

## Computer Learning of Small Math Using MATΣMATX in English Class

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**An increasing trend of computer use at primary school level has caused changes in the learning style, using dynamic hybrid model including multimedia learning through a play and as a supplement to the classical teaching approach. For this purpose, a simple web-based application has been created, called MATΣMATX, for children (7 to 9 years) in their study of basic mathematical principles (numbers up to 20, mathematical operations of addition and subtraction) for four language skills in English teaching class. A study was carried out on two test groups, trying to determine the potential usefulness of such a computer programme in the everyday teaching environment. The results of the study are presented in this paper.**

**Key words:** CALL, hybrid learning model, young learners

### I. INTRODUCTION

Globalisation – a process by which people of the world are unified into a single society through a combination of economic, technological, social and cultural and political forces – as well as the continuous development of computer technologies in the past two decades have led to an ever increasing interest in foreign language acquisition as well as a noticeable integration of computers into all aspects of everyday life (at home, workplace, school, on the road...).

According Communication from the Commission regarding promotion of language learning and linguistic diversity, ref. [3] language learning and improving of cognitive skills contribute to develop knowledge-based society. It is primarily responsibility of the member states authorities to implement language learning and to develop education policies.

The increased interest in foreign languages is closely tied to the increase in computer use. In absence of a localized version of a programme or operating system, a large number of users are forced to work on a computer in a non native language (most often English or German). In an effort to more easily understand their working environment a certain, high percentage of users, enrol in a language course.

Unfortunately the increase in potential of students has not resulted in a proportional increase of foreign language teachers.

Traditional teaching methods are slowly being modernized and adapted to the specific needs of the information driven society primarily through various

attempts to integrate computers and multimedia in the everyday classroom.

The development of information technology makes it possible for teachers without any previous programming training or skills to develop simple multimedia programmes for use in their courses. Multimedia, the Internet and the World Wide Web make communication between teachers much easier and make a better collaboration in development of new teaching methods, exchange of teaching materials, programs, and publications possible - with instantaneous access to authentic materials such as videos and sound files.

Taking into consideration the need for computer and simplified software application in classroom at an early age (first grade of elementary school and onwards), when study through play is still the basic way of knowledge acquisition, a programme – MATΣMATX – has been developed to research the practicality and viability of such a teaching approach. It is intended for use as an aid in small math revision participating in first year English (as foreign language) course. The programme is also used for testing the student's visual perception, listening, reading and writing skills. It is comprised of eight exercises which help the teacher determine the level and speed of knowledge acquisition – of both English language and mathematics. The programme is based on the communicative approach to language teaching (CLT) which puts emphasis on interaction as the key to language acquisition.

Mathematics was chosen as the core subject due to its under-representation in the current CALL (Computer Assisted Language Learning) software available to Croatian students.

### II. MATΣMATX

#### 2.1 About the programme

MATΣMATX is a CALL programme intended for use as an aid in small math revision (numbers 1 to 20, basic mathematical operations of adding and subtracting) for second grade students - aged seven to eight - participating in first year English course.

In accordance with the age of the students and the knowledge of English (Common European Framework A2) instructions in Croatian are available in the case of any trouble with understanding English. These instructions are

not immediately visible and in no way impair the language acquisition.

Prerequisites for MATΣMATX use are:

- a) basic vocabulary – mathematical terms
- b) understanding of basic mathematical concepts – mathematical operations, odd and even numbers
- c) basic literacy skills – reading and writing
- d) listening comprehension
- e) basic computer operations – use of mouse and keyboard

## 2.2 Technical details



Figure 1. MATΣMATX interface – main screen

The programme has been written in the form of a web page in order to be compatible with the largest possible number of operating systems. It is based on two wide spread technologies – the Hypertext Markup Language (HTML) used primarily for interface structures and JavaScript, responsible for the execution of the mathematical code. Graphic elements – background images and animations were created for the programme using JPEG and GIF compression in order to speed up the loading and make the programme usable even on older computers. Sound files – the numbers – were taken directly from the Internet (files are freely available for public, non profit use).

MATΣMATX has been tested on the following operating systems: MS Windows XP (Home i Pro distributions), MS Windows 98SE, Apple MacOS X i Knoppix Linux distribution. It works best on Windows operating system with Internet Explorer 6 and 7. Due to partial JavaScript incompatibility with Mozilla Firefox and Apple Safari – certain programme elements are not available to users exclusively using these browsers (ActiveX scripts used in media reproduction – primarily sounds).

## 2.3. Pedagogical application

MATΣMATX is, due to the nature of mathematics and widely accepted knowledge acquisition methods in the subject, based on the behaviouristic language teaching model which accepts the “drill and practice” method as the core revision technique. The programme attempts to break away from the monotony that such revision might cause through use of various media in the exercises – sound,

images and various colours and shapes representing the numerals.

