Media Education at the Bauhaus-University Weimar

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Abstract

The rapid evolution of Media through the introduction of digital technologies, the multimedialization of computer hardware and the development of new network technologies have generated the need for new profession profiles responding to the rapid changes in this fast evolving branch. In the new Media, arts and humanities are tied to rapid technological development to create new markets and new products. This paper describes the study courses taught at the Department of Media of the Bauhaus-University in Weimar, where future Media Designers, Media Critics and Media Scientists are forged. All courses are taught in a project based way, so as to teach flexibility for a rapidly evolving sector. The new study courses represent a first attempt of definition of an education at the leading edge of technology which is entirely based on graphics, multimedia and network-based paradigms.

1 Introduction

In recent times, the information society is transforming from an individual or organization based archive (or repository) of information to be processed to a networked environment allowing communication between humans and within society [7]. Older broadcast-based media, which allowed essentially a one-way communication, have been completed by Internet technology, which instead allows a two way communication on the same medium. The development of computer networks, as well as the introduction of powerful graphics hardware on computers, have allowed the introduction of computer-based communication: computers have evolved from data processing units to hardware for a new medium allowing a new type of interhuman communication bringing in a new quality, and allowing multimodal location-independent communication. New powerful hardware allows the generation of shared virtual environments, where communication can happen between virtual representations of users (avatars), allowing the decoupling of the representation of the subject from his physical appearance.

The establishment of these new technologies requires new specialized study courses which differ from classical Engineering, Computer Science, Artistic and Human Sciences education [8, 4], integrating different traditional fields [5, 2]. The market requires creative and innovative graduates capable of coping with a rapidly changing industry and with the challenges of three-dimensional representation [1]. Moreover, the scientific foundations for such systems are still at their infant stage, there is no general model, and systems are developed on the stimulus of application, and are not generalizable.

The establishment of a Department of Media at the Bauhaus-University in Weimar and the introduction of two study courses in "Design of Media" and in "Media and Cultural Studies" in 1996 have awaken great interest in the German Media Community. On one side, for the first time in a German University a Department was established at the crossroad between the Humanities, the Arts and the Sciences with the purpose of forming a generation capable of researching, developing, designing and analyzing products in a fast evolving medialized world which is being created through the introduction of new graphical, acoustical, multimedia and communication technologies.

The Humanistic-Economic department component is represented by the presence of professorships in "*Perception Theory, Theory and History of Media*", "*Theory and History of Artifical Worlds*", "*Sociology*" and "*Media Management*", while Design professorships have been established for "*Multimedia Storytelling*","*Design of Media Environments*", "*Media Events*", "*Trends and Public Images*","*Interface Design*", "*Experimental Radio*" and "*Electronic Music Composition*". Instead of following the classical single medium oriented education, the design professorships have been conceived to have designers capable to utilize more than one medium for their expression. The technological component is currently represented by professorships in "*Databases and Communication Systems*", "*Networked Media*" and "*Computer Graphics*", and will expand next to include professorships in "*Virtual Reality Systems*", "*Computer Supported Cooperative Work*" and "*Computer-Based Gaming*".

The Faculty of Media understands itself first of all as a think tank and as a confrontation location. A think tank where the critics of existing and of new forms of media serve as a stimulus for the conception and for the development of new media, both as new forms of representation with traditional media as well as new types of technologies. The mission of the department is to study and criticize existing media, to research and develop new interhuman communication paradigms, and to promote the creative use of existing media.

The focus of the two study courses currently available is mainly set on the Arts and Humanities, whereby students have the possibility of receiving a strong education on the available technologies so as to be able to follow and to participate to their development as competent initiators and co-concievers. This approach is motivated by the observation that many of the technologies which were developed in the last thirty years in this field could not make a breakthrough in the market due to the lack of applications based upon them. The closeness of end users to the developers of these technologies is a key to the success of the technologies themselves. End users should be able to have a constructive exchange with the developers and conceivers, so as to both influence the development and be aware of it in time.

To complete its offer, the Department plans to introduce a third study course in 1999 on Media Systems, so as to insure the presence at the faculty also of technology developers aware of user needs. The new study course aims at the market of the rapidly expanding media, multimedia and telecommunication industry which creates technologies and systems for the new media.

