Efficient language teaching software in a multimedia context

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Abstract. In this article I deal with the efficiency of multimedia teaching programs, analyzing possibilities for their improvement in the field of language teaching. This research has been carried out with the use of the latest technologies, language teaching software, internet based language teaching applications, digital dictionaries, online content, and the latest results from the field of computational linguistics. The goal of my research is to create a general model that serves and supports various kinds of approaches to improving efficiency; I cannot attempt to present a complete, detailed analytical review due to the complexity and size of this topic. However, my opinion is that by considering and understanding the theoretical aspects of the subject, and supported by certain important ideas, we will be able to achieve remarkable improvements in the field of learning efficiency and knowledge retention in the language teaching and learning process that might lead to outstanding results.

Key words and phrases: multimedia, e-learning, language teaching software, efficiency improvement.

ZDM Subject Classification: B60, U10, U50, U80.

1. Overview

As a general tendency it is noticeable that computer sciences, through the use of information technology tools, are acquiring an increasingly significant role in our everyday life. In the 1980s and '90s personal computers became popular in Hungary as well, a process which was followed by the explosive spread of mobile

phones. In parallel with this new information technology development, the internet also filtered into workplaces, teaching institutions and our homes. Nowadays it has become natural that the internet is accessible almost everywhere, and wirelessly too. Mobile phones have become online, interactive, multimedia devices which are even more multi-faceted than our computers at home, due to their various built-in sensors, electronic devices and radio communication platforms. Obviously, this development does not stop here. The internet network strives to reach us in all possible ways. The first 'smart' televisions have just appeared on the market (2011), complete with access to the internet and equipped with several services, straining to establish themselves as the new, 'multimedia center of the home' [9]. In 2012 most mid-category televisions already possess this feature; and prices are now lower, which leads to the beginning of their rapid adoption by the general public.

The devices mentioned above, enabling the world-wide, rapid and unlimited availability of information, have modified traditional teaching, pedagogical and didactical options as well. Looking back over thousands of years of history, there has been no other explosive technological development in any way comparable to what has been happening over the last few decades. Would we be able to use these technological advances effectively in the field of education? Do we use these tools appropriately and effectively? Are we aware of the possibilities with which we might make the difficult and deeply-analyzed process of knowledge transfer and retention simpler, faster, more permanent, or, in a word, more effective? What accessories, exercises or forms of application should be used to reach a certain goal?

It is not easy to find the answers to these questions; moreover, it is impossible without familiarity with particular cases and circumstances. We need an exact description or a refinement of the goals we intend to achieve. At the same time we have to face the issue of interdisciplinarity, since whenever we choose to apply a form of computer aided teaching, it is essential to have some computational skills.

2. The internal structure of teaching software

2.1. The schematic design of language teaching systems

Figure 1 shows the schematic structure of a typical piece of teaching software. The student is at one of the input points and in an ideal situation he/she has

motivation, diligence and a determination to study. He/she enters the system - the system is like a 'black box' - and after a while leaves it, preferably with the desired results; i.e. the capability to communicate as an individual. The teaching system in this situation is a computer aided system, but the traditional method of teaching follows the same, or a very similar, process.
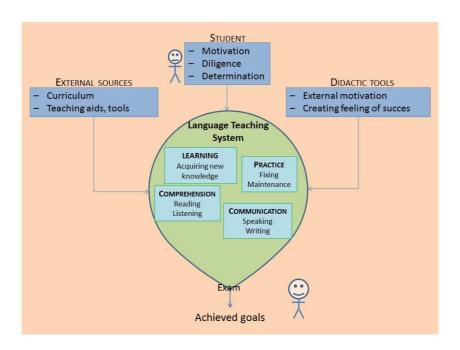

Figure 1. The schematic structure of language teaching software

To make the system work, additional materials are needed, for example the curriculum, other teaching aids, external motivation, and a very important element: the feeling of success. These inputs - like fuel for a machine - make the process smoother and more fruitful, and help the student to overcome problematic phases, giving more motivation to reach the desired results. Within the system the various channels have to be permeable from everywhere to everywhere and the program has to offer the option of going back. The 'exam' is positioned either at the output, or inside the system but close to the output, which is a way of measuring success; it is an important tool for demonstrating the existence of knowledge, but is not always necessary.

