INTERACTIVE TOOLS FOR LEARNING FOREIGN LANGUAGES – CASE STUDY: CLUJ-NAPOCA GERMAN CULTURAL CENTRE

Victor-Eugen SALCĂ Roxana-Dorina MOLDOVAN Bogdan ORZA Aurel VLAICU
The Technical University of Cluj-Napoca, Cluj-Napoca
Str. Memorandumului nr. 28, +40 (0) 264 401309, {Victor.Salca; Bogdan.Orza; Aurel.Vlaicu}@com.utcluj.ro;
Hypermedia, Cluj-Napoca
Str. Heltai Gáspár nr. 22, +40(0) 371 398 899, Roxana.Moldovan@hpm.ro;

Abstract: The Cluj-Napoca German Cultural Centre organises German language courses for different levels of linguistic competence. In teaching German, the tutors implement interactive learning concepts, mostly serious game. A feedback survey focused on the students' perception on the interactive techniques used and how further implementing interactive learning techniques improve the German courses was conducted. This paper shows the results of the survey, and interprets them from the perspective of the lifelong learning concept implemented at the Cluj-Napoca German Cultural Centre. The results interpretation was considered when implementing an Adobe Flash® serious game for writing and vocabulary exercises.

Keywords: *e-learning, lifelong learning, foreign languages, special education, serious game, problem based learning.*

I. INTRODUCTION AND RELATED WORKS

Interactive learning is a pedagogical approach that includes elements of social networking and uses the modern communication technologies in public environments with the aim of conceiving and providing educational materials. Interactive education developed as a consequence of the great increase among the students of the use of digital communication technologies and of the virtual communication. The students of the end of the 20th century were expecting the modern communications technologies to be used in the educational process. This generation, raised with close contact with the digital technologies and their numerous applications, sometimes referred to as "the Net Generation" or "the Y Generation" [1], act naturally when using the technologies in all aspects of learning, both in the classical context, in a classroom, and outside the classroom. The students and teachers can rely one on the other to facilitate the access to information and knowledge sharing. This shifts the role of the teacher from the holder of knowledge to that of mentor during the learning process. The role shift is both a challenge and an opportunity to change significantly the learning habits of students.

The "serious games" have a double purpose: firstly is the entertainment, and secondly is the instruction, education, in different domains such as defence, education, scientific explorations, health, emergency situation management etc. The games that have an educational purpose may be called "educational games". These games are designed to be implemented both in the classical form of board games, and in an interactive form, that uses the modern communications technologies, an example being computer games. Behind these game designs lay learning theories that allow the participants both competition and teamwork. Another concept is the team evaluation that allows the participants to evaluate both his or hers role and performance in the team, as well as the team's performance. Certain issues are still unsolved regarding the adoption of the serious games in education. Del Blanco et. al. identify these problems in order to propose solutions to boost the adoption of serious games in the education al system [2]. In order to enlarge the range of use of the educational videogames, integrating it to the existing e-learning infrastructure is proposed.

With the fast development of the information technology, learning a foreign language with the help of the computer has prevailed. Network systems offer a wide space for learning a foreign language, creating vivid multimedia learning environments, often helpful in establishing mixed learning modalities. The theoretical fundamentals and success practices of the "blended learning" concept are explored in [3]. Based on the practice acquired in the teaching process, a blended learning procedure is designed for college level English language. Also a set of suggestions regarding computer aided foreign language learning are enumerated.

A learning environment based on the "problem based learning" concept integrated with an e-learning system using the cloud method is presented [4]. The students are divided into groups and are faced with a realistic problem; a series of necessary technical skills is also provided. This method is applied to engineering courses, and usually takes place in face to face meetings. The proposed system allows the students to focus on acquiring knowledge on their own, thus overtaking the lacks of the classical educational system. The "problem based learning" concept can be implemented in an e-learning system to improve the problem solving skills of the students, also developing the students' soft skills. This method helps the

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engineering students to participate in the continuous or lifelong learning. Also it promotes the problem solving, communication and teamwork skills of the student. Using the cloud technology in the e-learning system introduces the scalability of the system, access to the system independent of the user's location, data storage and efficient resource management.

