SOLFÈGE IN THE COMPUTER CLASSROOM

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(Abstract)

The aim of this essay was to know more about the process of solfège learning (ear training) when assisted by computers. The research was made in the Länsi-Uusimaa Music College (LUMO) in 1996/97. The average age of the pupils was 16 (N = 20).

The study focused on the pupils' attitudes, motivation, opinions and learning-outcomes in case of computer-based music learning. We also wanted to examine how does the new, electronic ear training program work (Solfeggio 1). The theoretical problem was the utility of J. Karvonen's attitude theory and Z. Báthory's differentiated teaching learning model testing in this research.

It seems that the notions of learning teaching change in quality, in the computer lab. Learning comes into the focus instead of teaching in the process of education. The computer is a good aid to help pupils' independent learning with task system. Research results show that solfège learning needs renewing specially in the area of aims and educational instruments. The role of teachers is more requiring than ever before.

It was found that computer-assisted music learning is more agreeable and effective like the traditional. Pupils are well motivated if the patient 'researcher-teachers' get all the instruments what they need in a modern and well-functioning computer classroom.

Keywords:

- Music education and computer
- Differentiated teaching-learning
- Computer-aided ear-training
- Computer-aided solfège program

FOREWORD

"Why should we all do research: to become a better teacher and to be more effective in the classroom."

(R.G. Pembrook -& C.R. Robinson)

Today people go to bodybuilding clubs or aerobic training. People buy fitness videos and practise at home. They know the importance of regular exercise to maintain good health. *Solfège* means the training of the ear.

When one starts to learn music one has to learn the basics like reading and writing the notes, the terms of music theory, forms, styles and so on. The traditional method of teaching and learning solfège is quite an atomic: look at the theme or write the melody and so on.

The opinions and experiences of Finnish music theory teachers' were examined in the research of Tiina Pietiäinen (1991). According to her results the most Finnish music theory and ear-training teachers has 16 pupils in a group. Usually they use piano and blackboard on the lessons. Other educational equipments are the most overhead projector, photocopying machine, tape recorder and record player. They criticised the national materials of exams (e.g. see p. 86 lns 6.4). According to the opinions of teachers *new textbooks and reform are missed* at the field of ear training and music theory teaching learning.

What were the starting-points of this research?

1. As a piano teacher I was wondering why pupils 'complain' against music theory learning in Finland. Why they always mention the theory only and never the solfège?

As I remember in Hungary we loved solfège learning because it was full of music. We sang a lot and all the music theory came later or I say in a convenient time, naturally. Anyway I decided to try to find the way how would it be possible to teach and learn the music theory and the ear-training more easily, more quickly and more effectively in Finland.

Usually the situation is on the contrary in Finland. Pupils have to learn a lot of theoretical 'unfortunate' concepts at 10, when they are not able to understand them. The music theory teaching is full of central requests and there is not time enough to teach pupils to enjoy music. There are also a lot of contrasts between the aim and the instruments. Some of the teachers think that the solmization is the most important for their pupils to know. They forget or do not know that solmization is only an instrument and not the aim.

Aarre Joutsenvirta tells that the teaching of general materials of Music College is still based on the model example of 1800 (1998). The exercises in the textbooks of music theory, they are full of mathematical structures instead of musical models. Joutsenvirta hopes the change from the methods of teachers' management to the teaching of pupils' central.

2. I was teaching as a theory teacher in a computer-classroom first time in 1991.

The new environment was very exciting for the pupils as well as for me. I admired the pupils' enthusiasm about the computers including that that had never used computers in music before.

The point in my first question was: why are pupils usually enthusiastic about computers? Unquestionably, the fascination of novelty is always good for motivation. For how long does it survive? I was and I am still full of reservations. Is it proper to use machines in music education at all? In any case it is not a question of substituting 'real' music with 'machine' music, but of trying to find new possibilities to encourage the process of music learning more effectively.

3. In 1992 I went to meet my previous solfège teacher Erzsébet Szönyi in Lahti.

That was why I had the possibility to listen to the subject of Jukka Louhivuori: "Melodia Dictation as a Cognitive Process" in a Kodály Conference. That was the moment when I thought I have to go to continue my post-grade studies at the University of Jyväskylä.

4. In the autumn of 1992 Zoltán Báthory enjoyed as a fellow researcher the hospitality of the Institute for Education Research of University of Jyväskylä.

He and Kimmo Leimu published together a comparative essay about the Finnish and Hungarian education. When looking for the suitable theory to my research my interest was aimed at the differentiated teaching-learning theory of Báthory.

5. Sibelius Academy attributed me for taking care of solfège teaching assisted with computers in the Department of Kuopio in 1995.

Then I wrote my four electric solfège books for students named Solfeggio 1 - 4. I started the research to know more about the process of computer-assisted teaching learning and to test my electric ear-training book.

During the school year 1996/97 we followed closely the solfège learning of two music theory groups in the Music College of Länsi-Uusimaa (LUMO), in Finland. The average age of the pupils was 16 (N = 20). The environment of the test group was a computer lab in Lohja, and the control group was learning in a general classroom with the addition of a computer for assisting the teacher's work in Nummela.

The theoretical problem was the utility of J. Karvonen's attitude theory and Z. Báthory's differentiated model testing in the computer lab. To find the answers the pupils' atitudes, opinions and learning outcomes were in the centre of experimental measures. We wanted also to examine how the electronic ear-training material works. What would be like the suitable environment for solfège learning nowadays?