In my opinion, we cannot completely do without the presence of the teacher, not even in a language teaching system which is highly rated and believed to be effective. Although in certain situations and processes the teacher is indispensable, in other cases when the teacher cannot be there, he/she can be partially replaceable (remote teaching). We can state, however, that with the use of these systems, the role of the teacher changes and the 'tutor' becomes more and more of a 'mentor' [6].

As technology develops, institutions come up with new solutions for teacher substitution, for example the efforts towards virtualization. However, these virtual teachers imitate real attitudes and gestures; in sum, all the behavioral patterns of a live person. To mention an example, the practice of pronunciation cannot be replaced by computers without difficulties. Applications aiming to support this activity appeared long ago, but the real teacher's sophisticated listening skills and capacity for situation-specific, appropriate correction cannot be applied by any system. Not to mention the level of development of machine translation. The artificial intelligence of these translating programs is not high enough to pass the Turing-test [11]. (Questions put by an individual are answered both by a computer and another person; the computer passes the test if the person who asks cannot tell even after a long time or many exercises which replies came from the computer and which answers came from the person.) Because of the complexity of natural languages and the context-dependency of thought, there are many cases where even the basic idea gets lost through a machine translation, not to mention the meaning between the lines.
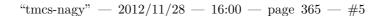
2.2. Characteristics of language teaching software

Following this introduction I would like to narrow the topic down somewhat and list the characteristics of a good language teaching software program. These concepts are not axioms, nor are they the only way of describing a system, but all of them together - with a suitable approach - create a useful group of properties. I would emphasize the following elements:

- Functionality
- Reliability
- Usability
- Efficiency
- Maintainability
- Portability

2.2.1. Functionality

Functionality in this context means the ability to complete the expected (pre-programmed) tasks; the expectation is for the system to be capable of achieving at least as much as the traditional method, so teaching with computers should be at least as effective as it would be with the traditional method. Moreover, the effort invested in the use of the system should yield results, and from some perspective, we should achieve more than we could without the system.

2.2.2. Reliability

Reliability is a qualitative factor enabling the problem - and error - free usage of the software.

2.2.3. Usability

An application is usable, if the target audience can use it to work on the tasks the system was created for.

2.2.4. Efficiency

The efficiency of a system is related to several factors; the transmission and retention of knowledge would be the most important measurement of this criterion. Efficiency, according to this concept, is the relation between the result produced during a certain activity, and the resources used to produce it [2]. We may look at this relationship from two perspectives; to reach the goal with the least effort, or to reach the best possible goal with the same effort.

2.2.5. Maintainability

The maintenance of the program would be considered appropriate if those who use or maintain the program are able to perform the necessary service tasks themselves; for example saving data and downloading updates, etc.

2.2.6. Portability

Regarding portability - the most fashionable and popular feature today -, the more platforms the applications can run on, the better, as more platforms mean more potential users; thus it can reach the same user from several directions.

These factors as characteristics of a good system are basic concepts that may seem obvious to everybody, but together they describe the requirements of

a modern system. The presence or the increase of any of them improves the efficiency of the system.

As was mentioned earlier, the productivity of a system may be best connected to its efficiency. Efficiency here is the most general concept, since if we are able to improve the program significantly from any of these perspectives, it will be more productive and so our effort will increase its efficiency.

Finally, let us consider in detail in what areas and with what methods we can increase efficiency.

3. A model of factors improving efficiency in multimedia language teaching systems

The deeper I searched for different ways of increasing the efficiency of a language teaching application the more I felt the need to create a general model which would clearly show the relation between the various factors. It would be a theoretical model that aims to provide a framework, and to be systematic, where the structure could be broken down into sub-structures and would help to estimate efficiency both when building a new system and when choosing the most suitable from already existing ones.

