

## MULTIMEDIA TECHNOLOGY FOR SPEECH AND LANGUAGE DIAGNOSIS AND THERAPY

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### **Annotation**

*Published research establishes that multimedia technology is increasingly being used to create learning environments in education and clinical settings.*

*The aim of this study is to investigate the use of multimedia technology by speech and language therapists in developing their own digital material on diagnostic and therapeutic procedures. Undergraduate fourth-year students were motivated to use various multimedia editing and authoring tools for diagnosis and therapy procedures in building social skills deficits. The research questions concern students' accomplishments on intergrading multimedia technology in speech and language diagnosis and therapy, and the effectiveness of the digital environment they created.*

*The results revealed that students used text, graphic, audio and video materials and animation to facilitate procedures in speech and language diagnosis and therapy and accomplished good outcomes while designing multimedia activities, meeting technical and pedagogical/clinical criteria. Finally, students' multimedia technology development approaches were discussed and concluded in the demands of modern information society.*

**Keywords:** *multimedia in speech pathology, computer in speech and language diagnosis, computers in speech and language therapy, computer and social skills.*

## Introduction

Multimedia technology refers to computer-based applications that allow people to communicate and deliver messages in forms of digital elements with content in different forms, such as text, audio, images, video, animation, and interactivity.

Research illustrates that multimedia technologies have had a leading part in various aspects of modern life, including education (World Bank, 2003; Tunis Commitment, 2005; Plowman & Stephen, 2005; Programme of International Student Assessment, 2005; Kozma, 2008; Toki & Pange, 2012). The significance of the benefits of multimedia learning environments has been well established in the educational and clinical setting (Bellini *et al.*, 2007; Robin, 2008; Sadik, 2008; Hirano *et al.*, 2010; Reichow & Volkmar, 2010; Toki & Pange, 2010; Bastanfard *et al.*, 2011; Toki *et al.*, 2012).

Multimedia technology can contribute in changing the traditional teacher-student relationship and upgrading educational and clinical quality with new educational environments, teaching methods and clinical approaches (Toki *et al.*, 2009; Chai *et al.*, 2010; Hirano *et al.*, 2010; Reichow & Volkmar, 2010).

Today, people, youth especially, commonly use the web, social web (such as Facebook, Youtube, Twitter, Myspace), collaborate through wikis, blogs or Skype, have mobile connectivity and form everyday tasks online, such as learning, listen to radio, applying for a job, shopping or even dating (Becker & Ravitz, 2001; Plowman & Stephen, 2005; Robin, 2008; Kim *et al.*, 2010). They spend increasing amounts of time online in multimedia environments and they even deal with activities that involve creating and publishing multimedia materials (Toki & Pange, 2009, 2010; Toki *et al.*, 2012). In order to do so, they use authoring tools that give the option to create easily multimedia material even at the beginner's level and require little technical knowledge in order to put together a multimedia creation (Oud, 2009). Moreover, learning outcomes are gained with collaboration and interaction and the exchange of ideas, knowledge and the target to accomplish tasks (Toki & Pange, 2013).

Pelayo (2013) supports the view that multimedia "promotes and multiplies the ways in which we see, listen, read, write, signify, relate and, above all, become aware of the innate capacity for creativity common to each and every human being, [...]". Consequently, multimedia material creation can inspire students' learning and creativity and serve as a double function: learning and pleasure at the same time.

Then again, Robin (2008) brings up the importance of teachers' knowledge to effectively motivate and engage students into learning new content and to understand the content better with the help of multimedia technologies. This can be applied not only for a teacher/special education teacher, but also for all practitioners that deal with learning activities, i.e. speech pathologists.

Precisely, speech pathologists apply (i) various formal and informal assessments to draw the case profile, even though there is no single tool that can be applied universally (Hitchcock and Stahl, 2003) and (ii) intervention procedures according to the individual's needs. Many clinicians prefer to use informal assessments and then plan intervention particularly designed to fit the individual's needs. Thus, speech pathologists need to be able to create and adjust digital material easily to serve the diagnosis and therapy needs of a case in line with the current trends of modern life and society (Petrogiannis, 2010).

