

## Διδασκαλία Νέων Ελληνικών στο διαδίκτυο μέσω της μεθολογίας του Συμμετοχικού Σχεδιασμού και του Κατανεμημένου Δομισμού

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Θα παρουσιάσουμε την εφαρμογή της θεωρίας του **κατανεμημένου δομισμού (Distributed Constructionism)** και της μεθολογίας του **συμμετοχικού σχεδιασμού (Participatory Design)** για μια μαθητευόμενη κοινότητα στο διαδίκτυο. Θα επεκτείνουμε ένα προηγούμενο σχέδιο και θα δημιουργήσουμε μια ομάδα με Έλληνες και Κύπριους της Διασποράς όπου θα συνεργαστούν πάνω στο περιεχόμενο και την λειτουργική ανάπτυξη μιας διαδικτυακής σειράς μαθημάτων της Ελληνικής γλώσσας. Σ' αυτό το μάθημα οι μαθητές θα επιθεωρούν τα μέλη, θα δημοσιεύουν ύλη συνεισφορών, και θα συμμετέχουν σε ομάδες συμμετοχικού σχεδιασμού.

Ο **συμμετοχικός σχεδιασμός(PD)** θα εφαρμοστεί σαν μια διαδικασία τεσσάρων σταδίων:

- (α) θα χτίσουμε γέφυρες με τους προτιθέμενους χρήστες
- (β) θα καθορίσουμε τις ανάγκες και τις εισηγήσεις τους στο σύστημα
- (γ) θα δημιουργήσουμε ένα πρωτότυπο
- (δ) θα ενσωματώσουμε τις ανταποκρίσεις τους και θα συνεχίσουμε τις επαναλήψεις.

## Online teaching of Modern Greek through Participatory Design and Social Distributed Constructionism

We will be presenting the implementation of Distributed Constructionism (DC) through a Participatory Design (PD) methodology for an Online Learning community. As an extension to a previous project, we will be setting up a face-to-face physical team with Greeks and Cypriots of Diaspora who would collaborate on the content and functionality development of an online Modern Greek language course, peer review and publish content contributions, through their involvement in participatory design teams.

Participatory design will be implemented as a four step process:

- (a) Build bridges with the intended users
- (b) Map user needs and suggestions to the system
- (c) Develop a prototype
- (d) Integrate feedback and continue the iteration.

**Keywords:** Computer Supported Collaborated Learning (CSCL), Distributed Constructionism (DC), Participatory Design (PD)

## **1. Introduction**

The contribution of this paper is the presentation of an empirical study of an online learning community collaborating with the design team of the course under the Participatory Design methodology. We measure the student participation during the different phases of the design process, and the changes in their behavior when new design elements are introduced. We implement the different phases of Participatory Design methodology using a four stage process: (a) Building bridges with the intended users, (b) Map user needs and suggestions to the system, (c) Develop a prototype, (d) Integrate feedback and continue the iteration. Our participatory design methodology was carried out by following the Distributed Constructionism pedagogical theory, and took advantage of the online and distributed nature of the student community to asynchronously design, implement and study the course. We conclude that the online discussion board can promote student collaboration and the identification of the key community users who can participated productively in Participation Design activities.

### **1.1 Participatory design**

Participatory design (PD) (often termed the "Scandinavian Challenge" (Bjerknes et al, 1987)) refers to a design approach that focuses on the intended user of the service or product, and advocates the active involvement of users throughout the design process. User involvement is seen as critical both because users are the experts in the work practices supported by these technologies and because users ultimately will be the ones creating new practices in response to new technologies (Ellis et al, 1998).

Blomberg and Henderson (1990) characterize the PD approach as advocating three tenets:

- The goal is to improve the quality of life.
- The orientation is collaborative.
- The process is iterative.

### **1.2 Distributed Constructionism**

Distributed Constructionism (Resnick, 1996) extends the Constructionism theory (Papert, 1991; Papert 1993) to knowledge building communities, where the online learning community (instead of one student) collaboratively constructs knowledge artifacts (Resnick, 1996). The three major activities of DC, within the context of an online learning community are (Resnick, 1996):

1. Discussing Constructions: Students discuss their constructions during the design, implementation, evaluation and reiteration phases
2. Sharing Constructions: Web based systems allow students to share their constructions and make them part of the shared knowledge.
3. Collaborating on Constructions: The community can use online communication, to collaborate on the design and development of the knowledge artifacts.