Research results show that renewing the process of music theory teaching learning we need a well-functioning computer classroom with suitable electric textbooks. Learning comes into the focus instead of teaching in this environment. Well-motivated pupils are very important. The role of patient 'researcher-teacher' is more requiring as never before, because he/she is the motor on this structure. The success of learning-teaching process is in his/her hands.

CONTENTS

1 INTRODUCTION

1.1 What should be the mission of music education nowadays?

Keith Swanwick (1988, 10) wrote in the book "Music, Mind & Education":
"Perhaps the oldest and best established theory of music education is that which emphasises that pupils are inheritors of a set of cultural values and practices, needing to master relevant skills and information in order to take part in musical affairs."

According to this theory, the task of the music educator is primarily to initiate students into recognisable musical tradition. Swanwick refers to Zoltán Kodály's highly structured sequential approach as a fine example, which was intended primarily to develop musicianship through singing, especially sight-singing. Every child should learn to read music and articulate it vocally. For Kodály, pupils are to be initiated into music beginning with the folk traditions and proceeding eventually to encounter the best music of the European classical tradition.

Over the past forty years or so, an alternative perspective on music education has gained ground, a theory, which emphasises the qualities of 'expression', 'feeling' and 'involvement'; shifting our attention from the student as 'inheritor' to the student as 'enjoyer', 'explorer', 'discoverer'.

According to Klára Kokas (1972, 6 - 9) the basis of modern pedagogy is on the one hand an artistic and scientific value present in the given material, and on the other hand a total creativity by the children. The task of the education is to help children to discover the science and the art. The pleasure of discovery has to be realised in the interaction process of teaching learning. We can show the tools, but a child himself/herself has to restore the music to life. It is not enough to render knowledge in music education, but the instructor is a partner in discovering the experiences. The pedagogue who teaches music has to be ac-

quainted with the levels and connections of childhood development as well as be able to discover the best and most effective ways of teaching again and again.

Erzsébet Szönyi (1988, 153) calls attention to the dangers of modern ideas in music education, emphasising the importance of the teachers' high-level specialist knowledge. The problem of music pedagogy is that traditional music education is usually the result of tiring and steadfast work. This is primarily the reason why the tendency of creativity has appeared, which places the process of learning music on a new footing. This tendency rejects the importance of acquaintance with previous masterpieces; with reference to the lack of time, it contradicts the significance of practising for many years.

1.2 The next step

Let us remember the words of Zoltán Kodály (1949, 252 - 254)
"Our nation is familiar with the field of unison, has composed masterpieces in it, and is also brilliant in its interpretations. The next step is to introduce people to the secrets of the many parts of music, to pave the way towards the monumental works of world literature. Many people have tried it before, but they did not set about it the right way. To move away from the narrow limits of unison to music of two or more parts which in its restrictions holds more freedom. This is the way of democracy in music!

Unison song with a simple instrumental accompaniment also develops some passive and obscure, almost subconscious, sense of harmony. But our ear can only completely receive the many parts of music if we learn to sing one part without instrumental accompaniment so that we can concentrate on the other parts. In this way we can seek to understand that kind of music, where the parts are not living by themselves alone, but by helping and complementing each other, they create a unit of higher level.

This ability develops slowly, but practising it is not tiring, in fact it is delightful, since the way leads towards the great masterpieces through more and more

beautiful music. He / she - who reaches as far as that - can feel enriched spiritually, and it is worth any trouble or sacrifice. The seed is sown, only peace and the May rain of Love are needed to harvest it. "

1.3 The teacher as a researcher

Randall G. Pembrook and Charles R. Robinson (1994, 262 - 268) at the ISME conference said in Tampa: "Research is often considered as an activity outside of the regular context of a teacher's routine - a project done as part of a graduate degree or an article completed by someone else and published in a journal. Neither of these concepts relates to the work carried out by the teacher on a daily basis. Some teachers who become researchers do so because they have an intrinsic need to know something, for the benefit of the students with whom they work on a daily basis, and in order to make their musical and personal lives more productive."

There are at least four possible levels of interaction between the teacher and the research community:

- The teacher as a bystander, is not aware of the existence of research
- At another level the teacher as a consumer is aware of current research results
- A third category includes the teacher in the field as a partner in research, interested in research questions, but does not feel he/she has the expertise to conduct research independently
- The teacher as a researcher is the last category and considers the teacher as a true researcher

R. G. Pembrook and C. R. Robinson are of the opinion that the teachers-researchers have a knowledge of the questions and the problems that is very real to them. This aspect is very important in making a project come alive. They understand how to design suitable solutions.

At the University of Missouri-Kansas City they have three levels of research projects. The most informal is a one-on-one environment, where they are

matched with a faculty mentor. The next level is matched with three faculty members, and if considerable input is sought, the highest level of research is conducted with help from five selected faculty members.

Why should we all do research: to become a better teacher and to be more effective in the classroom.

2 THE MOST IMPORTANT DISCOVERIES OF THE MODERN PEDAGOGY

Many remarkable discoveries have occurred in respect of explaining the teaching learning which has contributed to the development of the modern pedagogy. Báthory Zoltán (1992, 28 - 31) summarises them in five headings:

1. The coherence of activity and thought
2. The role of speech
3. The theory of the sensualist
4. The role of memory
5. The role of motivation

2.1 The coherence of activity and thought (Piaget, Brunner, Skinner)

Intellectual activity interweaving with physical activity is the best way of guaranteeing the active learning. The computer-classroom seems to be an ideal environment, where we can sing as usual. Furthermore, because every pupil has a 'base' of his/her own, he/she can also work alone according to his/her own level. The patterns of work can be used in a more varying and effectual way, because there is the possibility for everybody to join in actively all the time during the music lesson.