This paper does not propose a complex survey of serious game use in foreign language learning. It uses the approach in [5] related to the web-based application for language learning, and those in [6] related to the rise in complexity of the online exercises … . It is organised as follows: the introduction and related works are presented in the first section. The second section presents the way interactive learning is implemented at the Cluj-Napoca German Cultural Centre. Also a feedback survey conducted on all the participants at the German language courses and its statistical interpretation are presented in this section. The third section consists of the technological aspects related to the development of a serious game for learning basic German language. Experimental results are highlighted in the fourth section. The fifth and final section presents the authors' conclusions regarding the implementation of serious games for learning a foreign language.

II. INTERACTIVE LEARNING CONCEPT. GERMAN CULTURAL CENTRE APPROACH

At the Cluj-Napoca German Cultural Centre German language courses are organised. The courses cover a wide range of linguistic competence, from the low-level beginners, to the top European levels of reference: A1/A2 – elementary users, B1/B2 – independent users, and C1/C2 – experimented users. The courses are organised year-round, with the same content and methods. Regular courses have a span over several weeks, with two weekly sessions, up to a total of 14 sessions. During the summertime, the scholar holyday, the Centre organises the courses at a higher pace, called intensive courses. The sessions of these intensive courses take place daily, over a three-week period. The only difference between the regular courses and the summertime intensive courses is, as we said, the pace at which the courses take place. At the Cluj-Napoca German Cultural Centre German is taught by interactive techniques for introducing new notions and vocabulary and grammar exercises, and by minimal initial presentation of grammar rules. The vocabulary and grammar exercises are mainly based on two interactive learning concepts: "serious game" and "problem based learning". For the pronunciation exercises a small number of multimedia materials are used, mostly audio files. The students are encouraged to use as much as possible German throughout the course, and as little as possible Romanian. This practice is due to the fact that most of the Centre's students live in a non-German speaking environment, which does not allow them to practice the learned German. By creating a German speaking environment, the students are encouraged to practice intensively their German language skills, as practice is the best method of improving one's language skills. To encourage even more the practice of the German language, all the exercises are designed for pairs or groups. This way the students practice the German skills with non-native speakers of the same level, and improve the interactive learning experience.

The participant students at the 2012 summer intensive courses were divided in seven groups of 14, based on their initial German language knowledge. Participation to this study was free willing, and conditioned by the presence at the last meeting. As a result, out of the total of 98 students, only 54 decided to take part to the study. All the numbers and percentages presented in this paper are calculated with respect to the total number of participants to the study. The study group consists of 41% female and 59% male respondents, with ages spanning from 17 to 40 years old, with two approximately equal peaks at the 21-25 years old and 26-30 years old groups, of 20 and 21 respectively. On the demographic scale, 92.6% of the participants come from urban areas, while only 7.4% come from rural areas. On the professional scale, all the Centre's students are also involved in some form of classical education, most of them having graduated from high-school, the university, or from a master's degree. This ensures that the students answer our questions related to the interactive concepts by comparison with the classical teaching methods. Our study does not take into account the degree of knowledge of the German language because, as we mentioned, the Cluj-Napoca German Cultural Centre implements the same interactive learning concepts regardless of the students' linguistic skills.

The feedback was collected at the beginning of the last meeting, without the students having prior knowledge of this study, therefore collecting their retrospective opinion without distracting them from the main purpose of the course: learning German. The feedback form was anonymous, and contained 16 questions, out of which four were socio-demographic (sex, age, demographics, studies), and one question on the reason for studying the German language. The other 11 questions referred to the efficiency or utility of the interactive methods used in teaching German language at the Cluj-Napoca German Cultural Centre. The students were asked to answer the 11 questions by ratings on a scale from 0 to 4, 0 being the lowest, and 4 being the highest. The questions referred to the following issues:

- To what extent the students left the meeting with "the lesson ready learned";
- How much did the exercises implementing the "serious game" concept help practicing known (taught earlier) linguistic concepts;
- How much did the exercises implementing the "serious game" concept help introducing new linguistic concepts;
- Did the exercises implementing the "problem based learning" concept stimulate the creativity and student involvement;
- Did the exercises implementing the "problem based learning" concept resemble real-life situations;
- To what extent the use of images and objects has proven useful;
- To what extent the use of multimedia elements has proven useful;
- How useful would be for stimulating the student's creativity and motivation the following:
  - Computer applications with classical exercises for grammar and vocabulary;
  - Computer applications for simulating real-life situations with certain requirements in these contexts;
  - Realizing a group or individual project in

German language on a given subject;
- Solving complex exercises that implement the "serious game", "problem based learning" and "project based learning" concepts.