The iterative structure of our Participatory Design approach enhanced Distributed Constructionism among the users of the system. The knowledge artifacts contributed to the course, enhanced both the learning experience of the users and the content and functionality of the course itself.

This paper is structured around three main sections. First, our PD design approach is presented and its linkage to the Distributed Constructionism pedagogical theory specified, then the results of a user-centered evaluation of the course are put forward and the paper ends with a set of conclusions and suggestions for directions for future research.

## **2. Design Approach**

Our focus has been to design an online learning community around a Computer Aided Language Learning (CALL) course. We believe that online interaction and community would increase users' motivation, commitment and satisfaction with the online course. The Participatory Design methodology blends nicely with our goal. In particular, involving users during system development is thought to lead to greater user commitment, acceptance, usage, and satisfaction with the system (Baroudi, et al, 1986).

In the design phase of the on-line course, we implemented PD as a four-step process (Ellis et al, 1998).

### **2.1 Building bridges with the intended users:**

This step opened lines of communication between intended users and the development team. Specifically, this step involved the initialization of a multidisciplinary development team, identifying key groups of end users, and creating new methods of communication with users.

The development team in this project came out of the Kypros-Net (Kypros-Net Inc, 2002) group. Through their involvement in Cyprus and Greece related projects, they had longstanding relations with the intended user community.

The intended users have been especially people of the Greek Diaspora, travelers to Cyprus and Greece and other Greek speaking areas and people who are generally interested in the Greek culture and language or languages in general. In our case, bridges with the intended users were built through our years of work at providing information about Cyprus through the web pages of Kypros-Net who primarily attracts the same user population as our intended Greek language online course.

### **2.2 Mapping user needs and suggestions to the system:**

Our conceptual design model has been "to design an effective online Greek language course that can build and sustain an online learning community of students".

Based on the questions and inquiries we received from our users we tried to match their needs (they wanted an easy to follow, both elementary and advanced course that they could attend at their own pace) with our conceptual design model.

### **2.3 Developing a prototype:**

The project consists of 105 audio files, which were originally recorded as Radio lessons in Modern Greek for English speakers in the 1960's. The lessons were retrieved

from the archives of the Cyprus Broadcasting Corporation, digitized in Real Audio 5.0 format and published online through the course. Although, an optional textbook accompanied the original Radio lessons, the online lessons were designed as a complete standalone course. We used several tools to assist students with the lessons, including an online English-Greek-English dictionary, a Greek spell checker and a web-based discussion board. The discussion boards served as the foundation for creating a community of online students and enhanced the learning experience with Distributed Constructionism.

#### **2.4 Integrating feedback and continuing the cycle:**

Feedback from our users and suggestions are continuously incorporated into our design through a series of additions and corrections. For example, we were asked to add an online notes section and to encode some files again because they were corrupted.

An important element in the participatory design methodology is the direct involvement of the users in all stages of the design process. We kept the users involved by participating in the discussion boards, and sharing with them design and development plans for the course.

### **3. Course Evolution with Distributed Constructionism**

The students of the audio courses included people with no knowledge of Greek language, bilingual members of the Greek Diaspora, as well as high-school professors of non-Greek language. These students created an open online community whose collaboration has boosted the learning experience of the whole community. The web-based discussion board has proven to be the most constructive tool for the students learning experience and the main source of feedback for the maintainers of the project. The experiences shared on the discussion board included tricks and tips on how to record the audio files, installation of Greek fonts, learning methodologies and questions about the Greek language itself that arise from the lessons. The experienced users (some of them were retired teachers of foreign languages) had taken a lead role in the vast majority of the threads on the discussion board, answering most of the questions and encouraging the beginners to study the lessons further. They have also become the communication interface between the maintainers of the project and the community's requests.

At some point, the users started exchanging, through email, written notes taken by the experienced users. They also used the discussion board to announce the availability of their personal notes. This behavior suggests that we must provide (and we did) the users with the capability to post their notes on the project's site.