In my own practice I never wanted to use ready-made exercise programs. If somebody has any trouble recognising intervals, etc. he/she can practise alone with these programs at home or during lessons if there is no computer at home. We try to find ways of using time more economically in the music lessons. For

example, the pupil sings one part of the score, the computer 'sings' the others, or the pupil plays the others on his own keyboard. In a traditional classroom this kind of exercise can be a problem if there is only one piano. Only one pupil at a time can do the task, otherwise it is more agreeable to play only if the teacher is listening to the production on other earphones.

2.2 The role of speech

The speech is an important component because of the contact with thought in the process of teaching learning. However, in case the teacher only speaks and the pupils only answer, this influence is uncertain. The possibility of communication can intensify the learning for the individual as well as for the class as a whole.

Alfred Born (1981) wanted to find the answer as to why teachers and pupils like the computer so much all over the world. He came to the conclusion that the computer brings back 'Socrates' to us. Learning becomes the focus again instead of teaching in the process of education, so when using the computer pupils can be activated as in the case of personal teaching.

There are a lot of possibilities to create situations for communication in the computer-classroom and it can really lead to the growth of learning intensity. In this more free and easy environment the teacher can become a more helpful partner, who has more time and a greater opportunity also to teach pupils personally.

2.3 The theory of the sensualist

The technological education system has restored to life "the sensualist of Comenius", starting an attack against extravagant verbal teaching. The results of the technical educating researches proved that audio-visual communication is more successful than the single one-channel communication (using only the visual or only the audio stimulus) in education.

Piaget stated that sensualist is no more than "the verbalisation of a picture". The subject matter of instruction only illustrates but does not activate the process of learning. It is not enough to activate the apparatus of perception-observation; we also have to encourage the pupils to think.

When developing high quality CD multimedia materials we can use them interactively with the individual as well as in group teaching. Using computers we can print a 'perfect music picture'. In my groups we use the Encore music program, because it is not so difficult and it suits our needs in our music lessons.

2.4 The role of memory

In the process of learning the role of memory was always a central problem. As understood by Ebbinghaus memory acts as a mechanical register structure. There is an imprinted process on the mind, and for this reason the accent is placed on repetition in this theory.

According to Bartlett (1932) the human memory can actively organise learned materials with the help of schemes. In Tulving's (1985) interpretation the memory is a hierarchical system where new information finds its place within it. There are three components: procedural, semantic, and episodic.

The approach of W. J. Dowling and D. L. Harwood (1986, 4) suggests that the brain can perform many complicated operations simultaneously, not all of which are accessible to conscious experience. Our sensory systems receive information. Sensations are filtered through perceptual processes that direct attention to important events. But even important signals are often too numerous to handle. Processes for remembering, for labelling, for integration with other information in memory, help us to handle the incredible amount of stimulation we face each moment of our lives, making actions of the environment possible. Musical sounds and the musical actions of others are environmental stimuli that are important - that have meaning for us - sensed by our ears and eyes and interpreted in the context of our memories.

Jukka Louhivuori conducted research at the University of Jyväskylä in 1990/91 to gain knowledge about the cognitive processes that take place during the process of melody dictation (N=17). Students worked alone and a computer program gave three different melodies to be written down on the screen. They could listen to the melody as many times as they wanted, but always from the beginning to the end.

Results showed that two different styles were found concerning the strategies of notation. One style is to try to write the melody one note after another in the same order as the notes enter the melody. The other style is to begin from the middle or the end of the melody and fill in the melody step by step (Louhivuori, 1992).

In the solfège education the aim of the melody dictation is to develop the pupils' ability to write the melody to note-pictures. Generally the main aim is to develop the memory and the pupils' ability to perceive the musical elements.

Memory can be long-term and short-term as well as declarative and procedural. The improvement of the short-term memory assists in writing the melody decisively. The quicker the melody can be stored in the pupils' memory the quicker they can also write the notes. At the same time the short-term memory depends on the operation of the long-term memory.

The important task of the education-process would be to shape and to reinforce in the pupils such schemes and forms, as the music comprises and is usually built for. If in what they have to write there are unfamiliar forms in the melody, the pupils perceive the melody with the help of assistance-points. When these are lacking pupils use generation, which requires the knowledge of the rules of music styles (Louhivuori, 1995).

I think that on the basis of our experiments using computers we need new methods in the field of melody dictation. It is not enough to remember the pitches, but we have to concentrate on the correct rhythm too. It seems to be useful first of all to learn by heart the dictation and after that to write it down

with the help of a computer. A positive plus there is the possibility to control it, because we can listen to it and correct it immediately.

2.5 The role of motivation

Modern learning psychology attaches importance to the energetic basis of learning. The component of attitude is important at the beginning and for the continuing of learning (motivation) as well as the realisation of future plans (aspiration). The computer-classroom is an ideal environment for motivation itself, but we have to choose well the most effectual and various methods, which will increase the level of motivation.