Statistics. Obtained results and interpretation

The first question investigates if the high retention factor is achieved. The students were asked to rate the measure in which they left the meeting with the taught lesson already learned. A total of 70% from the students answered with the highest ranks, 3 and 4, and 26% answered with the low ranks, 1 and 2, and none with the lowest rank, 0. This proves that, overall, the methods used and the concepts implemented at the Cluj-Napoca German Cultural Centre, are very efficient, and determine a high retention factor.

The efficiency of the "serious game" concept in repeating known linguistic notions and concepts and in introducing new linguistic notions and concepts was studied. Relatively the same number of students ranked with 3 and 4 the utility of the implementation of this concept for both purposes 87.04% and 88.89% respectively. This proves that the "serious game" concept is successfully used in teaching foreign languages, and that the methods implementing this concept have a high retention factor.

Regarding the exercises that implement the "problem based learning" concept in a foreign language learning context, the students were asked if these stimulate the student's creativity and involvement, and if these exercises were similar to real-life situations. A total of 81.48% of the students rated the stimulus for both the student's creativity and his or hers involvement with 3 and 4. Regarding the resemblance of these exercises with real-life situations, 62.97% of the students rated it with 3, and 11.11% rated it with 4. This proves that the "problem based learning" concept is suitable for implementation in vocabulary exercises.

The use of images, objects and multimedia elements was also studied. A total of 90.74% of the students consider that the use of images and objects is useful in teaching a foreign language. Regarding the multimedia contend used at the Cluj-Napoca German Cultural Centre, 83.33% of the students consider it as useful. One should note that the multimedia content is mainly (if not only) audio content, used for developing audio skills and understanding native spoken German language.

Regarding the possible improvements that the courses at the Cluj-Napoca German Cultural Centre could suffer, the students consider that the use of a computer would produce a considerable improvement. The possible use of computer programs for grammar and vocabulary exercises has been rated 2 by 24.07%, 3 by 40.74%, and 4 by 24.07% of the students. A total of 83.33% rated 3 and 4 the possibility of using computer programs for exercises simulating real-life situations. A total of 90.74% of the students ranked 3 and 4 the possibility of participating to exercises based on individual or group projects. The last question asked the students to rate the help a complex exercise, which would implement all three interactive learning concepts, would provide in the learning of a foreign language. A total of 88.89% from the students rated 3 and 4. These four answers prove that introducing the computer in the teaching of a foreign language will improve the outcome, by increasing the learner's involvement, motivation, and retention factor.

III IMPLEMENTATION OF A SERIOUS GAME

In order to illustrate the concept of "serious games" it is necessary to integrate it into some existing e-learning infrastructure. Therefore we designed an educational software application to be implemented in the classical form of computer games using the modern communications technologies. This interactive application aims helping one to easily understand and learn the basic concepts of a foreign language (English or German).

It is important to mention that the system described below is an example of a "serious game", but also it is an