This model is a hierarchy-based presentation, where the bottom represents technology, the middle levels show methodology - as an organizing theory for curriculum building, - and the upper levels describe the structure of the content. (Figure 2)

3.1. The basic elements of the model

In general we may conclude that if we intend to achieve increased efficiency in a language teaching program, we have to examine:

- With what tool:
    - the possibilities provided by a certain technological system
- How:
    - the expectation and requirements of the present context and circumstances
- What:
    - the up-to-date structure of the content which is appropriate in itself, and which also fulfills the previous two conditions.

Of the above three ideas, the second may be the one requiring some further explanation. As time passes, several things change in the world and within a country as well; the economy, the composition of society and the relative proportions of the elements that make up that society; certain areas of knowledge may gain more importance, while others lose value, and the lifestyle or the speed of life may change. The basis of success lies in the extent to which we are capable of self-adaptation. If language teaching software is to be successful, these aspects have to be reviewed.
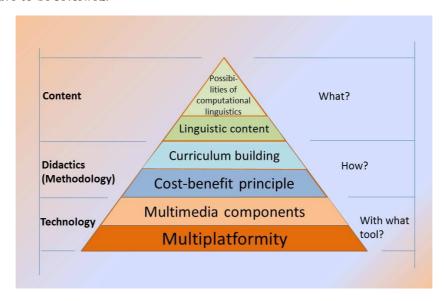

Figure 2. A model of factors improving efficiency in multimedia language teaching systems

This model is built up from the concepts mentioned above (Figure 2). Let us attempt a more-detailed interpretation of the levels.

3.2. Building a model

3.2.1. Technology - with what tools?

3.2.1.1. Multiplatformity

Our lives are more and more organized around three screens; hardware resources are more and more permeable in terms of functionality. Even regarding usability, the difference will only be the size of the screen. In fact the biggest

screen is the television, the second is the computer and the smallest is the display of a mobile (communication) device. The ideal way for an application to become wide-spread and have numerous users is to be able to use all the previously mentioned displays, but in all cases, at least two of them. From another point of view, if a user can access the desired application in several ways and in several situations, the system is worth more for him/her, and so it will be more effective. We can conclude that multiplatformity has become a basic requirement, as this is the easiest way to increase the number of users and the time spent on individual usage.

In order to enable this method to be used in reality as well, an increase in screen resolution was needed and the accessibility of computer networks had to be created for all the three groups of the main hardware tools. An application which is visually well built for the computer requires another, simpler output for its representation on the television due to its low resolution, and the display of the mobile phone, because of its small size and more difficult handling, was for a long time incapable of running any more serious application, not to mention the flaws in network and other hardware capabilities (data-transmission, processor, memory, mass storage, input units). As televisions are becoming (have become) 'smart' multimedia centers in our homes, we do not only think of them as 'bigger' displays. Mobile phones have been equipped with higher resolution, bigger touch-screens, CPUs, fast memory and mass storage and broadband network capabilities which have made them complete interactive multimedia devices.

The appearance and fast penetration of the so-called 'cloud-based' web solutions support the idea of multi/cross-platformity which means that the content is not held on a particular device, but on remote software. The user (student) may access and use this content anywhere, anytime, and from any device that is capable of creating and presenting web connectivity.

3.2.1.2. Multimedia components

The next level of the hierarchy model represents the 'interactivity' and 'the possibility of an increase in efficiency in multimedia content'. This option 'rests on' technology, indicating the dependency between the two. How could we use the possibilities of these concepts to increase the productivity of knowledge transmission and retention in the most efficient way?

The experience of information inputs accessible through visual and audio channels, interactive control over them, or in general, the effects of these joint-stimuli on learning have already been investigated by many researchers.

Probably the most popular and accepted model is the latest interpretation of Edgar Dale's 'Cone of Learning' in Figure 3. The original publication did not include percentages; those were added to the model after further research [8]. Obviously, these percentages are not fixed (the topic has been approached by many researchers and from several points of view), but on the basis of the results they are approximately correct and the cone is undoubtedly pertinent.