3 TYPES OF LEARNING

We can distinguish three types of learning:

1. Verbal
2. Perceptive
3. Motor (movement)

The psycho-physiological basis of verbal learning is the association. If we want to get in touch with the productive and joyful side of learning, then we have to improve the explanation of the mechanics of association psychology. In respect of the learning-organisation it is necessary to activate and to stabilise, on a high level, the cognitive abilities and the power of thinking (e.g. analysis, synthesis, application, creative employing). Without any previous learning one can understand some contexts, if the contexts refer to problem solving. The efficiency of learning with texts and marks can increase strongly, if the learning assignments make the pupils adopt independent and original solutions, and lead them to "discoveries" and if they are encouraged.

In accordance with Bruner (1968, 1981) problem solving produces discovery learning. There are three possibilities:

1. There are not enough instruments and information for pupils to be able to achieve the learning aim
2. There is a conflict between pieces of equally valid information
3. Pupils feel the desire to construct a system and symmetry

The characteristic features of verbal, psychomotor and perceptive learning rarely occur in a "clean" form, they mix with one another. The success of the learning strongly depends on the organisation of the learning and on how considerably are all the psychological parts are activated.

There is also another complicated learning process involved in school learning, which is almost impossible to systematise: that of social learning. Our interests, our appreciated attitudes to the direction of things, institutes, and persons can be attained in social connections by means of interaction.

According to Buda Béla (1975, 1980) the essence of social learning occurs on the basis of emotive identification. The explanation of the process of the personality's development is unimaginable without social learning.

3.1 Learning according to Carroll's model

In the model of J. B. Carroll (1963) the active learning time is the central factor. The time devoted to learning and the necessary time to learn depends on five factors:

A. The opportunity to learn
B. The perseverance of the pupil
C. The pupil's ability to learn
D. The ability of the comprehension of the teaching
E. The quality of the teaching

It is frequent in American learning-psychology and in practical teaching, that the parts of learning, which are connected logically and in content, are usually determined in learning tasks. In Carroll's model the basis is active engagement in learning. We can determine the optimal measure of the "time on task" if we

know an external factor (the opportunity of learning) and an internal factor (the persistence in the learning).

The success of the learning and the pupil's intelligence (the general ability to learn) correlate considerably. Prior learning also strongly determines the ability of the teacher' s comprehension. The most important external factor is the quality of the teaching. The constitutional, personal and material factors of the teaching play an important part in this. To sum up, what seems to be the most important - from the point of view of the pedagogical activity - is to operate the learning time differentially (depending on the pupils' ability and motivation) and otherwise to ensure the quality of teaching by using the best methods which have been proven experimentally to be so.

3.2 Teaching in school according to Bloom

Bloom's school-teaching theory (1976) surpasses Carroll's views in two ways. It refers not only simply to prior learning, but it attaches great importance to the whole prior history of the pupil. The term previous " knowledge" includes not only cognitive knowledge, but also affective behaviour (emotional-volitional).

This is an important new element. He explains performance in a complex way, distinguishing the cognitive and affective side within it. The quality of the teaching has a central role to play in this system too. In Carroll and Bloom' s models the environment of the learning, the sociological determinant of the school and the pupils are left out of consideration. The process of teaching learning is described above all in psychological and pedagogical terms.

3.3 The hypothesis of Báthory

Learning starts with a comparatively slow developmental part (the warming-up phases), which is followed by a sudden rise in performance and zoom (the learning phase), then approaching the top the success of learning slows down

step by step, (the saturated phase). For the continuation of learning we have to create a new learning situation, a new warming-up phase (Fig. 3.1).

Style "B" makes an effort to make precise use of the time. Typical of this is the ambition to realise the requirement rigorously and the strong-minded and systematic work of the teacher. By using the teaching time and learning time one can expect an early and quick rise in performance, which can bring about saturation comparatively early. In case of style "A" the aim of the warming-up phase is to put into place a rich stimulus-informant, which makes it possible in different ways to get acquainted with the syllabus, developing complicated associations, giving preference to personal ways chosen by the pupils. Dragging at the start is refunded later in the higher -level saturation point of the performance-level.

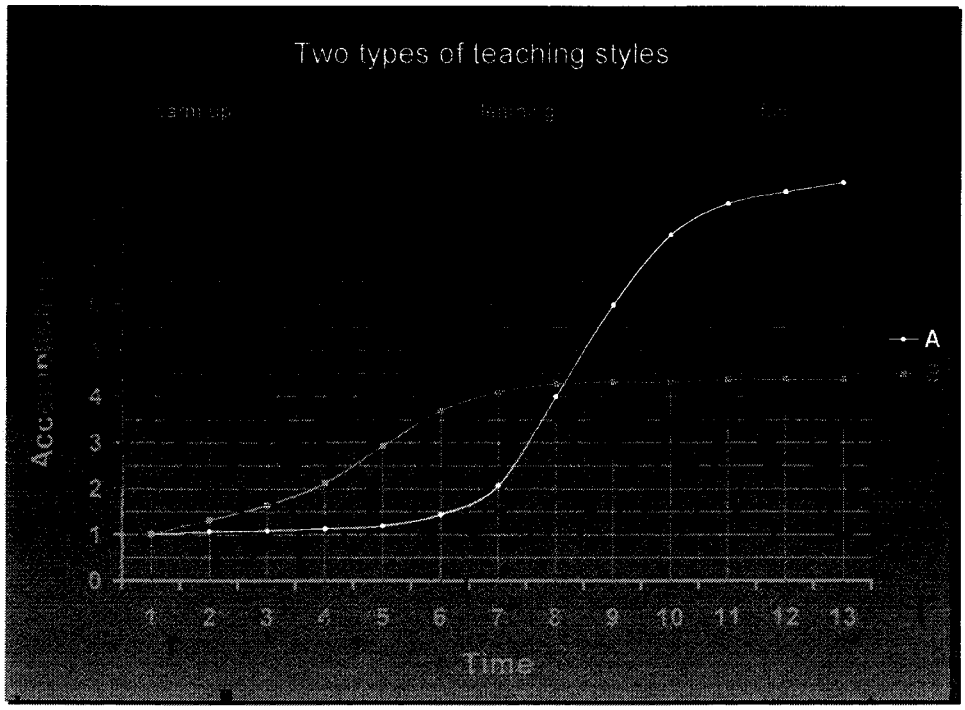


FIGURE 3.1 Hypothesis of the two types teaching styles (Báthory 1992, 57).