Oud (2009) suggests that for the implementation of multimedia material "...helpful strategies include simplifying and focusing content around clear goals, presenting content so it

is easy to understand the main points, making sure the interface, technology, and practice activities are easy to understand and complete, removing any words or graphics not absolutely needed, and directing attention to the most important points using visual and verbal cues”.

The creation of multimedia material with educational/training content involves various ways to combine instructional methods and media (Nguyen & Clark, 2005). Employment of cognitive theories together with technology can shift from classroom centered educational instruction to distributed learning environments. Cowan (2005, p. 1–3) specifies that human working memory has a limited capacity to hold information. New information should not be too much in order to be beneficial. Multimedia instructional material should maximize learning efficiency. The designer has to balance the forms of cognitive load by (i) managing the complexity of the content, (ii) minimizing the irrelevant staff and (iii) maximizing the benefit of the instructional goal by providing instructional examples/practices (Nguyen & Clark, 2005).

Empirical evidence in research presents confirmation of multimedia successfully applied in disability education and speech pathology (Simpson *et al.*, 2004; Skau & Cascella, 2006; Thorp, 2007; Sansosti *et al.*, 2008; Rayner *et al.*, 2009; Hirano *et al.*, 2010;). Mayer (2002, 2006, 2009) stated that there are three recommendations on technology-based multimedia interventions: (i) to be produced with the individualized cognitive needs of the target learner in mind, (ii) to look and sound appropriate in terms of limiting extraneous processing, fostering the processes in working memory and managing active learning and (iii) to employ technology as one strategy that can assist in making instruction relevant to students regardless of the topics or skills being taught.

Building social skills, deficits may involve individuals on the Autism spectrum (White *et al.*, 2007) or other diagnoses or typically developing children, who need to improve the targeted skills. Each individual, even the ones with similar diagnosis, may vary on skill levels. Consequently, this requires flexibility, creativity and attention to individual needs to prepare valuable and engaging clinical/educational material (White *et al.*, 2007). Besides, social skills often need to be taught specifically taking into consideration whether language and imitation skills are absent or delayed (Rogers, 2000).

Diagnostic and therapy procedures can fall in three different approaches (Paul, 2003): (i) adult mediated (teacher or clinician instruction/therapy), (ii) peer mediated (particularly with preschoolers), and (iii) combination approaches (social skills groups with peers and an adult present).

The study aims to contribute to the upward demand for speech pathologists/practitioners and educators to be able to create quickly their own digital material for clinical and educational practice. In particular, the focus is to investigate how undergraduate students use multimedia technology to build their speech and language diagnostic and therapy materials. The research questions concern the following issues: (i) how effectively students have used multimedia technology (how and why technology is used) and (ii) to what extent the students managed a meaningful integration of digital material that contributes to the effectiveness of the learning accomplishments on social skills.

## 1. Materials and Methods

During the last academic year, final year students of Department of Speech and Language Therapy of the Technological Educational Institute (TEI) of Epirus in Greece, under their ICT courses using blended learning, were given the option to create multimedia material. A self-

selected group of 94 students participated in the study. The sample consisted of 80 females and 14 males. In the Department of Speech and Language Therapy, the majority of students were females. The average age of the students was  $22.9 \pm 2$  years.

For the purpose of the study, students were presented with an introduction to multimedia technology, elements and constraints of multimedia as stated by Mayer (2002, 2006, 2009) and Nguyen and Clark (2005), following by example stimulus. Then, students were asked to form groups of collaboration. The groups decided the tasks they preferred to work, concerning social interaction targeting children, adolescents or adults with social skill deficits. All groups had to take part in several talking and/or writing activities as preparation to their script. Once they had formulated their script on paper, they had to gather and create all digital material (such as computer-generated texts, images and computer-based graphics, animations, video clips, music, recorded audio, visual and sound effects) in order to create the multimedia materials. They saved their digital material either locally or on the web. For their final test (exam), they had to create a short report, including literature review, and present their multimedia material to their classmates.