Nevertheless, we attempted to respect to move through all phases during the course, such as exposition, establishing comprehension, querying, recognition, manipulation, production and extrapolation to new circumstances, ref. [2].

The teaching of math in basics in English is based on the practice of the four language skills:

- listening,
- reading,
- writing and
- speaking

throughout exercises including counting out loud, connecting the audio and visual representations of a numeral with the textual representations and spelling practice. It is essential that the student understand all the concepts in order to be able to start solving the basic math problems and the more difficult exercises later on. With this in mind, a revision table connecting all four skills has been included in the programme. Hovering with the mouse pointer over a table field with a certain numeral in, it allows the user to see the graphical representation of the number, the spelling of that number, and upon a click – to hear how that number is pronounced.

The exercises are divided into four groups according to difficulty:

- comprehension checks
- exercises with numerals
- exercises with words / spelling checks
- listening comprehension

Spelling exercises complement the listening with comprehension exercises.

The programme contains a number of “help elements” – aimed to ease the revision. These include the clearly visible elements - revision table on the starting pane and the instruction screen for the odd and even numbers exercise. There are the less apparent elements – such as shapes and colours denoting the numbers, intended to make the odd/even distinction clearer to the student throughout the programme.

## 2.4. Exercises

Upon completion of each exercise the student is given feedback on the accuracy of the submitted answer in the form of an animated character followed by a sound byte indicating whether the answer was correct or false.

### 2.4.1. Comprehension

An exercise used to check if the student correctly connects the numerical concepts – the computer randomly chooses a number (between 1 and 20) – the numeral is displayed on the screen – the student is expected to be able to type in the number in the provided field – only correctly spelled answers are accepted by the computer.

Odd and even numbers – the student, after a brief explanation of the terminology, is expected to be able to differentiate between odd and even numbers. The computer

randomly chooses a number (between 1 and 20) – the student has to decide which of the two offered solutions is the correct one by clicking on one of the fields on the screen (ODD or EVEN).

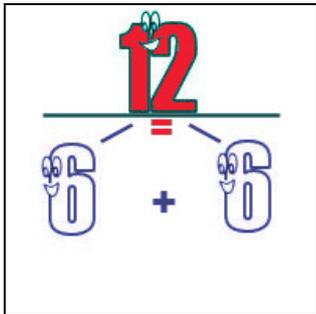


Figure 2. Help element – Even numbers revision

#### 2.4.2. Exercises with numerals

This type of exercises most closely resembles the traditional mathematical exercises:

- ADDITION – the computer randomly chooses two numbers (between 1 and 20 taking into consideration that the answer cannot be a number above 20) and displays them on the screen separated with a plus symbol. The student enters the answer into the provided box using numerals.

- SUBTRACTION - the computer randomly chooses two numbers (between 1 and 20 taking into consideration that the answer cannot be a number below 1) and displays them on the screen separated with a minus symbol. The student enters the answer into the provided box using numerals.

#### 2.4.3. Exercises with words/spelling and listening comprehension check

– ADDITION 2 – the computer randomly chooses two numbers (between 1 and 20 taking into consideration that the answer cannot be a number above 20) and displays them on the screen using graphical representations (for example - four apples and six pears) separated with a plus symbol. The student types the answer in the provided field – only correctly spelled answers are accepted by the computer.

- SUBTRACTION 2 - the computer randomly chooses two numbers (between 1 and 20 taking into consideration that the answer cannot be a number below 1) and displays them as words on the screen separated with a minus symbol. The student types the answer in the provided field – only correctly spelled answers are accepted by the computer.

– LISTENING – the computer randomly chooses a number – a “click to listen” icon appears on the screen. Once the student clicks on the icon with the mouse pointer the computer reads out loud a number. The student types the number into the provided field – only correctly spelled answers are accepted by the computer.

#### 2.4.4. Learning through play

The last exercise is hidden within a puzzle game – a three by three grid is displayed on the screen with 8 fields filled with numerals (1 to 8) in scrambled order. The student uses the mouse pointer to move the numerals around to get them in sequential order ranging from the smallest to the highest number. Once all the numbers are in the correct places the computer displays the number of moves used to solve the puzzle.

There is no limit on the number of attempts to get the correct answer in any of the exercises. Students are, in case of a wrong answer, encouraged to try solving the exercise again.

### III. STUDY

A study was carried out to determine the viability of using a simple programme such as MATEMATX as a teaching aid in English as foreign language classes with young learners.

Two test groups partook in the study, which was carried out at a private language school. The students were aged seven and eight, attending second grade of elementary school and were first year English students (students attending second grade were chosen to participate as they are most likely to find revision of small maths lessons useful).

The two groups were tested independently from one another. The same teachers took part in both tests. The same written test was used for both groups.

