives and contexts and can be reflected and structured in an active and self-organized way, co-operative with others.

Teaching and Second Life

Second Life as socialware

The company Linden Research provides free access to a basic version of Second Life, which was used by the students. The involved teaching institution rented a spot in Second Life¹. The three-dimensional virtual world on the web does not provide a plot or a story leading to a specific goal. Whatever the user's goal is - it is up to the user himself what to do with one's "second life". Second Life provides a wide range of possibilities to create and develop one's own virtual world by designing and programming individual objects which constitute one of Second Life main assets. Linden's 3-dimensional editor and its programming language Linden-Script provide a wide range of possibilities to define and create the content according to individual goals (Nusch, 2007).

Second Life is designed as a medium for collective communication and interaction. It is not important to define a specific aim beforehand as nobody overpowers the other. One of the main assets of Second Life is that user groups create their world interactively in a never-ending circle of collaborative design. Due to its structure of media Second Life fosters *swarm intelligence* in the sense of collective intelligence (Kerckhove, 2007). The principle of non-hierarchical structures facilitates dynamic, self-directed behavior and learning which is structured according to the "creator's" concepts. Flexibility and plurality of the teaching model optimize interaction and provide a potential for a constructive transformation of pedagogical processes within single learning communities.

Second Life as digitally augmented learning space

Second Life itself mirrors the ideas of the 1980s and 1990s: the simulation of reality as a virtual world. However, the beginning of the 21st century is shows new radical forms of computer-based interaction where the

¹ [http://slurl.com/secondlife/European %20University%20II/85/124/27](http://slurl.com/secondlife/European%20University%20II/85/124/27)

physical world is augmented digitally (digitally augmented reality, ubiquitous computing, tangible, ambient and mobile media).



Fig. 3: dance mat



Fig. 4: Performing Herma, Hypolyta and Helena (with Wiimote controller)

Virtual and digitally augmented worlds are very different concepts: in virtual reality, users are placed mentally within the digital simulation whereas in augmented reality they interact within the physical space (Winkler, Ide-Schoening, Herczeg, 2008).

Within a typical virtual reality system, users act exclusively in virtual space without regard of their physical existence. Contrarily, within the digitally augmented physical space, users act instantaneously and directly in the real-physical world, which is extended and enriched by digital information. Therefore, we programmed new body- and space-related interfaces to extend the physical world around Second Life: tracking of whole-body movements in the physical space by Wiimote controllers and a dance mat. Thus, new forms of learning spaces are integrated into the lessons. The students have the possibility to move through physical and digital spaces at the same time and to interact in them simultaneously.

Conception of a Teaching Model for a Teaching Module

New forms of teaching by means of digitally augmented learning spaces

In an interdisciplinary lesson project of arts and computer sciences it is shown how Second Life, augmented by physical interfaces, can be the possibility and an area of reflection for a contemporary dealing with identity constructions. To design a narration on the one hand and to program a space for action with Second Life and alternative interfaces on the other hand, this kind of concept needs not only new and different thinking models. Moreover it focuses on adequate possibilities of communication, reflection and presentation for the project's process character.

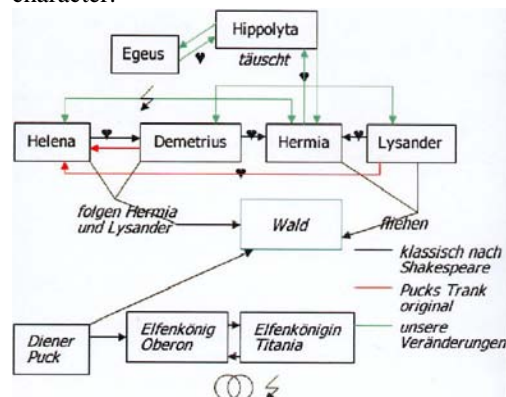


Fig. 5: Sketch of the narration

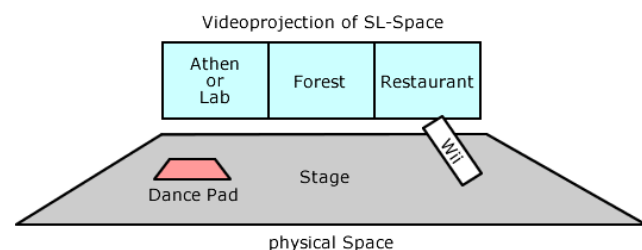


Fig. 6: Sketch of the action space

With the learning platform *Moodle* a place for work and discussion is introduced – as an extension of the learning space in schools – in which students and teachers can work on a project's content, ideas and sketches from every place asynchronously. Additionally a parallel communication is possible in Second Life. With this, different

competences are strengthened and supported: self-organized and self-determined work as well as interdisciplinary cooperation in a team.