The students had initiated Distributed Constructionism themselves. The course designers only provided technical support to facilitate the students' construction activities.

#### **3.1 Discussing the Constructions**

The course designers offered to provide publishing access to the online course to whoever wanted to contribute their material. Five users, asked to be given access. Consequently, the five users with the two course designers constituted the Participatory Design team. The PD team solicited contributions from the user community. The users

suggested that they should transcribe the audio lessons, and compile verb lists, vocabulary lists, and grammatical notes for each lesson.

### **3.2 Sharing the Constructions**

All the user contributions were shared in the common area of the online course. The users members of the PD team regularly posted notices on the discussion board about new material for the course. Also other less active users chose to offer contributions for the course, by posting on the discussion board, rather than contacting the PD team.

### **3.3 Collaborating on the Constructions**

The user members of the PD team did not include any native speakers of Greek. They were all learning the language through the online course, and at that stage, they were primarily depended on the audio lessons. In order to ensure the quality of the new material before publishing them on the course website, the user members of the PD team implemented a peer review process. A group of 7 users, that included the five central user PD team members, reviewed and corrected all the material before posting them on the website. Each of the 7 users offered to transcribe a number of the 105 Audio lessons, and two of them also offered to provide verb and vocabulary lists. However, all materials were posted in a private area first, reviewed by the 7 user members of the PD team, and posted on the website, when the five PD users were satisfied with the quality. Then the 2 PD course designers, who were both native Greek speakers, would go over the already published material, and make sure that it is correct. Most of the mistakes we had to correct were spelling mistakes, and we rarely had to correct grammatical mistakes.

Two months after the Distributed Constructionism effort started, students of the audio lessons managed to transcribe 81 out of the 105 lessons, correct them through the peer review process among themselves and post them on the project's website. Six months later, the students had transcribed and peer reviewed all 105 lessons.

The knowledge constructed attracted significant user attention. As we can see from Figure 1, the accesses to the audio lessons, the language tools, and the total access of the message board and the notes pages, all kept increasing exponentially. However, once we allowed our users to publish their own notes, there was a dramatic shift of traffic from the message board to the notes pages. In our view this is due to the fact that the users did not need any more to visit the discussion board to find out where other users had posted their notes. All the content was already aggregated and organized in a central location.

The course's popularity is apparent from the fact that the course currently has over 20,000 registered students who actively participate in an online community which evolved around the course.

## **4. User-Centered Evaluation Methodology**

To further assess the success of our methodology, a series of user evaluation techniques were employed.

Many aspects of usability can best be studied by simply asking the users. This is especially true for issues related to the users' subjective satisfaction and possible anxieties (Nielsen, 1993).