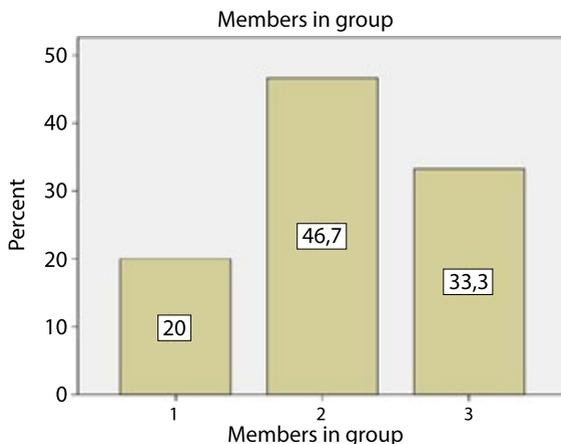
The research tool was a questionnaire designed for the purpose of the study and consisted of two sections. Section one was composed of 6 questions, aiming to collect general information regarding the participants' age, occupation, sex, computer ownership and Internet access. Section two was composed of 9 questions, aiming to gather information on course structure, materials used by the teacher and students' attitudes towards using multimedia technology. In particular, students were asked about course structure, types of learning, learner-instructor interaction, learner-learner interaction, creativity, engagement, motivation, time devoted, learning outcomes, materials used and digital rights.

Additionally, an evaluation of groups' effectiveness on using multimedia technology to express and deliver speech and language pathology message was applied, regarding (i) stating the purpose of the task, (ii) clarity of message presented in the task and (iii) suitability of learning material. Also, classification of purpose of use and interactivity were encountered.

The data was then analyzed using SPSS.

## 2. Results and Discussion

The students formed 30 groups of collaboration. The groups consisted of 2, 3 and 4 members. 20% of formed groups consisted of 2 members, 46,5% of 3 members and 33,3% of 4 members (see Figure 1).



**Figure 1.** *Students allocation in groups of collaboration*

The production of multimedia materials employed a wide range of multimedia software and hardware components, depending on the content, the structure and the nature of the speech and language pathology activity, i.e. Microsoft PowerPoint, MovieMaker, Video-PadEditor, PhotoShop, Audacity, etc.

Regarding computer ownership, participants revealed that almost all (99%) owned a computer and had Internet access.

As to the course structure, the majority of the participants (94%) were satisfied with the structure and the content of the course that included various materials (e.g., exercises, examples and videos with case studies, assignments and reference books), which created a very supportive ground for practicing and learning the topic of multimedia technology in speech pathology for diagnosis and intervention.

The participants stated that they were generally satisfied (95%) with the type of learning and face-to-face interactions as well as interactions over the Internet with their instructor and their peers, as it was easy and quick to communicate with them for any matter and provide guidelines or additional information in case of need.

Almost all students (95%) stated that they found learning activities very enjoyable. This can be explained due to the fact that the sample was self-selected and chose the subject of multimedia. Sound, voice/music, video materials and images motivated students and enhanced their engagement and time devoted. As it was noticed, self-expression inspired them, made them enthusiastic for the learning activities and they were very pleased with their final work and learning outcomes.

The evaluation shown above averaged to mostly very good results. Scores follow the Likert scale 1–5 (1 – strongly disapprove, 2 – somewhat disapprove, 3 – average, 4 – somewhat approve, 5 – strongly approve). All multimedia material created by the students contained texts, images and audio material. 70% of them also used narration, 40% included videos and 10% used animations. The multimedia design was overall good with clear goals and multisensory stimulus. The students used various speakers in their recordings, with a maximum of 4 different speakers. 33% of the students included role playing in their recordings. Recording quality was average to good. Language used in the recording was good to very good. Images were mostly from digital cameras, downloaded from the web or cartoon and comics.