Dale organized the different 'action activities' into a hierarchical order. The scheme clearly shows that the lower the abstraction level, the higher the possibility for increasing the level of recall. Abstraction reduction may be facilitated by involving more sense organs, or by the lifelike, practical structure of the material. More sense organs involvement is itself a strategy for understanding and stabilizing knowledge, as encountering the experience of visualization and hearing, through sounds, tunes, pictures, and video clips facilitate long-lasting learning more than reading a simple written text [4].
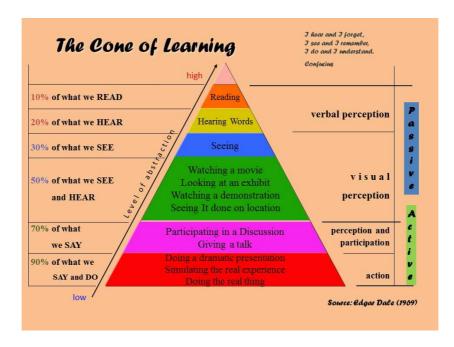

Figure 3. The Cone of Learning

We must distinguish between active and passive activities. One of the main possibilities of today's computer networks is that besides displaying multimedia

content, they are capable of interactivity. These systems, as I have already mentioned, are able to simulate reality with their interactive or online content; and this live content may be treated as real experience even though it exists in the virtual environment. In my opinion the value of virtual-real experience is situated between the two levels: 'simulation of reality' and 'real experience', both of which are considered high levels in terms of knowledge retention.

Today, as we already live in the 'web2 world', more and more people use blogs, on-line chat, and videoshare, and live their social lives and make other connections in the virtual space; indeed, the border between the virtual and non-virtual world seems to be fading away [10]. Being aware of the above may give us ideas for using these possibilities in language teaching.

3.2.2. Didactics - How?

3.2.2.1. The cost-benefit principle

The concept of the cost-benefit principle comes from economics. This idea appears in more and more contexts where efficiency is emphasized. Costs have to be directly proportionate with the expected results; otherwise there will be no benefits [1]. How can we use this idea in the process of language teaching, especially regarding efficiency?

The expectations of the environment are emphasized at this level. The expectations for language learning are completely different from what they were 20 or 30 years ago. Life demands 'real', usable knowledge, but the time and patience we have for the language learning process is less. Our lives have become fast and success-oriented; we want everything now, or as soon as possible. Although acquiring reliable and usable knowledge is not easy even today, we have more and more possibilities to choose from, which makes language learning more colorful and more interesting.

How can we make the language learner believe that today everything is easier and simpler than it used to be? By using these systems everybody would be able to achieve rapid results!? Yes, this key-sentence is based on the psychological fact that the initial spectacular and quick success gives a feeling of achievement even to those students who tend to give up too early or who are not diligent enough. After analyzing several case studies I came to the conclusion that this way of thinking is becoming more and more accepted [5]. Even the modern, spectacular, multimedia systems are not themselves able to hold the students' enthusiasm and diligence for an extended period if the initial huge enthusiasm is not followed by initial success.

This view is reflected in many false beginners' opinions as well. We can significantly increase efficiency and consequently, productivity as well, especially in the beginning, by constructing the material with these basic ideas in mind. We can be more effective from the 'goal-to-achievement' point of view if we manage to postpone the initial difficulties by placing the rarely used, more problematic content at a phase when the student has more confidence and feels that he/she is able to overcome the difficulties associated with it. We will have more successful, satisfied and confident students who are able to communicate. [5] This idea could be used with the greatest benefits when constructing the content and methodology of the curriculum.

3.2.2.2. Curriculum building

When constructing the curriculum it is a crucial expectation of the pedagogical and didactic methods, to make all the aspects - technology, media, and target users - dependent on and organized around the one concept which is able to make use of and exhaust all the possibilities of the situation completely.

The science of pedagogy and media has a didactically extended literature and wealth of experience that goes way beyond the scope of this research. At the same time it possesses the least easily specifiable functional system in general.

It is important to know for whom we are designing the teaching software. We have to take age, education and the students' developmental phase into account. On the bases of the above, we also have to decide what components to include and in what proportion we intend to use them.