In accordance with Báthory's hypothesis (Fig. 3.1) the educator, who regards motivation as an important task in the learning-organisation, he/she does not

achieve results at the beginning, but he/she is able to achieve a high-level of development over a longer term. The learning-organisational importance of motivation lies in the careful groundwork. We can summarise the delayed starting and the possibility of quicker development later thus.

3.4 Motivation

First of all motivation is analysed by Z. Báthory, as a learning-organisation task, or in a wider sense as a pedagogical principle. In pedagogical and psychological research connected with motivation, the question is mainly how best to use a method in developing an incentive scheme in the direction of the learning. The motive-based learning happens in more complex circumstances than subject learning. It occurs as a part of the development of the personality.

Motivation is a very important prior condition to *the success of learning*. The more different and diversified the learning possibilities offered by the school system to its clients (to its pupils), the more chance it has to change the uninterested pupil into an inquirer.

The democratic mentality of a school can create such an atmosphere, just like learning may need effort, but sometimes it brings about pleasure. It then qualifies as a creative activity.

In the autocratic school expectations dominate, holding possible defeats in store for those pupils whose motivation is uncertain. The other area of motivation is the teaching-learning process organised within the scope of the other subjects.

The character of the syllabus and the personality of the teacher can be like an increasing or decreasing component of the learning-motivation. If the subject is motivating, development and not expectation is at the centre of teaching.

3.5 Activation

Activation is an old principle of pedagogy and of practical education. The modern theory of activation depends on the higher level and conscious activity of psychology. Accordingly, we can prognosticate the success of the learning-organisation, in so far as we can activate the whole person, the whole personality, during the process of teaching learning.

There is no successful learning without the knowledge of the person, without the personality's participation. Dependent on the pupil's age, social status, motivation and the relation between the internal - external motives which influence learning, personal abilities - consequently differentiated in many respects - it can only be possible to determine the optimal strategy of the activation, which serves the purpose of both the learning-organisation and the individual interest, thus leading to active and productive learning.

The "unfolding" of the activation can be discerned in the absorbed and continuous learning. Connected with these activation two types of learning time are noticeable. Carroll' s model points out the time used personally for learning ("time on task"). The learning time is easily measurable. Measuring the time used for intensive learning is much more difficult. The pupils' activation and education method used are two of the most important key-questions.

Only the whole learning activity in well-motivated and principled learning can be productive. In the case of school teaching learning it would be an important task to subordinate the pupils' learning activity level to the teaching method and learning organisation according to the conditions of the school teaching. We can only reach really intensive learning activity by differential learning tasks in a differential form of organisation (Table 3.1). Better differentiation of groups, shows better quality of learning. The best kind in school learning is in the form of small groups. It is also important to mention the significance of different school equipment, as well as the infrastructure of the school -which help the learning - during the development of the pupils' activity.

TABLE 3.1 Connections between the method and the level of pupils' activity (Báthory 1992, 65).

Learning method	*Learning concept*	*Differential measure*	*The premised level of the pupils' activity*	
			Looking at the persons	*Looking at the class*
Explanation	Narrow	Low	Possible	Low
Common task	Wide	Middle	Possible	High
Task system	Wide	High	General	High

Two basic forms of the learning-organisation can modify the level of activation:

- Pupil's tackle given problems during directed learning.
- The pupil determines himself/herself the problems during independent learning, he/she collects the necessary information and processes them systematically. Independent learning is the most active mode of learning.

3.6 Reinforcement

From the pedagogical view reinforcement is the internal experience of the appreciation given for the success of learning. The experience of Hurlock (1925) shows that negative reinforcement is better in terms of the person than without any criticism, only passivity towards the production.

The good teacher can react variedly. As to the reinforcement, it is uninteresting how that happens: with words, with marks, with signs, with gestures or mimicking. Reinforcement is built into the programmes in the case of the task system of programmed syllabuses. In this learning situation the comment information is short: it is directed towards the pupil and from the pupil. This is the only objective valuation: the pupil himself/herself compares his or her own solution with that of the standard.

The reporting back of the learning results and reinforcement of them all the time is important in the organisation of the learning, especially in their regulation and assessment.

4 TYPES OF TEACHING

4.1 Teaching theories

Bruce Joyce and Marsha Weil offer in the book "Models of Teaching"(1972) well-proved methods in practice for both teachers and pupils. They describe in detail how and in which conditions the models can be used. Their target is first of all to help the pupils to learn more easily and effectively. They suggest teachers try to combine some models to get better results.