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All the study courses are organized in a project-oriented way: students do not learn a theory that in future after the diploma will be applied in practice. Instead, the study courses are organized around the "learning-by-doing" principle. This is motivated by the speed of the development of technology: the goal of studying should be here to train flexibility and the development of new paradigms, more than building the knowledge for a lifelong profession. At a very early stage, students are therefore involved in the faculty research, development and artistic activities and participate in the development, accompanying the work on the projects with traditional courses relevant for the projects themselves. Furthermore, basics are taught through introductory courses which have to be completed before gaining access to the faculty projects.

This paper is structured as follows: section 2 presents the current arts and humanities study courses in Media, section 3 presents the new study course in Media Systems which completes the offer of the department. In the last section, perspectives for graduates are traced and some conclusions are drawn.

2 Technological Education and Multimedia for the Arts and Humanities

In the education of artists and of human scientists working with the media, a twofold goal has to be accomplished: on one hand, traditional media, such as film, broadcasting, print media have to be taught; on the other hand, students have to be prepared to the use of new media for their projects, and to successfully cooperate to the development of new technology. The contribution of artists to the technological development is essential, since end user feed back is of extreme importance.

Since the media industry develops itself at the same time towards multinational media corporations and into tiny services deliverers, a strong component of economical foundations have to be taught. This is achieved through the teaching of basic economical courses as well as special courses on the economics of startup companies.

Both study courses are centered on projects. Under individual tutoring, groups of students are assigned a theme each semester which they have to develop. Project results are then publicly presented at the end of the semester. This way of teaching focuses the study on the production process, from conception to execution.

Artists and Humanists are known to suffer of the typical computer device fear. Moreover, most students approach the study course attracted by the contents of media, not by the technology driving them. However, in a high-tech environment, it is very difficult to avoid being confronted with the glitches and problems of the technology. This is why a comprehensive technological component, including three basic courses on the foundations of Mathematics, Computer Science and Media Systems (network and broadcast technology) are taught. Additionally, fundamentals of programming languages, of operating systems, of communication networks, of computer graphics, of multimedia, of databases, of image processing, of sampling algorithms and of interactive technologies are taught on a regular basis. Students are also confronted with the basics of hardware development.

They are allowed to learn broad and comprehensive foundations of the technologies they will use during their lives. Teaching is not application-oriented or software oriented as in most institutions, but concentrates on principles, so as to avoid an application-specific approach, which has no sustainability on the long term. This ultimately trains towards flexibility. Additionally, students are allowed to visit introductory courses on the main interaction, animation, multimedia, modeling, rendering, image processing, compositing, sound editing and web based techniques so as to understand the principles of tool based work in the media. This is done through hands-on intensive tutorials aiming at real production.

The aim of this approach is to promote the competence in students so as to allow them to dialogue with other people involved in the media industry, whatever their personal inclination is, be it towards the arts, technology or on reflection on the media, and to promote the understanding of the basic technologies available.

The job perspectives of the students are improved considerably by the in depth technological education which improves their chances in the work market. The traditional gap between research and development, and end users is minimized. Arts and humanities students cultivate in the non-technological study courses (which still constitute the main part of their study) their characteristics as artists and critics, and pursue careers in the creative or humanistic field, but are able to understand the potential development in technology and to accompany it from its very early stages. This is a decisive advantage with respect to traditionally schooled students in the arts and humanities.

3 Media Systems: a New Paradigm for Multimedia Education

Media Systems are systems that have an influence on the Media, i.e. that support and allow communication between people. This includes broadcast, networked and point to point communication. Setting the accent on systems underlines that focus is set on complex entities, rather than individual hardware components thereof. Media Systems are therefore complex systems used to communicate.