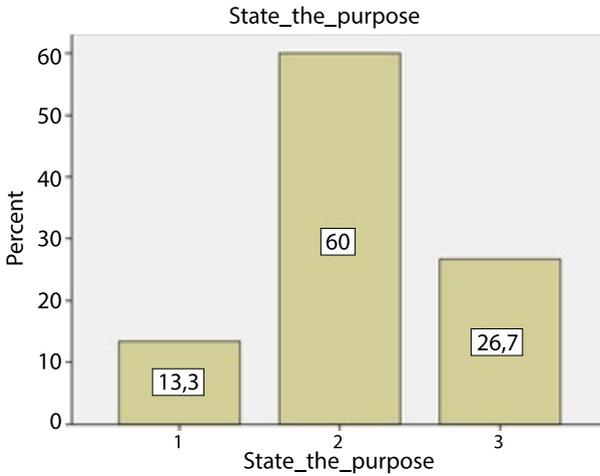


Figure 2. Clear statement of the purpose of task

NOTE: In figure 2, State\_the\_purpose should be State the purpose

As for multimedia effectiveness for building social skills deficits, the following were found:

- **Clearly state the purpose of the task:** The majority of the students got good and very good evaluation (86,7%) (see Figure 2).
- **Clarity of message presented in the task:** Again, the majority of the students got good and very good evaluation (86,7%) (see Figure 3).
- **Suitability of learning material:** 30% of the students faced some difficulties on the ways how to present feedback and error message on the learning material. 70% of the students accomplished good and very good results (see Figure 4).

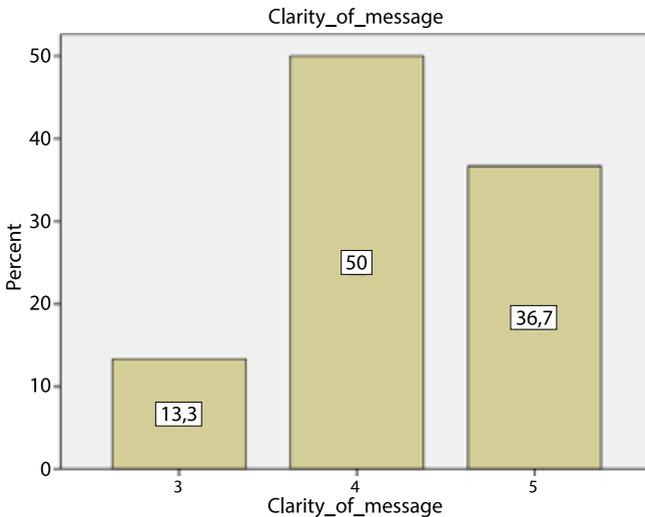
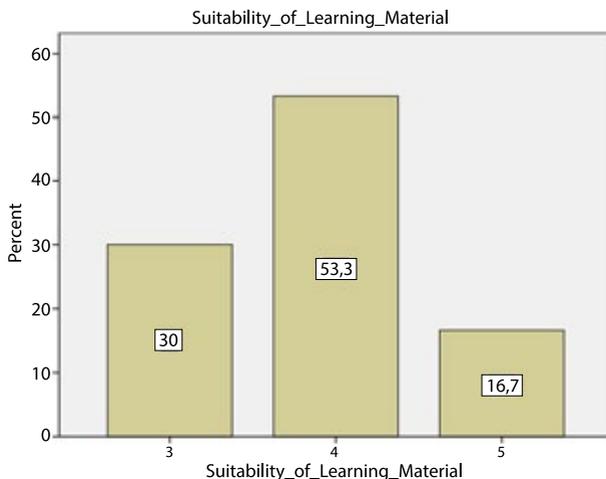


Figure 3. Clarity of message(social Skill)



**Figure 4.** *Suitability of multimedia material*

NOTE: In figure 3, Clarity\_of\_message should be changed into Clarity of message. Also, the title should be changed to Clarity of message (social skill). In figure 4, Suitability\_of\_Learning\_Material should be changed to Suitability of learning material. Also, the title should match it, it should be called Suitability of learning material.

The results of the study revealed that all groups accomplished their tasks on time. According to the teacher's evaluation, they achieved overall good grades.