The teaching theories are banded in three groups by Nuthall & Snook (1973):

- The rational model
- The behaviourist teaching model
- The learning theory tendency

Cogitation and the role of speech are at the centre of the teaching in *the rational model.* The interpretation of learning following *the behaviourist tendency* influences:

- Programmed education
- The use of teaching machines in school
- Evolution of the approach of cybernetics

Developing information is a step towards the requirements of didactics, which brings about:

- Development of the infrastructure (accessories) and the syllabus
- The individualism of the learning

In the first place it serves the demands of the adults, but we must remember that the social factor is inevitable in case of young pupils. In *the theory of information* the following are important:

- The structure of the syllabus (logic)
- Individualised learning
- The possibility of the pedagogical adoption of the computer

The informative theory developed programmes, methods, technical sets and planning of learning systems to help the learning.

The learning-theory tendency seems like the subject of scientific analysis of teaching learning. Education is not the most important subject of the didactics. Nowadays it is no longer a question of "what", but "how". The emphasis is on how successfully or what the conditions are like. Eclectic:

- Cognitive psychology
- "Discovery learning"
- Communicative theory
- Psychological views according to creativity
- Piaget' s ideas of developmental psychology

The learning theory tendencies try to make the question of learning more human and more differentiated than the information theory did.

4.2 Computer-assisted education

The opinion of Jukka Lehtinen (1985) is that the computer can never replace the personality of teachers in the process of learning, because it is mechanical without individuality.

In the 1950s computers were used like teaching machines, without enough success to boost the effects of teaching. (Glaser & Marino 1977). In the 1960s Donald Blitzer created the PLATO- teaching system.

This was the beginning when computers came to the schools. The object of teaching was the structure and operation of the machine. At the end of the 1970s the first small sized microcomputers appeared. From this time onward it became general also in Europe to use computers in the field of education.

The first researches of teaching about computers were published from 1978 (Rantanen). 1979/80 was the 'pilot-year' of micro teaching programmes in Finland.

Computer in the education:

- Teaching about computers
- Teaching through computers
- Teaching with computers

The project of National Board of Education in 1983-1984 was a follow-up and mapping study concentrated on tracking different ADP courses. Ministry of Education (1986) set an executive group TOP (Tietokone opetuksessa-johtoryhmä) for researching the benefit of utilisation of computers in the education.

The aim in the information technology of the school operation range was:

- Pupils' preparation for building information-society actively and critically
- To help schools in developing according the new requests in society

The strategy of TOP in 1991-1995 invest the importance of developing:

- The extension of research and development operation
- The generation of information technology education
- The primary developing of ADP resources in schools
- Further education of schools

4.3 Computers and music education

Researching of the computer-assisted music education started in the end of 1960s in USA and England. First programs (Raynold 1967) were intended as ear-training exercises. M.A. Areson and F.T. Hofstetter from the beginning of 1974 developed GUIDO education system.

Pembrook in 1986 compared college students' opinions of computer-based melodic dictation instruction and classroom instruction. His research indicated that the computer program required too much time outside class, too much progress was expected in too little time and the increase in difficulty levels was not consistent throughout the program.

The aim of the research of B.E. Willett and A.J. Netusil (1988) was examining pupils' attitudes towards the computer-assisted music theory learning comparing the traditional. Learning outcomes of pupils' assisted with the computer were much better as in the traditional group. According to P.E. Janols (1990) the new technology increases children's sense at the field of base factors of music.

Kaakkurivaara (1987) presented description about the experiments of computer-assisted music education in Jyväskylä. It was a 'refreshing change', rewarding experience of succeeding and emotional pleasure achieving of pupils, with the help of computer.

Klintrup and Ylimäki examined the computer-assisted music theory education's efficiency in the perspective of learning teaching in 1989. Pupils' learning outcomes recovered assisted with the computer. The computer turned out as an effective and versatile tool from the teacher perspective. The motivation of pupils affected affirmatively.

In the focus of the case study research of Kukkula (1992) was examining the possibilities of using the computer in music teaching. He wanted to find how and what the teacher can do with assistance of the computer. He also researched the pupils' attitudes to it. Pupils' opinion was that traditional singing and playing is more important action in music lessons than using the computer.

In the interview research of Forssén (1992) the music high school teachers' opinions of teaching with computers were examined (N=9). Pupils were well motivated and active. On the opinion of teachers computer would be also a well-applicable tool in the illustrating of education. In that time the problem was the defect of instruments.

The Music Science Department of the University in Jyväskylä has carefully examined music education. Jukka Louhivuori (1990) directs our attention to the exaggerated accent on the development of knowledge and examines behaviourist-teaching models. Didactics should deal rather with the emotional and social impressions as well as with the developing of psychomotor abilities.

The process of teaching has to come closer to reality, moreover taking the development of pupils' 'emotional life' into consideration during the acquisition of knowledge. There are the very important questions of motivation and the efficiency of the memory in the process of learning.

The terms of learning teaching can change in quality, mainly at the area of 'learning-by-doing' and in the case of 'discovery-learning' in the computer-assisted music theory education. Is it more important if a pupil learns the names of instruments certainly, or that he/she can choose well the timbre in the meantime of composing? The whole class can participate in the music learning with computers, so the social learning characters can also develop in this method.

In the solfège learning pupils can also practice alone intervals, chords, melodies, rhythms, etc. with the computer programs. The teacher can make ear-training exercises using the music programs. The computer-based music learning doesn't want to replace the world of the 'real music'. It is only a possibility to reorganise the music learning more actively with the accent on the 'learning-by-doing'.