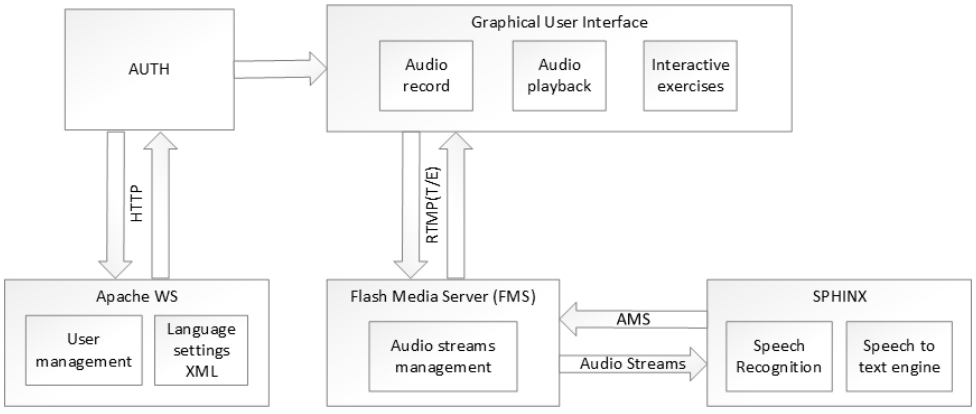

Figure 1 – System architecture

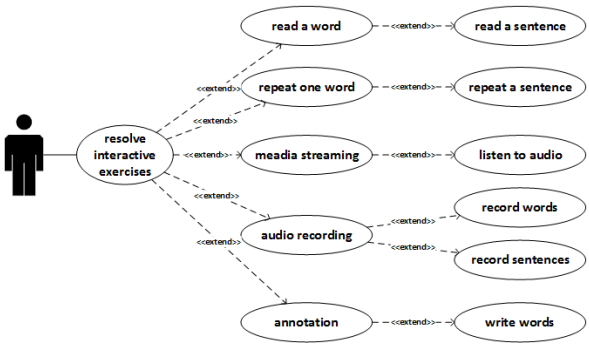

Figure 2 – UML use-case diagram of the application

example of an e-learning interactive educational process that encompasses "web-based learning", "computer-based learning", "interactive learning", and "virtual learning". This "serious game" is designed using some popular web technologies in order to ease the user's access to the content, independently of hers or his location at the accessing moment.

Adobe Flash is a multimedia platform used to add animation, video, and interactivity to web pages. More recently, Flash has been positioned as a tool for the so-called "Rich Internet Application" ("RIA") [7]. Flash content may be displayed on various computer systems and devices, using Adobe Flash Player [8]. It supports bidirectional streaming of audio and video, and it can capture user input via mouse, keyboard, microphone, and camera.

Because Adobe Flash Platform is frequently used in developing computer games, our solution uses this multimedia platform to build the client layer of the serious game. The new developed application enhances the high-level interaction model of educational games with interactive exercises, and speech-based user interaction, pushing the whole system towards entertainment, avoiding monotony and preventing the boredom. This educational web application facilitates one's access to new information, independently of hers or his location at the accessing moment.

Use of Flash makes the web application more interactive and attractive, allowing web designers and developers to use their creativity. One major advantage of a Flash built application is the lack of the cross browser compatibility problems, but it requires installation of the latest Flash Player version. ActionScript is the object-oriented programming language used by Flash and it enhances JavaScript capabilities with additional functionalities intended for processing animations.

Figure 1 illustrates the system architecture centred on the client-server design pattern. The client code can be written in ActionScript 3.0 interpreted by Adobe Flash Platform. The server side consists of a Flash Media Server and a SPHINX library. Flash Media Streaming Server provides four streaming services: live, VOD (video on demand), livepkgr (HTTP streaming), and multicast (RTMFP). Streaming services are prebuilt server-side applications [9]. The server and the client can communicate over a persistent connection using Real-Time Messaging Protocol (RTMP). RTMP is a reliable TCP/IP protocol for streaming and data services. One reason why FMS uses the RTMP protocol is because it is better suited to streaming information and also ensures that stream-ripping programs cannot rip the data. One disadvantage is that in some cases RTMP can be blocked by firewalls. The acknowledgment messages are passed between the client and the server in order to communicate the connection state.

Flash Media Server uses a simple, yet powerful, distributed data model based on shared objects. Both client-side ActionScript and Server-Side ActionScript have a SharedObject class that lets developers share data between clients connected to a server [9]. In this case we are talking about remote objects like audio streams passed from the client side to the server side in order to be managed by the FMS server and then passed away to the SPHINX server.

Sphinx is an open-source, full text search server providing a tool that translates a set of source files into various output formats, automatically producing cross-references, indices etc. [9]. In other words, Sphinx allows the user to create an index from a data-source and then search it with great speed without even touching the original data source. Sphinx isn't ideal for every application, but in this case it is useful for getting the audio streams and converting them into text messages to be passed back to the client in order to be interpreted by the web browser. This approach provides great performance and a secure management of the audio streams.