Classification of purpose of use

The groups of the students, while working, used the multimedia material for two types of purposes:

- (i) Diagnosis: 16,7% of the groups of the students chose to work on diagnostic activities in social deficiencies. In detail, the groups selected to create multimedia material for diagnostic procedures that evaluate areas of social strength and challenge aiming the child/adolescent/adult, the teacher and the parent.
- (ii) Intervention: 83,3% of the groups of the students chose to create multimedia material for intervention in social skill deficiencies. In particular, they dealt with material aiming for the management of conversational skills, feelings of the self and others, play, cooperation, conflicts, teasing, and friendship with adult and peers mediation.

It is important to notice that the students managed to adjust interactivity successfully (75%) according to the needs and the purpose of their task.

## Conclusion

This study presented implications for practitioner education in terms of preparing speech and language pathologists or special education teachers to build their teaching frameworks with multimedia technology.

The results of the study indicated that almost all students:

- demonstrated multimedia knowledge and skills to support effectively our digital society;

- were able to model and use effectively multimedia technology for diagnostic and intervention procedures in building social skills;
- considered multimedia technology a positive experience that promotes learning and creativity;
- addressed the issues of diverse learning styles by dynamic customization and personalization.

Limitations of this study concern the sample size and the formation of self-selected students. Generalized future research may provide more information on this matter.

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# MULTIMEDIJOS TECHNOLOGIJŲ TAIKYMAS KALBOS IR KALBĖJIMO SUTRIKIMŲ DIAGNOSTIKAI IR TERAPIJAI

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## Santrauka

Moksliniai tyrimų rezultatai rodo, jog pasaulyje efektyvioms mokymosi aplinkoms kurti vis plačiau naudojamos multimedijos technologijos.

Straipsnio tikslas – ištirti, kaip multimedijos technologijos taikomos diagnozuojant kalbos ir kalbėjimo sutrikimus ir įpranaujamą ugdymo procese. Epyro edukacinių technologijų instituto ketvirto kurso bakalauro studijų specialiosios pedagogikos studentai buvo mokomi naudoti įvairias multimedijos technologijas kuriant priemones ir jas naudojant socialinių įgūdžių nustatymo ir ugdymo procese. Tyrimo klausimai siejami su studentų gebėjimais naudoti multimedijos technologijas kalbos ir kalbėjimo sutrikimų diagnostikos ir terapijos metu ir jų pagalba kalbos klaida sukurtos skaitmeninės mokymo medžiagos panaudojimu edukaciniame procese ir neaiški mintis. Tyrimo duomenimis, studentai, naudodami tekstą, grafiką, garso, vaizdo medžiagą ir animaciją, siekdami palengvinti kalbos ir kalbėjimo sutrikimų diagnostiką ir terapiją, pasiekė gerų rezultatų: tyrimo dalyviai pademonstravo multimedijos žinias ir įgūdžius, būtinus skaitmeninei visuomenei palaikyti; gebėjo modeliuoti ir efektyviai panaudoti multimedijos technologijas diagnostikos ir intervencijos procedūromis ugdant socialinius įgūdžius; išsakė nuomonę, kad multimedijos technologijų naudojimas yra teigiama patirtis, skatinanti mokymąsi ir kūrybiškumą; gebėjo dinamiškai pritaikyti ir personalizuoti skaitmeninę mokymosi aplinką atsižvelgdami į įvairius mokymosi stilius. Naudodamiesi multimedijomis, studentai sukūrė priemones, atitinkančias edukacinių / klinikinių technologijų kriterijus. Studentų praktikuojami multimedijos technologijų plėtojimo būdai straipsnyje nagrinėjami ir apibendrinami šiuolaikinės informacinės visuomenės poreikių kontekste.

**Reikšminiai žodžiai:** Multimedijų taikymas kalbos patologijos diagnostikai, kompiuterio naudojimas kalbos patologijai, kompiuterio naudojimas kalbos ir kalbėjimo sutrikimų diagnostikai, kompiuterio naudojimas kalbos ir kalbėjimo sutrikimų terapijai, kompiuterio naudojimas ir socialiniai įgūdžiai.

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