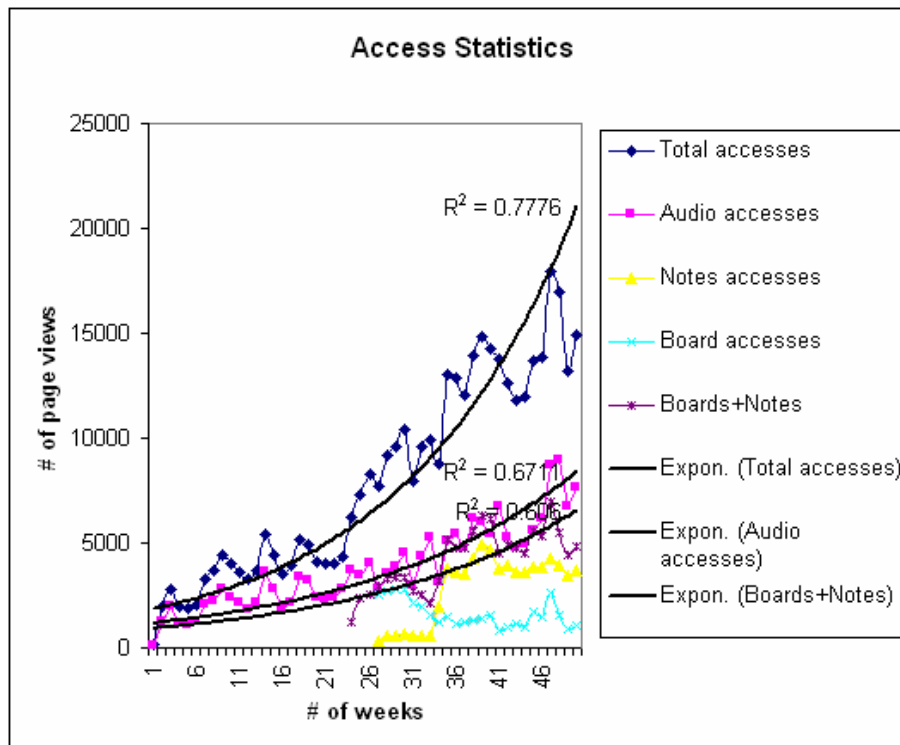


Figure 1 Access Statistics for Greek-Online site.

Since the course is highly dependent on user participation, the design team has taken steps in collecting and analyzing user feedback. Evaluation of the course has been from the beginning an integral part of our Participatory Design implementation. First, a questionnaire was provided for collecting feedback about the general usability of the course. Secondly a discussion board was created where users could post their questions and comments and finally an email address was provided through which users could contact the design team.

#### 4.1 Questionnaire and Discussion Board postings Evaluation

One hundred and eighty one students, taking the online 'Learn Greek Online' course in its first year of implementation, responded to an online questionnaire assessing the overall usability of the course. The questionnaire was based on the Computer System Usability Questionnaire (CSUQ) and was administered through the web-based user interface evaluation with questionnaires system provided online by (Perlman, 1999)

CSUQ consists of nineteen usability questions to which the respondent was to agree or disagree on a five point scale, ranging from 2 (Agree) to -2 (Disagree).

Table 1 shows the overall ratings for the online course for the nineteen questions. A graphical representation of the results is provided in Figure 2. Next the responses to all questions were combined together and the average overall ratings was plotted in Figure 3.

In addition to the questionnaire, we analyzed a total of 371 postings (posted online to the discussion board from December 1998 to March 2000).

After a first careful reading of the 371 postings, five main categories were identified: (1) Technical related questions and instructions related to technical questions, (2) Content related issues, like spelling, grammar and syntax, (3) Resources and Notes related postings, (4) Miscellaneous.

