

Writing system – the starting point for reading and writing

A writing system is one of the greatest inventions in the human history. When human societies developed and organized laws and trade began, the old way of having spoken agreements was not enough to keep the society in order. The need of documenting what had been said and agreed between people led to creating a writing system.

Creating a writing system was based on the idea of symbols, special written characters that represent human speech. In many places, a **writing system was created to represent individual speech sounds** (phonemes). The spoken language was analyzed down to the smallest meaningful unit and special characters, letters, were given to each sound. This system is now called the alphabetic code and learning this code makes it possible to write any spoken words and read any printed words in a spoken language. **Learning the alphabet code is to learn the connections between speech sounds and written symbols.** Being able to read and write means learning the alphabet code so well that process of connecting sounds and letters to each other becomes automatic, so fast that we are not aware of it anymore.

Different languages, different alphabetic codes

A writing system is based on a spoken language, and this is why alphabetic codes are different in different languages. In the Western alphabetic system we have a set of letters which are commonly thought to be the “alphabet”. However, in some languages all the letters of the alphabet are not used and the meanings of the letters might vary. This means that in some languages there are less phonemes (smallest sounds in words that can distinguish meaning) than there are letters in commonly known alphabet set and some languages have actually more phonemes than there are letters in the alphabet, which means that the same letter might be pronounced in different ways. **We have approximately the same set of letters, but the connection of these letters to actual phonemes can vary between languages.**

English is opaque: complex and irregular

English is one of the languages in which the existing alphabet has very little to do with actual phonemes. This is because English is a very old language with a relatively old and established writing system and many other languages have influenced it, bringing new words and ways of pronunciation. As a result, there are thousands of letter-sound connections in the English language. **English can be categorized as an opaque language: it is difficult to know how a phoneme should be written or a letter should be read as there is no straight forward system of connecting sounds and symbols together.** It has become common to teach reading and writing in English by teaching whole words, rhymes and other units of text which don't have much to do with single speech sounds as such. It has been thought that once people learn enough examples of the writing system (core vocabulary) they can read other words on the basis of their experience. All this makes learning to read in English difficult: children learn to read in English much slower than children who speak other languages with newer writing systems and a simpler connection between phonemes and graphemes (letters).

Finnish is transparent: straightforward and regular

One of the more regular languages is Finnish, spoken by approximately 5 million people in the world. Finnish is transparent: there is one written symbol for each phoneme and there is only one way to read

a letter. **When children learn to read in Finnish, all they have to do is to learn 24 pairs of sounds and symbols.** After that they can read and write any Finnish word they wish, even if they have not seen or heard the word before. One must learn the letter-sound connections very well in order to learn to read. The better one remembers them, the faster and more precisely one reads. However, sometimes people have special difficulty in reading (dyslexia) and they need more training in reading skills than majority of people. These people are not unintelligent; their brains just need more time and repetition to learn the letter-sound connections. If they are given enough support when they're beginning to learn how to read, they can overcome their initial difficulties and be just as good readers as everyone else. The Ekapeli-English computer game is one of the methods how people can be supported in learning to read.

Helping children with reading difficulties with Ekapeli-English

The Ekapeli-English ¹ is based on Finnish methods of literacy teaching. **For about 100 years teachers have been encouraged to use phonemes instead of the letter names** (e.g., /k/ instead of the letter name "koo"). **Using letter names in spelling has been found to be confusing.** After the children have learnt to master all the letter-sound connections, they are taught to put the sounds together to make syllables (blending), and then finally syllables are put together into words. Teaching starts with the smallest and easiest things and children learn to read and write longer and more complicated words by time (synthetic approach).

In Finland children start school at the age of seven. They start school in September and they are expected to read by December. **Most children in Finland learn to read and write in three months.** At the end of the second grade, they read almost as fast and accurately than adults. The **Finnish school system is based on expectation that fluent reading skills are built during the first year of school.** After this the school work is based on reading and writing large amounts of texts and it is very difficult for poor readers to follow the lessons. On the third grade children in Finland usually start to learn English, which require learning a whole new alphabetic code. Learning English is very difficult if children have not overcome their reading difficulties in Finnish.