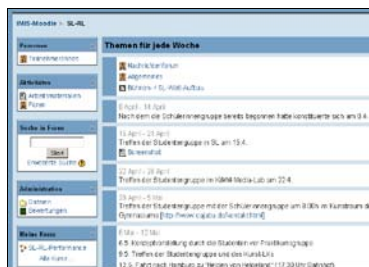


Fig. 7: The learning management system Moodle widens the geographic learning space



Fig. 8: Designing possibilities to combine the physical with the digital

The connection between the construction of identity and technology

The use of digital media in the process of teaching, for example the project Second Life vs. Real Life, a performance designed by students of a 12th grade (18 years old) of the Carl-Jacob-Burckhardt-Gymnasium in Luebeck (a municipal high school) in co-operation with students (informatics) at the university in Luebeck shows that the tension between learning and identity can initiate a critical potential for self-organized learning. A new form of teaching and learning is created in a complementary and multiply adjusted crossing of physical (stage) and digital spaces (Second Life) following the horizon of senses and the way of interpreting by the learner. A behavioral scope is opened from former life experiences to other identity concepts, which is formed by variety, complexity, discontinuity and flexibility. This learning space makes it possible to get to know other ideas of reality and try to act them out.

With this the mixed-reality-learning space allows a breaking-up and reconstruction of perspectives on a subject. For example a classical theater play by William Shakespeare (*Midsummernight's Dream*) can function as the starting point for the designing of a story space (as a mind map of topic modes). By means of non-linear narration structures, the constellation of characters and the plot (classic, anti-classic or contemporary) are weaved together, layered, overlapped, broken or extended. By the learners the plot then is understood as a passable, more-dimensional space, which opens a self-driven navigation between the physical and digital world.



Fig. 9: A student controls her avatar by body movement (projection in the middle)



Fig. 10: Students playing a role and themselves simultaneously

To tie the main conflict of the Shakespeare pattern to current communication structures, on the one hand the students consciously act in the medium of performance. Not the stories or the roles are in the foreground, like in the theater, but the actions, movements and processes which are focused on the situation and plot. Four main elements come into play here: time, space, the students' bodies and the relationship between the students and the audience of the performance. Even if the performance follows a precise dramaturgy, openness, which means the sociological and philosophical contingency of development, is an important element in the course of the performance.

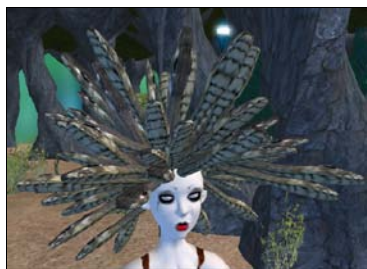


Fig. 11: Self moving snakehair of the avatar of Hippolyta



Fig. 12: Titania activates particle effect in the forest of the elves

On the other hand, students communicate in an up-to-date way with “Studi-VZ” (student web platform to exchange information) and mobile phones, beyond our extended version of Second Life. The real action of the students oscillates between the playing, trying and contrasting of a role and the possibility to dismiss these identity constructions in the next moment. For some time they are in the physical or Second Life virtual space or simultaneously in both spaces, but always in alternating identities. In the performance they act as those who play a Shakespearean role; as those who act that they act, and also as those who they really are: as people who construct their own identity. Roles are seen from the physical embodiment as well as the digital embodiment perspective (from an avatar’s point of view). *“The aesthetically organized process of learning establishes a relationship to hypothesis, fictions, and events, not yet existing”* (Röll, 2003).

Results of the Evaluation

The teaching project took place in the 12th grade arts class with 9 female students (f) at a secondary school (average age 18.5 years) and 5 male university students (m) studying media informatics (average age 23 years). Concerning the answers to the questions a scale was used from 0 = *does not apply at all* to 5 = *applies fully and completely*. The *mean* (arithmetic average) (*M*), the *standard deviation* (measure of the statistically dispersion) (*SD*), and the *median* (relative frequency, not influenced by extremes) (*MD*) were calculated. Some of the questions could only be answered with *No* or *Yes*. These answers are pointed out by percentages. The questionnaire was systemized in five categories.