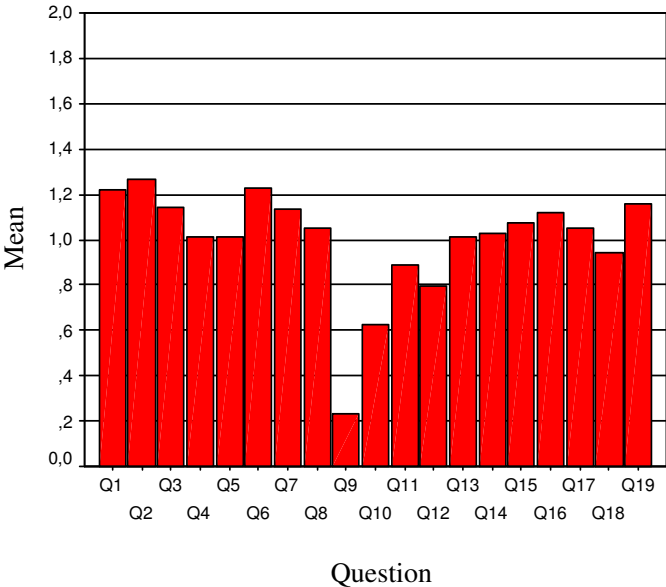


Figure 2 Mean user ratings for the 19 questions

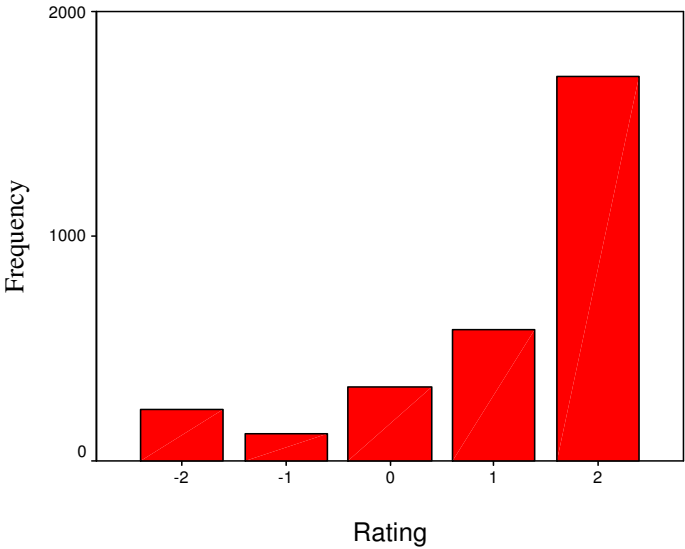


Figure 3 Overall Usability Ratings for the course

Then we conducted a more elaborate study and further categorization was performed looking into nine subcategories of the four main categories based on the technical actions necessary to improve on each one of the categories. Table 3 shows the frequency of postings for each subcategory.

In addition to the nineteen questions, users were also encouraged to provide feedback by listing, up to three, of the most positive and, up to three, of the most negative aspects of the online course.

#### 4.2 Analysis of Server Logs

The data described below are taken from the cumulative log file record, a 590-megabyte corpus, for a 30-month period from July 19, 1998, when the learn Greek online project was officially “launched,” through December 31, 2000.

These logs, in the extended log file format, keep track of who was visiting the site (unique internet addresses), when they visited the site, what they requested, how long they looked at each page, where they were before they came to the site, what browser they were using, what country they were from, and more. Log files were analyzed using wusage (<http://www.wusage.com>).

Table 3 represents the overall access statistics for the 30-month period.

Table 1 Mean user ratings with standard deviation in parenthesis

	<b>Question</b>	<b>Rating</b>
Q1	Overall, I am satisfied with how easy it is to use this online course.	1.40 (1.14)
Q2	It was simple to use this online course.	1.40 (1.13)
Q3	I can effectively complete my work using this online course.	1.20 (1.22)
Q4	I am able to complete my work quickly using this online course.	1.05 (1.27)
Q5	I am able to efficiently complete my work using this online course.	1.10 (1.24)
Q6	I feel comfortable using this online course.	1.49 (1.07)
Q7	It was easy to learn to use this online course.	1.37 (1.15)
Q8	I believe I became productive quickly using this online course.	1.19 (1.17)
Q9	The online course gives error messages that clearly tell me how to fix problems.	0.13 (1.60)
Q10	Whenever I make a mistake using the online course, I recover easily and quickly.	0.81 (1.29)
Q11	The information (such as help, on screen messages and other documentation) provided with this online course is clear.	0.89 (1.34)
Q12	It is easy to find the information I needed.	0.83 (1.37)
Q13	The information provided for the online course is easy to understand.	1.24 (1.07)
Q14	The information is effective in helping me complete the tasks and scenarios.	1.19 (1.06)
Q15	The organization of information on the online	1.20 (1.23)



	course screens is clear.	
Q16	The interface of this online course is pleasant.	1.30 (1.12)
Q17	I like using the interface of this online course.	1.23 (1.17)
Q18	This online course has all the functions and capabilities I expect it to have.	0.99 (1.30)
Q19	Overall, I am satisfied with this online course.	1.40 (1.06)

### 4.3 Site Traffic

Traffic to the site peaked following the addition of each new item and any publicity campaign, then tapered off considerably during the late spring and early summer, probably in correspondence with the academic calendar, and then picked up and resumed at about 1378 user sessions per day, (User sessions are defined as a sequence of HTTP requests from a unique user, as determined by internet protocol address. Sessions are considered to have terminated if there are no requests for a 30-minute period.) During the 30-month period, there were an estimated 1,256,770 user sessions, lasting an average of 0.47 minutes with the longest lasting 174 minutes. Sessions were split roughly equally between daytime (8:00 a.m. – 6:00 p.m., user’s local time) and evenings (6:00p.m. – 8:00a.m., user’s local time). There were 46.7% of sessions in the daytime and 53.3% in the evenings.