Having difficulties in reading has a negative impact to children and might cause emotional and behavioral problems. This is why children in Finland are closely followed and if children fall behind others too much, help is offered. Traditional methods of help have involved one-to-one teaching with a teacher, doing some extra exercises and giving more time in written exams. A new method is a computer based learning game "Ekapeli" which helps the child to become fluent in letter-sound connections. The Ekapeli was created in 2003 by Professor Heikki Lyytinen. The game is now widely used in Finnish schools and private homes (approximately 17 000 active users in December 2007) and other language versions of the game have been tested in English, Spanish, Dutch, French, Chinese, German and Cinyanja.

The game teaches the concept of a writing system in its easiest form. First, all phonemes of the language are introduced and the player is asked to select the letter that symbolizes the phoneme. The player hears the sounds from headphones and sees a selection of letters on the computer screen. The player needs to select the correct letter in a given time limit. **If the player selects an incorrect letter for a phoneme or is too slow, a new opportunity is given so that player is encouraged to try again as long as it takes to find the corresponding letter for a given sound.** If the player successfully

¹Ekapeli-English game system is being developed in various research projects, e.g.. under the names Graphogame, Ekapeli and Literate game (in Nordic Psychology, Vol. 59, 2007) .

makes the correct selections, more letter-options beside the target letter will be provided on the screen as well as the time in which the selection will have to be made will get shorter.. When the player has made a predetermined number of correct selections, a new, more advanced game level is introduced. In the end the player needs to read many words on the screen and select the one that corresponds to the one presented from the headphones. Advanced versions of Ekapeli-English have also other features, and the development of the game contents continues.

Children like the game very much and they are motivated to learn with it. There is much less stress and fear of rejection from the teacher or other pupils when one is using a computer. **The computer is also able to provide hundreds of repetitions which are sometimes needed for the child to learn a letter-sound connection.** The Ekapeli-English teaches the child to react quickly when he or she has to make a connection between a phoneme and a written letter. This is like body building the brains which become more and more quick to process the alphabetic code and in this way reading and writing become easier.

Who can use the Ekapeli-English?

Ekapeli-English is best suited for children who are just beginning to read. Most research on the Ekapeli-English has been done with children who have a familial risk of reading difficulties; therefore it is likely that learning of average, non-risk children is faster than the Ekapeli-English studies report.

How fast can you learn with the Ekapeli-English game?

Children can learn basic reading skills in approximately 4 hours by playing the Ekapeli-English. It seems that the best results are achieved if the players play the game for about 15 minutes per day, at least 3 days per a week. The results from Finland show that 6-7 year old children who played the game 1-2 hours improved their blending skills (putting phonemes together to make syllables) and children who played 1-4 hours improved the speed and accuracy of reading aloud. Even 1.5 hours of playing was useful for the children and improved their reading skills compared to those who had not been playing the game. A new study shows that children who had been identified with reading difficulties at the beginning of school were able to catch up the grade standards with the 4 hours of training which was given in addition to the supported teaching they received at school .