5 THE THEORETICAL BACKGROUND OF THE RESEARCH

5.1 Juhani Karvonen's model

In Juhani Karvonen's research (1970) "Teachers' attitudes, expectations and learning results in further training" (I - IV). The attitudes of the participants were examined on a radio and TV course on comprehensive school didactics. The measurement of the pedagogical research was collected by means of the "attitude-differential" (asennedifferentiaali) as Karvonen called it.

5.2 The differentiated teaching learning

The frequently mentioned characteristic of the didactical essays that teaching is regarded as the process of implementing educational aims, means that they are described only in the normative function (Báthory 1992, 9). Learning as a psychological and sociological phenomenon is not considered to be important. In Báthory' s opinion part of the didactical specialists is indifferent to examine reality. They underrate an experimental approach.

The differential teaching-theory starts from two principal-theoretical preconditions (Fig.5.1):

1. *Any explanation of education always has to and can only be connected to its aims and the pupils.*

The differentiated model of teaching learning

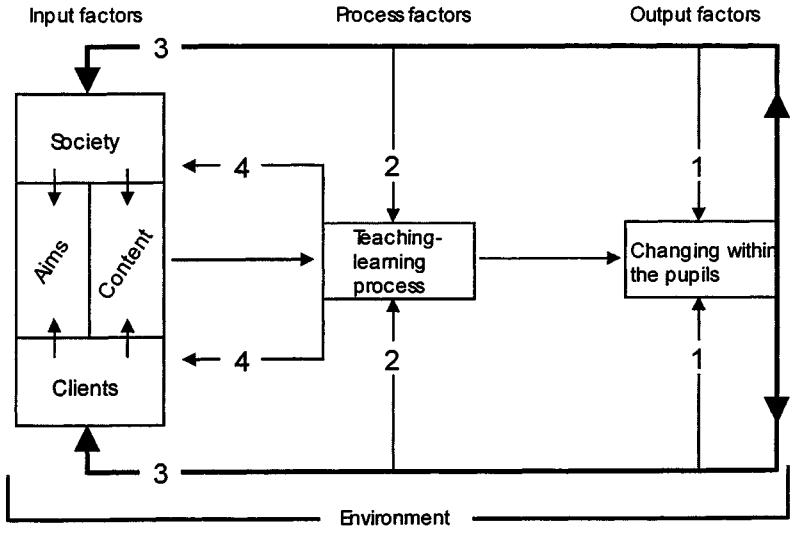


FIGURE 5.1 Báthory's differentiated model of teaching learning (1992, 20).

Education has an aim-implementing (normative) function - in so far as transmitting the syllabus means organising the learning of determined aims - and an empirical or experimental function - which relates to the process of the learning-organisation. These two functions are closely connected with each other, and if thrust into the background of teaching and the learning, will lead to a parochial approach and a creation of unilateral theory.

The *normative function* demands an adherence by the teacher in aims and philosophy. In the traditional didactical approach - by Báthory - the normative function became autocratic, which gave rise to serious problems in theory and also in practice. It helped the formation of monolithic didactics, whose practical implementation proved to be minimal.

The *experimental function* needs mainly psychological adherence, because the learning happens in time and space, between the causal contacts, in an individual way. At all time one person learns. We have to take account of the situation, e.g. what are the social and personal interests in the current learning. We must comprehend the experimental function in relation to interdisciplinary learning, considering the personal difference and in wider terms the social learning.

We can measure the modernity of a didactic system by noting how far it can balance the normative and experimental functions in its theoretical method. The main task would be developing the importance of the experimental function and integrating it subsequently (Báthory 1992, 10).

2. Getting to know and developing the process of the teaching learning - methodically - first of all needs differentiated research.

The experimental approach has a serious tradition internationally from Ernst Meumann as can be read in the pedagogical and didactical bibliography. Naturally the influence of the social sciences is very important in this aspect, too.

5.3 The differentiated learning-organisation

The differentiated learning-theory sets out the whole logic of its learning-organisation according to the pupils and to the values connected with the learning. We have to adapt the school and the education to the pupils and not to tailor the pupils to the aims of the education. This kind of pedagogical view supposes the maximal learning motivation on the part of the pupils, because they can learn what they want, or what they need in the future.

A very important principle of the differentiated teaching-theory knows there exist differences, their recognition and acknowledgement. The task is not how to discontinue them. *Pedagogy is the world of differences* (Báthory 1992, 75).
Glaser systematised for the first time how to adjust to the pupils' differences like a school-pedagogical question in his book written about the adaptive pedagogue (1977). The adaptive pedagogue of Glaser includes the possibility of explaining again almost all of the didactical categories (aims, requirements, content, syllabi, class, pupil-group, educational method).

The ordinary mode of the internal differentials takes the next three forms:

- Hands-on (frontal) working
- Group working
- Personal learning (the individualising) describing and assessment

We can regard the teaching and learning with task systems as differential mode of the lesson, which makes it possible to direct the teaching towards the pupils' abilities and the rhythm of the learning. Examining the newer possibilities of the learning-organisation we have to think more of differences.

In the independent school we can determine two areas of the learning-organisation:

- The organisation of learning-groups and classes
- Choosing the syllabi (subject-system) and determining the necessary learning time (teacher's schedule for the term)

The possibility of differentiation demands the autonomy of the teachers and of the schools. A basic demand is the necessary competence of the educators, to give them those programs and instruments that they need, or there is no question of difference and individualism.