The study course is addressed therefore to all persons that want to acquire technical/scientific knowledge in the new media, and want to pursue a technical career in Digital Media, Gaming and Entertainment, Computer Graphics, User Interfaces, Animation, Image Processing, Visualization, Networks, Computer Supported Cooperative Work, Teleactivities, Virtual Reality and Digital and Multimedia Publication, and that want to participate to the technical conception and to the development of the expanding multimedia, entertainment and communication industries. The study course builds ultimately professionals that are creatively capable of conceiving systems that revolutionize the way of thinking and of communicating between humans, and that favour new forms of exchange between them. Furthermore, since the study course is integrated in a faculty where a wide variety of study profiles for the media industries are present at the same time, it prepares through dialogue and discussion with the creative and humanities faculty components to cooperation with all professionals of the media industry and research.

The study course global duration is four years, subdivided in two major slices of two years each.

3.1 The propedeutic years of the study course

The rapid developments in the multimedia and telecommunication industry require a total rethinking about how a scientific study course should be organized. Technology evolution is so fast, and new application areas and environments develop so quickly, that it is hard to predict what an optimal study curriculum is for the field. What are needed both in industry and in science are flexible persons that are capable of working in projects with minimal introduction times, and capable of working as a task force on a theme for a period of time in an innovative way, then move to new projects.

Instead of the traditional approach based on trying to cover during the study the whole spectrum of related matters until "universal knowledge" of the matter of study is reached, the study course is therefore organized around the concept of research project, and tries to teach "high-tech" on a learning-by-doing fashion. Of course, it is not possible to renounce completely to introductory courses, which

provide the tools for scientific reasoning. However, introductory courses should be kept to a minimum, so as to leave as much room as possible for project-based work.

From the point of view of content, the study course is centered on the idea of a system. Basic courses are taught during the first two years. They serve three main purposes: first they provide the mathematics and computer science basics for mathematical reasoning and for programming, second they provide an overview of system modeling which is relevant for the field and which is available in science. Third, the study of available media technology, including traditional media, is provided as a foundation. The modeling of complex systems requires the mastering of all possible modeling methods, which are then taught in the basic courses.

More in detail, the Media Systems introductory courses are constituted by the subjects listed in Table 1. Purpose of these introductory courses is to provide the student with the capability of abstracting and understanding complex systems and their components. The numbers to the right of the tables indicate the number of semester weekly hours of course during the study course, which have to be multiplied by 1.5 to obtain the credit points in the ECTS[1] given by the single units. Computer Science and Mathematics rudiments are built through the courses listed in Table 2. All the above mentioned courses have to be absolved in the first two years of the study course.

Note the centering of the subjects on the concept of systems and of mathematical modeling, and the relatively light Computer Science and Information Theory contents with respect to traditional Informatics and Electrical Engineering. The faculty of Media of the Bauhaus-University strongly distinguishes these two subjects from Media Systems, the latter involving more analysis and modeling capabilities than the first two, this in order to master the complexity of the systems to develop.

In order to prepare the students to the last two years, where the main part of the time will be spent in research projects, students are allowed to choose during the second year two labs where they can participate to the department's research activities in two chunks of 8 hours per semester (in study projects) so as to gradually familiarize with the research activities. Here, students have to bring their contribution to research, starting from the entry level of development and get acquainted with the methodology of study of the second part of the study course.

3.2 The second part

In the second part of the study course students have to work on the department research projects. Each semester, the student has to work in one of the laboratories of the faculty at a research project which is assigned to him at the beginning of semester. This means that students will have the possibility of working on four research projects in the last part of his study course, for a total of 16 hours per week presence at the lab each semester, which gives them 24 credit points if the project is concluded and defended successfully.

The department is currently setting up laboratories centered around the research themes listed in Table 3. Additionally to the work on projects, students have to get credits for accompanying courses in the quantity of 4 weekly hours per semester, giving them a total of 6 ECTS credit points per semester. The courses can be chosen from the advanced courses list, which are variable offers of the faculty, depending on the projects available, but which might include the course catalog listed in Table 4 The aim of extensive work on the research projects, and of the theoretical foundations which are delivered through the courses, is to train the students to be able to take up a research project having only basics knowledge

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[1]ECTS stands for the European Credit Transfer System, which is the official exchange system among European Universities and provides transferable credits to exchange students.

and acquire during the development of the project the necessary foundations on the project themes so as to deliver research results.