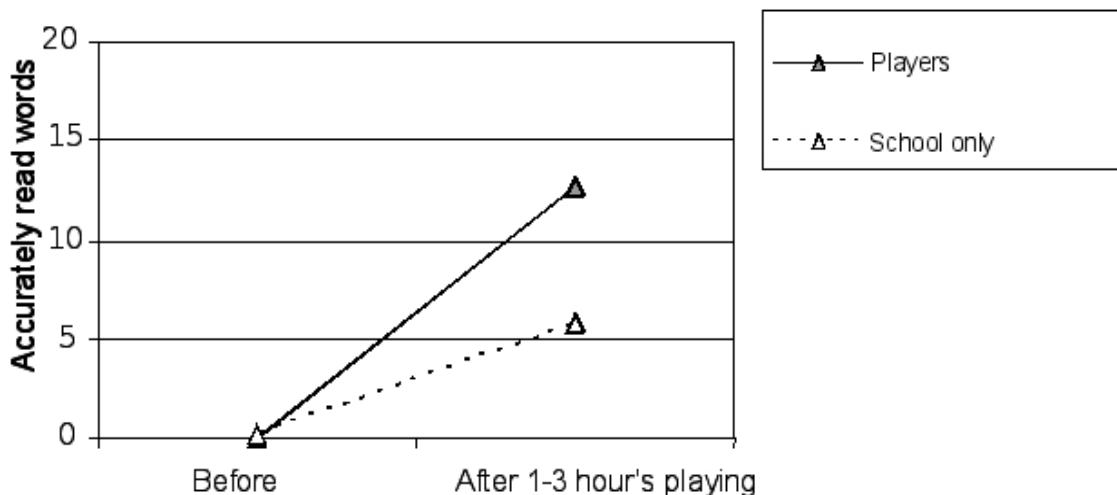


Figure 1 from Lyytinen et al., 2007

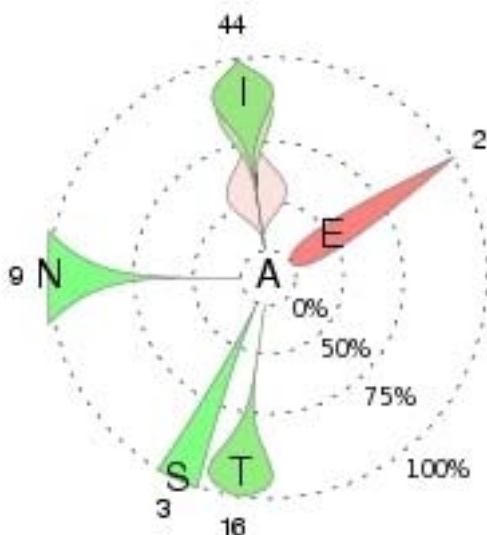
How do you get to play the Ekapeli-English?

The Ekapeli-English is not a commercial product available in shops; it is only available from our web site (a web-connection is required for playing) for those who wish to join the research. All players of the Ekapeli-English are listed in a database where their playing information is sent automatically. Researchers can use the information in order to get more information about learning to read. This information is strictly anonymous, so the true identity of the children is never revealed. Gathering this information helps the scientists to make research on reading, which then helps the schools and societies to improve the education systems and provide better support for children who need assisted teaching in learning to read.

Ekapeli-English gives information on learning process

Ekapeli-English has proved to be efficient method of teaching on its own right. However, there are also other benefits than merely improving children's reading skills. The Ekapeli-English also gives qualitative information on the learning process. **The Ekapeli-English records all the selections children make in the game and this information can be analyzed afterwards.** It is possible to see what letters have been difficult to learn, how long it has taken to learn an item, how fast the child has been able to proceed in the game and what kind of mistakes are typical to certain groups of children. This information can also be used for designing better methods of classroom teaching.

There are many different analysis methods for the Ekapeli-English. One of them is the so-called Daisygraph. Daisygraph makes a picture of each target item in the game and shows how well or poorly that item has been known.



In this picture, we see that a child **has heard the sound /a/** from the headphones. Other letters than the corresponding A-letter has also been presented on the screen at the same time (I E N S and T) and this picture shows **how well the player was able to select the letter A from all these options.**

This player has known the difference between N and A well as there are no mistakes at all during the 9 times when A and N have been on the screen at the same time. However, there has been a problem with A and I, and the player has made an incorrect selection many times: the selections have been in the 50% of correct area and improved by time near the 100% area. The closer the petal is to the outmost circle (100%), the better the player knows the correct answer.

It can be said, that this player knows the letter A to be different from letters N, S and T, but learning difference of A and I needed more training.

Daisygraph pictures can explain why a player was making mistakes in the game. For example, a

player might make an incorrect selection because the visual form of the letter is difficult to remember (p/d) or because the sounds are similar (m/n). The mistakes might also be the result of some previous misunderstanding if the player has learnt the alphabet wrong and needs to learn it again correctly.

Research on Daisygraphs can give teachers information on how to focus their teaching in those items which are the most difficult for children to learn. **This information is important for teachers as it can help them to design their lessons** and decide how fast or slow they should proceed, what things should be taught first and what things need the longest time to practice. This is one of the ways the Ekapeli-English research benefits the education and increases the possibilities of teaching literacy skills in an effective way.

The Ekapeli-English is based on ordinary classroom teaching methods. Finnish ABC-books have similar contents and structure as the Ekapeli-English. The secret is not in the computer: it is in the scientific knowledge behind it, and **this knowledge can be taught by an ordinary teacher as well** to the majority of children. The Ekapeli-English demonstrates what an effective, scientifically planned teaching of letter-sound connections can do. The Ekapeli-English research shows that products made for helping small minorities of children with learning difficulties can provide new insights in teaching that makes learning to read easier for everybody.

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