The first group carried out the revision tasks through the traditional approach (blackboard, cue cards, playing cards, rhymes and audio recording). The teacher first wrote all of the twenty numbers on the board introducing and explaining the spelling rules for numbers above number ten. Students then took part in reading and speaking practice. Each student was given a playing card and a cue card with a number they had to present to the rest of the class on the blackboard – they had to write down the numeral and spell the word. All the students took part in eventual corrections. Cue cards were later used to make pairs on the board for addition exercise which was again a group effort. Spelling, reading and writing were once again revised. After the final revision students were given the tests.

The second group carried out the revision tasks through the MATEMATX programme installed on the two computers in the classroom. The teacher first wrote all of the twenty numbers on the board introducing and explaining the spelling rules for numbers above number ten. The students were assigned to groups of four; each group was aided by a teacher in the revision as they tried to solve all types of questions available. The students were allowed the same amount of time as the first group for revision. Once the allotted time ran out they were asked to fill in the written test.

The written test was comprised of four exercises.

1. listening – students had to cross out the numbers they had heard on the tape
2. listening/writing/spelling – students had to write down the numbers they had heard on the tape –

the first letter and the correct number of spaces were provided

3. comprehension check – addition – one question with numerals and one with words – the answers were to be written down using numerals
4. comprehension/writing/spelling check – subtraction – students were given two word questions - the answers were to be written down in the textboxes provided

During the period of learning and repetition, we have tried to respect the model relying on Krashen's idea, articulating what makes comprehensible input and how to develop learner's linguistic knowledge, ref. [1], including:

- Input, i.e. target language to which the learner is exposed
- Apperception meaning noticing the input of the target language
- Comprehension suggesting understanding of the semantic content of a message which can be without syntactic knowledge or
- Intake implying syntactic and semantic processing
- Integration into the learner's linguistic system comprising holding the intake in short term memory to develop linguistic system in L2
- Output through oral or written communication

Upon completing the test the students were asked to fill in a test assessment questionnaire. Each exercise could be graded according to difficulty as easy (☺), moderately difficult (☹) or difficult (⊖). The final grade was given to the test as a whole.

#### IV. RESULTS OF THE STUDY

The test scores showed certain discrepancies between the two groups of students. Whilst the second group (hybrid approach) showed greater interest in the lesson the first group of students (traditional approach) scored overall better. They had higher scores in the listening writing / spelling exercises and comprehension tasks. Both groups performed equally well in general comprehension and speaking.

Table 1. Test scores overview

Task	Traditional		Hybrid		Grade	
	Corr.	False	Corr.	False		
Listening	7	1	6	2	7	8
List./Writ.	8		8		8	5
Gen. Compr.	8		8		8	8
Read./Writ.	7	1	7	1	8	8
Speaking	8		8		8	8
Overall						8/8

The first group performed better in tasks that were directly related to knowledge acquisition. It would appear that students absorb new facts faster in direct teacher-student contact. The second group performed revision tasks faster – a computer makes it possible for a student to adjust

the revision speed and time to their personal preference. They in turn also turned in their tests faster than the first group. The individual approach has one more benefit, it encourages the student to try and find the correct answer without the stress of peer pressure present in regular class.

#### V. CONCLUSION

The undeniable advancements in technologies used for educational purposes have, in many ways, improved the traditional language teaching methods. Teachers can more easily find teaching materials and have access to various online multimedia sources which make it possible to improve the, sometimes dull, course materials. The Internet also makes it possible for teachers to communicate with their geographically distant colleagues and collaborate in joint projects aimed at producing new teaching techniques as well as CALL software.

CALL in turn has made possible advancements such as distant learning and made it possible for students to adjust the speed of knowledge acquisition to their personal preference.

In terms of usefulness, CALL software such as MATΣMATX has been proven to be a good revision aid in individual student approach. It can be adjusted to individuals learning style with little or no change needed to original programming. This allows for faster revision as proven by the second group of students.

However, CALL programmes do not seem to be the ideal means to imprint new skills and knowledge on the student. Even with extra hints and instructions, it would seem that the students take longer to absorb new information. Students simply react better in human to human contact. MATΣMATX study confirmed this hypothesis through the listening and writing exercise. Students in traditional class, who did all their revision with the teacher, did better than their colleagues in the hybrid class.

The second disadvantage of current CALL software is directly tied to current technological progress. At the present there are no sufficiently developed AI (artificial intelligence) systems that would make it possible to tie in the error checking system with a strong error analysis database that would allow for an instantaneous and hundred percent accurate feedback systems that would literally allow the students to learn from their mistakes. This role is, for the foreseeable future, reserved for the "real" teacher.

The third problem in software development stems from the lack of communication between software manufacturers and their future users, teachers and their students. Most programmes are made by people with little or no background in education, which results in software with a large quantity of unusable modules that do not make best of their potential. Hopefully this problem can and will be resolved in the not so distant future.

Overall CALL programmes have great future in the educational system once the technological and development issues are overcome. While it may not, nor arguably ever should replace the teacher in the classroom, it can provide a significant aid in the teaching process.

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