Figure 2 presents the UML use-case diagram of the proposed application. The diagram is centred on the user who can listen to audio streams, record audio streams, read certain word and re-write it and also resolve interactive exercises like matching words and images. Even though the diagram looks very simple, the learning process of new basic concepts in a foreign language is not that simple. The application starts with writing and reading letters, then words and in the final stage it provides some interactive games for the user to really understand these new concepts.

IV. EXPERIMENTAL RESULTS

A simple writing exercise is illustrated in Figure 3.

Figure 3 – Learning how to write the letter "C"

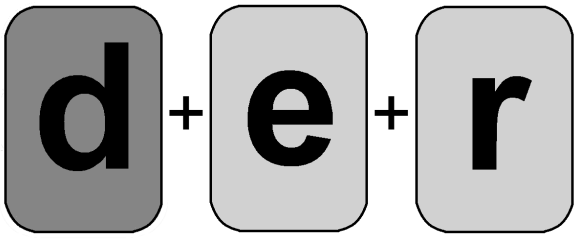

Figure 5 – Learning how to read a word. Here the article for masculine gender nouns "der"

The application starts by drawing and pronouncing a letter ("C" in this case) and requests the user to redraw and pronounce again the exact same letter. Thus the learning activity is pushed towards entertainment, avoiding monotony and preventing the boredom of the user. The system does not allow going to the next step of the game until the letter isn't correctly pronounced and written. It looks simple, but with a foreign language such as German, one can pronounce this letter several times until the correct sound is achieved. The voice recognition activity is handled by the SPHINX server. The audio stream generated by the user is passed to the SPHINX server after it has been processed by the FMS server. The audio stream is then processes by the speech recognition and speech to text SPHINX engines and transformed into text messages that can be interpreted by the client side of the software application. SPHINX server can also save into a database the correct answers the user gives or other useful data regarding these vocabulary exercises. A variety of stream and text processing features makes SPHINX the right solution for this kind of application.

After the user learns the alphabet he can pass to the next step that implies reading and pronouncing words. As

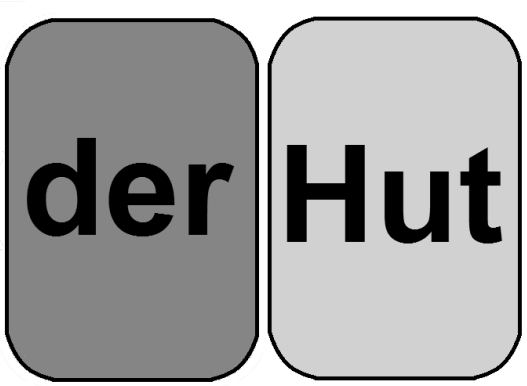

Figure 6 – Learning how to read two words. Here "the hat", "der Hut"

the reader will see, the process is an iterative one, starting from the simple learning of how to read and write letters, continuing with words and in the end playing some games like the one explained in Figure 6.

Iterative learning is an important feature of e-learning systems because it helps one to progressively gain new information. It helps the user to gain experience with continuous learning and professional development, guiding him to focus on certain concepts like self-directed e- learning of a foreign language. Figure 4 is an example of iterative learning using a serious game. It explains how a word is composed of several letters. The system writes and pronounces every letter of the word and then the whole word and the user need to rewrite and pronounce by self the proposed word.

Figure 5 presents multiple such words and aims to highlight how changing a letter or the order of letters can