3.2.3. Content - What?

3.2.3.1. Linguistic content

The methods to be used when constructing the target language material content - the next level of the model - should be based on the involvement of the previously mentioned economic and psychological concepts.

We may use cost-benefit theory as an organizing method during curriculum building in an effective way. If we intend to realize some efficiency or cost-benefit principle in language learning, it is advisable to start learning with the list of the most popular words. Depending on the level of the language learner, the acquisition of the 1000, 2000 or 3000 most popular words of the given language increases the oral or written word recognition and understanding dramatically.

With a small vocabulary - of some hundreds or a thousand words - we are already capable of achieving serious results. With 2000 words we are able to

understand approximately 80% of the words of written English texts. Analyzing everyday oral texts, the results are even more promising; 2000 words cover more than 95% of input received. We need to know approximately 16,000 of the most common words in order to understand 98% of written texts in general. In other words the efficiency of comprehension and understanding increases dramatically at first, giving some feeling of success to the student. Later on this increase moderates, but the understanding becomes more sophisticated [7]. (I need to mention here that this method of vocabulary learning does not achieve miracles by itself; it is not a revolutionary method, as we can see in several other instances.)

We must analyze the comprehension of the words found in the text and the text constructed of these words separately. In most cases we do not necessarily understand an entire text, or we do not necessarily understand perfectly when knowing only the words. Familiarity with grammar is essential as the thought expressed may be completely modified by inflections in the case of agglutinating languages or other grammatical structures in the case of non-agglutinating languages. While building up the grammatical curriculum content we may also apply the organizing theory; on the lower levels we focus on the simpler, more popular grammatical elements in order to increase efficiency and maintain motivation.

3.2.3.2. Possibilities of computational linguistics

At the stage of curriculum building we can already rely on various possibilities provided by computational linguistics: frequency analyses, comparative lists of vocabulary, corpuses, thesauruses, and concordances. Even though the application of the possibilities provided by computational linguistics is not obligatory, many time-consuming tasks could be simplified by their use. This is the top level of the pyramid, which could be handled together with the linguistic content layer - this area has now become so popular that I believe we should treat it as a separate level in the model [3].

After consulting university teachers and linguists in Hungary, I was surprised by how little used these methods are - despite being known and respected among teachers and believed to be efficient alternative aids - in the field of language teaching today.

4. Conclusion

'Multimedia unites all forms and tools. We receive everything in one box, everything that we have so far received on paper, in books, magazines, the cinema, television, radio, cassettes or records. The whole world lies behind just one screen.' [10]

As cross-platformed multimedia tools invade more and more areas of our lives, crucial opportunities arise for all users to involve these aids in the learning processes, and not only enjoy them for entertainment. The charm of high technology tools regarding language learning has faded away; it is not enough to make studying interesting and motivating anymore. However, the possibilities latent in the technologies accessible at present are - in most cases - not fully used.

The model of the factors improving efficiency in language learning, (What? How? With what tool?) tries to provide a generally useful aid for the three basic questions. This 'instrument' builds up the answers to the question of how to design or select a multimedia language teaching system in one model, on the basis of didactics, technology and content.

The layers are pyramidal. The advantages of cross-platformed solutions appear on the lowest 'technology' level, the second level includes possibilities for improving the efficiency of multimedia components. The upper layers are based on the concept of cost-benefit theory. The next, related parts are the levels of curriculum building and curriculum contents. The usability of possibilities in computational linguistics represents the peak of the pyramid where all the lower layers can be fulfilled.

In my opinion, building the previously revealed and organized theoretical correspondences into one single model can provide help both in selecting an already existing system and in designing a new one. The individual layers of the model used separately may also be used as tools for improving efficiency. The incorporation of any additional concept, or indeed the abandonment of a particular level can make the system more efficient. If we are fortunate enough to be able to apply several layers, efficiency may be multiplied.

I must mention that just as in other fields of education, we should not consider any of the methods outstanding and superior to any others. Together with other aids that are relevant to the learner's requirements and habits, language teaching systems may be effective on the long and rugged path of language learning. [6]

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