Table 2 Frequency of postings per subcategory of usability issues.

Category	Subject	N	%
Tech/Instructions	Problems with needing/installing Greek drivers and fonts	56	15.1
	Problem with/wanting to download lessons	49	13.2
	Problems with installing/using RealPlayer	40	10.8
Content	Questions about vocabulary	28	7.5
	Questions about grammar/spelling	17	4.6
	Questions about dialect	2	0.5
Resources	Questions about availability of text, CDs or including links to web sites.	37	10.0
Notes related questions	On-line notes	73	19.7
Miscellaneous	Miscellaneous	69	18.6

Table 3 Access statistics for the course: July 19, 1988 to December 31, 2000

Total number of successful hits	3,704,104
Total number of user sessions (visits)	1,256,770
Distinct Users	900,481
Average hits per day	4061
Average user sessions per day	1378
Average user session length	0.47 minutes
Average number of documents examined per user	2.55

#### 4.4 Requests for Site Features

With respect to features of the site that were accessed, 25.61% of the hits were caused from accesses to the Greek-English-Greek dictionary associated with the course indicating a substantial usage of this tool by the students of this course or even by visitors that are not regular users of the rest of the items of the online course, this is further supported by the fact that over 40% of users entered the site through the dictionary section. The main course page attracted 13.71% of the accesses. From the individual audio lessons, it can be observed that lesson one runs high (6.43%) whereas the rest of the lessons received accesses below 1% of the total, this shows to us that a lot of visitors to the Kypros-Net website show interest in investigating the course (by listening for a few minutes to the first audio file) although they might not be interested in taking the course (for example they might already know enough Greek or they might be interested to know that such a course exists but they don't have time to learn Greek right now etc.)

#### 4.5 Referrer Log Entries

Analysis of the referrer log data suggests that most of the traffic that did not come as a direct result of one of the links on the Kypros-Net other pages arrived at the course website from a net guide or a search engine. For instance, more than 130,000 accesses came from yahoo, 13,962 from msn, 13,346 from altavista and 8,551 from google. The keywords that most frequently brought visitors to the site were "greek dictionary", "greek language" and "greek translation" again showing a high popularity for the dictionary of the course.

### 5. Conclusions

We enhance the learning experience in our (web-based training) WBT by facilitating Distributed Constructionism in the iteration phase of a Participatory Design methodology. Questionnaire evaluation shows that the end system received high usability ratings from the users. Therefore Distributed Constructionism enhanced the learning experience of both the PD team, and the more passive users.

The students that participated actively in the design of the course also played a central role in the discussion board answering other students' language questions, helping out students to overcome technical problems and helping them to find other resources to enhance their learning of the Greek language. These observations are with agreement with

the underlying goals of Participatory Design which was an integral part of the development of this specific course.

Furthermore, the results of the analysis of the user questionnaire and the server logs shows that the final product (the course) meets to a very big extend the expectations and needs of the whole user population of this specific course. We believe that the direct involvement of the users in the development of the course helped in designing a more usable course that enhanced the learning of our users and provided them with a enjoyable and rewarding experience.

Future work on this project will focus on a non-virtual, face-to-face participatory design team. Like the previous PD team, key stakeholders (teachers of Greek in the diaspora, students, administrators and designers) will work together, participating and interacting throughout the whole iterative design process. They will once again collaborate on the content and functionality development, peer review and publish content contributions.

We believe that by encouraging the active involvement of the users, the product developed will be more enjoyable, more usable and most importantly, more catered to their specific needs and requirements.

Also we anticipate that the expected benefit of this face-to-face PD team versus the virtual PD team will be that everyone involved will feel more like a team and have a stronger relationship with each other. Since the PD team will be a face-to-face one, communication will be better and there will be fewer misunderstandings or misinterpretations, and finally the collaboration results should be more immediate, and the final product more usable and acceptable by all the stakeholders.

## **6. Acknowledgements**

We want to express our gratitude to our students who devoted valuable time in helping with the development of this course. Without their help this project would have never achieved the success it did.

Finally, we thank the Cyprus Broadcasting Corporation who kindly made the audio files used at the beginning of the development of this course available to us.

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