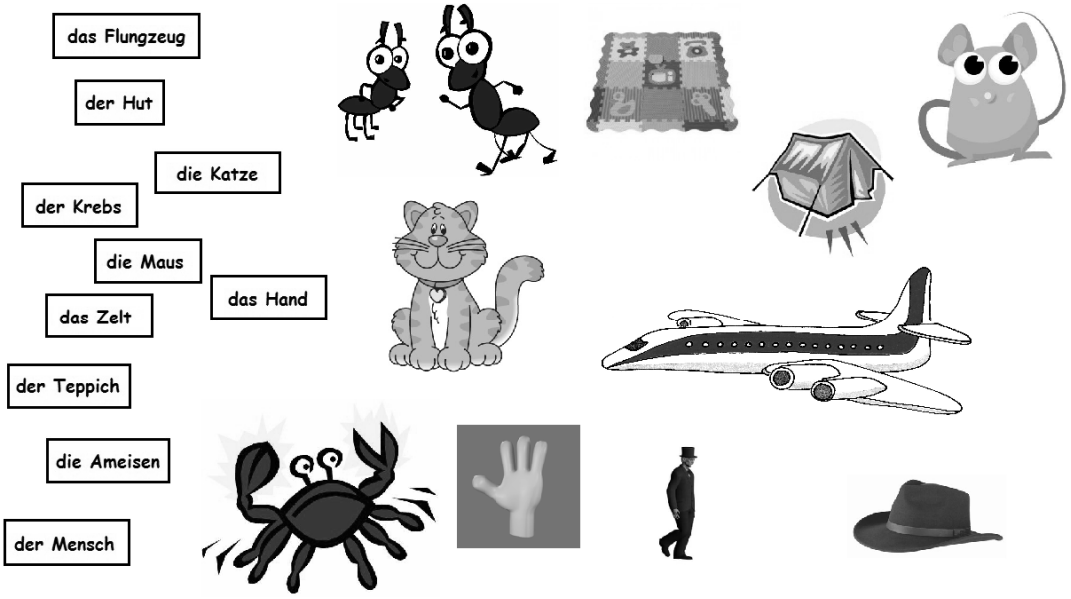

Figure 4 – Example of an interactive vocabulary exercise

change the whole word. The final step consists of understanding the meaning of every word and resolve a vocabulary exercise like the one previously described in Figure 6.

Our study revealed that a total of 90.74% of the students from the Cluj-Napoca German Cultural Centre consider that the use of images, objects and multimedia elements has an important impact in understanding and learning a foreign language. This is one of the reasons why our application is focused on multiple interactive games like the one shown in Figure 6. The user must overlap the right word over the right picture. If the overlapping isn't correct the system warns the user about his mistake and cancels his attempt. Such a "serious game" helps practicing taught earlier linguistic concepts. Resolving this kind of exercises, even though it looks very simple, the high retention factor is easily achieved.

The interactive software e-learning application described above enhances the "serious game" concept and exemplifies the e-learning interactive educational process. Repeating known linguistic notions and introducing new linguistic concepts is an important feature of such systems.

V. CONCLUSIONS

This paper deals with the use of interactive learning in teaching foreign languages. We studied the way the German Cultural Centre in Cluj-Napoca implemented the interactive learning concept for the German language courses organised by the Centre. We developed a Flash® application aimed at creating a friendly environment for writing and solving vocabulary exercises.

At the Cluj-Napoca German Cultural Centre German language courses are organised, with the students being grouped based on their knowledge of the German language and not by their age. This practice generates heterogeneous study groups, with students ranging from high-school students to graduate students. We conducted a feedback survey on the students of the 2012 summer German intensive courses, in order to observe the way the students perceive the interactive techniques implemented at the German Cultural centre. They were asked how they felt a "serious game" or "problem based learning" exercise helped them in learning German words or German language grammar rules. The majority of the responding students (between 80 and 90 %) consider the implementation of interactive learning concept as useful and very useful (ranked with 3 and 4 on a 0 to 4 scale). Also the same ratio of the questioned students consider that a significant improvement will be the use of the computer, specifically, the use of computer-based interactive grammar and vocabulary exercises.

Considering the results obtained at the survey, we developed a flash application aimed at beginners that helps them practice the writing of special, language-specific characters, such as letters with diacritics or entirely own letters, such as ß – "scharfes S". The application presents the correct way of writing a letter, and then provides the student with an environment for practice. Then the application presents the students the reading section, where it reads various words; for the nouns, the application reads also the defined article. In the vocabulary part of the exercises, the student has to match the word to an image representing that word. The matching is done by dragging the word over the image associated to it. The complexity of the words increases accordingly to the student's improvements of hers or his language skills.

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