In the course of their study, students enter their first projects (already in the second year) as executors, and acquire more and more experience, creativity and dialectic capabilities as they become more mature and gain broader knowledge, participating more and more to the conceptional phase and to bigger parts of the projects, until they are able with in the final thesis to take a project and develop it by themselves. This of course requires extensive individual tutoring, which has to be performed directly by faculty. In return, faculty is allowed to concentrate most of the time on its research themes and can profit from the work of the students. Through an admission exam and through a personal interview of the applicants selection of suitable students for such a non-conventional study course is achieved. The individual nature of the study course requires not only application, but also particular creativity of thought.

4 Perspectives and Conclusions

According to the last German Federal Ministry of Economics report on the Information Society [3] the average rate of growth of the entertainment, telecommunication and multimedia industry in the early nineties has been over 20% yearly. This growth rate has been rapidly increasing since, and creates an immense demand on specialized personnel, in all sectors, be they in the creative, organizational or technological sector. Graduates from flexible study courses at the leading edge of research stand excellent chances for conducting an interesting work life. Moreover, their flexibility "preprograms" them for continuous education, in a world where it is less and less possible any more to learn at the university a profession which will last a whole life.

With its three study courses centered on research, on the applications and on the critics of Multimedia and Network technology, the Department of Media at the Bauhaus-University in Weimar is an unique example of cooperation among people originating from traditionally distinct academic paths. This reflects in the education, which centers, of course, on the special skills required from scientists, artists and humanists, but completes them with elements which are necessary to ensure the capability of all three components to dialogue with the other participants to the technology development and usage. Furthermore, with its transdisciplinary approach, the department follows the path traced by the interdisciplinary research group at Xerox Palo Alto Research Center (PARC) in the early seventies [6] which developed the mouse-based desktop user interface, adapting the approach to respond to the needs of a broader subject.

The applications for access to the new study courses state the interest of youth for the perspective careers involved, and are currently beyond 1000% the number of admissions available in all study courses currently available.

Acknowledgments

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Media Technology	Broadcast and Network Technology, Communication processes and standards.	8
Psychophysiological Systems	Perception Theory, Human Senses, Psycho-physiology	4
Physical Systems	Mechanics, Dynamics, Electromagnetism, Waves	6
Logics and Discrete Systems	Logics, Semantics, Discrete Mathematics	4
Concurrent Systems	Concurrent and Distributed Systems and Processes	4
Fuzzy Systems	Analog and Fuzzy Systems, Non-quantifiable Systems (Quality, Expressivity)	4
Stochastical Systems	Statistics, Probability theory, Empirical Methods	4
Projecting Methods	Theory and Methods of Design	4
Cultural and Social Systems	Sensemaking Systems, Symbol Systems Narration, Social Systems	6

Table 1: Media Systems introductory courses

Introduction to Computer Science	4	Higher Mathematics	3
Device Architecture	2	Numerical Mathematics	3
Algorithms and Data Structures	2	Discrete Mathematics	3
User Interfaces	2	Functional Analysis	2
Operating Systems	2		

Table 2: Computer Science and Mathematics courses

Title	Description
Tomorrow's Realities	Virtual Reality, Computer graphics, Computer-augmented reality, Real-time systems, Visualization, Digital sound
Learning and Teaching	Teaching at distance, Tele-teaching, Multimedialization of courses, Continuous Education
Storytelling	Narrative techniques, Esthetical processes, Sensemaking systems Information presentation, Computer Animation
Entertainment	Games, Computer supported Gaming, Media-based Entertainment
Work	Computer Supported Cooperative Work (CSCW), Tele-working Work organization of tomorrow, Telematics
Interfaces	3D-Interfaces and -I/O, Haptic Displays, Immersion, Human perception

Table 3: Research themes for the department laboratories

Game Theory	Geometry	Computer Graphics	Multimedia
Storytelling	Image processing	Image Recognition	Global Illumination
Typography	Virtual Reality	Digital Television	Sound Processing
Colour Theory	CSCW	Learning at distance	Telematics
Ethics and Media	Empirical research	Visualization	Animation
Electronic Communication	Electronic publishing	Interaction	Creative Conception
Ergonomy and work science	Database Management Systems	Operations Research	Media Cultural Studies

Table 4: Optional courses for the second part of the study course