Ownership and usage of hardware:

- Most of the female students at school have their own computer at home, whereas all male students at the university have their own computer: (f = 77.78%) (m = 100%).
- Both, female students and male students, are working a lot at home with a computer, whereas the male students do this extremely often: (f = M 3.67; SD 1.66; MD 4) (m = M 4.67; SD 0.58; MD 5).
- While the female students hardly use the computer at school, computer based learning is a significant part of the learning process at university (f = M 1.11; SD 0.93; MD 1) (m = M 4.33; SD 0.58; MD 4).
- None of the female students owns their own laptop, in contrast most students do: (f = 0%) (m = 66.66%).

Usage of web 2.0 technology:

- Female students use blogs or newsgroups very often, male students hardly at all: (f = M 3.89; SD 1.62; MD 4) (m = M 1.69; SD 2.08; MD 1).
- Almost all students use Wikipedia for their research: (f = M 4.00; SD 0.87; MD 4) (m = M 4.67; SD 0.58; MD 5).
- Practically all students use search engines like Google or Yahoo: (f = M 4.89; SD 0.33; MD 5) (m = M 5.00; SD 0.00; MD 5).
- None of the students had knowledge about the learning management system *Moodle* before the project started (f = 0%) (m = 0%).
- Most of the female students and male students consider the usage of *Moodle* at school or university as meaningful: (f = M 3.22; SD 0.67; MD 3) (m = M 3.00; SD 0.00; MD 3).

The role of Second Life in learning processes:

- In conclusion the female and male students pointed out, that a practical approach to Second Life during learning processes makes sense: (f = M 3.44; SD 0.73; MD 4) (m = M 2.67; SD 0.58; MD 3).
- Using Second Life is regarded as a chance for creative work by most of them: (f = M 4.11; SD 1.05; MD 4) (m = M 3.33; SD 0.58; MD 3).
- The project offered more possibilities for the female students in regard to structuring the concept and to focus on the examination of constructions of identity. The male students were more interested in questions of programming: (f = M 3.11; SD 0.78; MD 3) (m = M 2.00; SD 0.00; MD 2).
- The crossover of the physical and digital world enabled all of them to develop a critical point of view of Second Life: (f = M 3.78; SD 0.67; MD 4) (m = M 4.00; SD 1.73; MD 5).
- Almost all of them point out that Second Life establishes free space for new forms of interaction between physical expression and digital design: (f = M 3.78; SD 1.20; MD 4) (m = M 2.67; SD 0.58; MD 3).

Assessment of team work, interdisciplinary cooperation, and potentials of the crossover of physical and digital learning space:

- The majority of the students judge the cooperative work for realizing the aims of the project as positive: (f = M 4.40; SD 0.73; MD 5) (m = M 4.00; SD 1.00; MD 4).
- For them, the reason for that is interdisciplinary learning. They experienced a multi-perspective approach to the subject. It is interesting, that the male students experienced this profit stronger: (f = M 3.44; SD 0.73; MD 3) (m = M 3.33; SD 1.15; MD 4).
- Predominantly in the opinion of both, female students as well as male students, it is possible to develop non-linear structures of narration and thinking by using Second Life, in the sense of an augmentation of the physical space and the own body by using an avatar: (f = M 3.22; SD 1.30; MD 3) (m = M 2.67; SD 0.58; MD 3).

Integration of the Teaching Model into Teacher Education

At present the results of the evaluation of the tested teaching models at school (as shown above) contribute to a differentiation of the curriculum in the state of Schleswig-Holstein, Germany. In this process there is a focus on the necessity of anchoring the importance of up-to-date technology regarding actual tasks in higher education and school education. As orientation these guidelines establish a basis for the conception of teaching processes within the scope of teaching modules for teacher education.

At IMIS we have developed the so called Open Experimental Modules since 2003. They consist of Application Modules, Approach Modules, and Tool Modules. They are created especially for assisting teachers in higher education and further education to develop and realize pedagogical projects with up-to-date digital, interactive, body- and space-related media. The training modules for teachers in training, carried out collaboratively by IQSH and IMIS at the University of Luebeck, are focusing on the deployment of innovative, interdisciplinary, and aesthetic learning scenarios in education.

Summary and Conclusion

The results of the evaluation show that process oriented teaching with up to date digital media with a broad interface between the physical and the digital world qualifies for complex perception and learning, as well as for a new kind of reflection. Also an intense focusing on identity constructions becomes possible by using these new media. Next to the existing forms of the way youths are influenced by media, differentiated layers of reflection of traditional and innovative potentials are possible because of the contemporary transfer into current pedagogical contexts. This will lead to a further development of the major skills for the 21st century. Besides testing of the extended, structured forms of communication and interaction by means of Moodle, the extension of body-related action in physical and digital space will happen simultaneously, including non-standard-interfaces (Wiimote controller, dance mat) via Second Life. In doing so, mental models are not imagined independent of the physical space, but as designable and experiential, connected to an actual, individual, body-based directed action space. The direct use of body- and space-related digital media results in a creative, cooperative and reflexive differentiation of identity and world.

The results are the basis for German learning modules for teachers' education and their advanced training. Finally we hope, that we can build up an international network, initiated by the Special Interest Group *Arts and Interdisciplinary Education* of the Society of Technology and Teacher Education (SITE), to establish a forum for the conception and design of teaching modules to qualify future teachers for using interdisciplinary and body- and-space related digital technology.

References

- Antonacci, D., Modaress, N. (2005) *Second Life: The Educational Possibilities of Massively Multiplayer Virtual Worlds (MMVW)*, EDUCAUSE Western Regional Conference, April 26, 2005, San Francisco, CA.
- Crider, M. (2006). *Living and Learning in Second Life: A Firsthand Exploration and Tour of a User-Created Virtual World*. Games, Learning, and Society Conference. Madison, WI, July 2006.
- Dickey, M.D. (2005). *Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education*. British Journal of Educational Technology 36(3): pp 439-451.
- von Hentig, H. (1985). *Wie frei sind freie Schulen? Gutachten für ein Verwaltungsgericht*. Stuttgart: Klett-Cotta.
- Ide, M. (2009). *Über die Notwendigkeit zur Verankerung zeitgemäßer Medienkompetenz in der Lehrerbildung*, IQSH-Publikationen, Kiel, Germany.
- Kerckhove, D. (2007). *Connected Intelligence: The Arrivel of the Web Society*. Toronto: Somerville House Books.
- Nusch, M. (2007). *Mit dem Bus durch Second Life*. Fischer: Frankfurt am Main.
- Lim, J.K.S. & Edirisinghe, E.M. (2007). *Teaching computer science using Second Life as a learning environment*. In ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007.
- Papert, S. (1993). *The Childrens's machine - Rethinking School in the Age of the Computer*. Basic Books, New York
- Winkler, T., Herczeg, M. (2007). *Digitally Augmented Multy-sensory Learning Spaces - An Interdisciplinary Approach Towards Aesthetic Creation and Computational Modelling in Schools*. Published on the non profit DVD: Constructivist Pedagogy - Powerful Pedagogies for Learning for South Australian teachers Learning to Learn Initiative - Department of Education & Children's Services, Curriculum Services, 2007
31 Flinders Street GPO, Box 1152 ADELAIDE SA 5001.
- Winkler, T., Goldmann, A., Herczeg, M. (2007). *Why and what children learn while creating an interactive, non linear Mixed-Reality-Storytelling-Room*. Proceedings of the SITE Conference 2006, Orlando, Florida, pp 742-749.
- Winkler, T., Herczeg, M. (2004). *Avatars - can they help developing personality among students in school? - Consequences of connecting the physical world with interactive 3D-Worlds to hybrid experience and acting spaces to promote sophisticated social behavior*. IEEE XPlore / Proceedings of the ITHET, Istanbul, Turkey, pp. 174-178.
- Winkler, T., Herczeg, M., Reimann, D. & Hoepel, I. *Learning in our increasing digital world by connecting it to bodily experience , dealing with identity and systemic thinking*. In Carlsen, R., Davis, N., Price, J., Weber R. & Willis, D.A. (Eds.): Proceeding of the 15th International Conference SITE Society for Information Technology & Teacher Education 2004. Norfolk, VA: AACE. pp. 3794-3801.