6 THE RESEARCH

6.1 A pilot test

There was a pilot test at the Department of the Sibelius Academy. We used the Solfeggio 1 material (sp. 83 Ins. 6.1) made for computer-assisted learning of the solfège 1 course. It was an intensive course of 60 hours. Among the 6 first-year-students at the music academy most of them had never used computers before.

The teaching happened all the time in a computer classroom. There were 6 Macintosh computers with Roland 5 type synthetic keyboards. Students had filled in 'Questionnaire A' at the beginning of the learning (Table 6.1) about their experiences of solfège-learning before our course.

Students came from six different towns in Finland, so it was interesting to read what they usually thought about music theory education. Students were learning to become church musicians. All of them were able to use the computers quickly, but they also had exercise papers available all the time, if they did not want to write the notation with the computer.

All of the participants were on the opinion that the computer-assisted music education was useful, mainly in the field of music theory learning. The Solfeggio 1 material based on traditional music was appreciated. Exercises were effective and varied according to the students.

TABLE 6.1

Questionnaire A

1. Your opinion usually about solfège learning?	5 4 3 2 1
2. Can you profit from what you'd learnt in solfège in your instrumental career?	5 4 3 2 1
3. Are the solfège books usually good?	5 4 3 2 1
4. Is there enough learning of the solfège in one year before the exam?	5 4 3 2 1
5. How good do you think the material for the exams is?	5 4 3 2 1
6. Did you sing enough during ear-training lessons?	5 4 3 2 1
7. What about playing instruments during solfège lessons?	5 4 3 2 1
8. Did the personality of the teacher influence your solfège learning?	5 4 3 2 1
9. How well can you use a computer?	5 4 3 2 1
10. What about using computers in music learning?	5 4 3 2 1
Scale: 5= very good / well 1= very bad / poorly	

Opinions about the traditional solfège learning

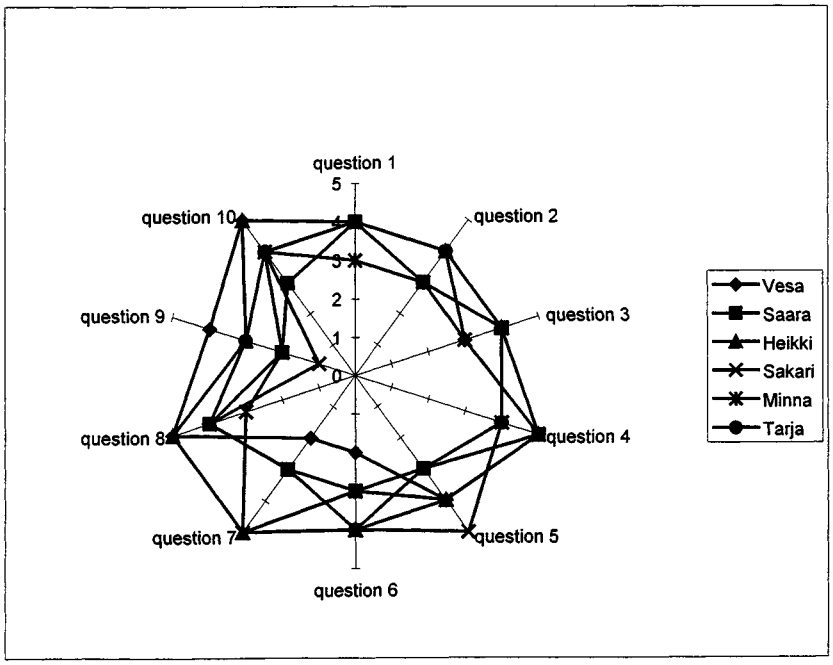


FIGURE 6.1 Students' opinions about the traditional solfège learning.

Everybody had the possibility to learn a lot, which they could use later in their instrumental learning too. Maybe it was "surprisingly" easy to use the computer the first time, but it would still be necessary to have a short 'how-to-use-the-computer' course in advance. Another observation was that it's good to learn the solfège in a course system because then the students concentrate only on that.

The area of melody dictation could get a new role in the quality of developing musical ability. One can see (Table 6.2) the students' observations with regard to the melody dictation.

TABLE 6.2 Students' observations about the dictation for melody.

Dictation for melody		
TRADITIONAL:		COMPUTER-ASSISTED:
piano	*STIMULUS*	synthetic voices
subjective	*DICTATION*	objective
with paper and pencil	*PROCESS*	with computer
by hand	*OUTWARD*	perfect
indirect	*FEEDBACK*	direct
slow	*TRANSPOSITION*	quick

It was also possible to make comments on the opinions without any restriction by the questionnaires. I have gained a lot of important ideas, which can help me in the actual research. Questionnaire B (Table 6.3) shows the questions at the end of the intensive course.

TABLE 6.3

Questionnaire B

1. Your opinion about the intensive solfège course?	5 4 3 2 1
2. Can you profit from what you've learnt in your instrumental career?	5 4 3 2 1
3. How do you like the material of Solfeggio 1?	5 4 3 2 1
4. Was this intensive course enough for the solfège 1 exam?	5 4 3 2 1
5. How do you like the material of the solfège 1 exam?	5 4 3 2 1
6. Did we sing enough during ear-training lessons?	5 4 3 2 1
7. What about playing instruments during solfège lessons?	5 4 3 2 1
8. Did the personality of the teacher influence your solfège learning?	5 4 3 2 1
9.Can you use the computer now?	5 4 3 2 1
10. What about using computers in music learning?	5 4 3 2 1
Scale: 5= very good / well 1= very bad / poorly	

Opinions about the computer-aided solfège learning

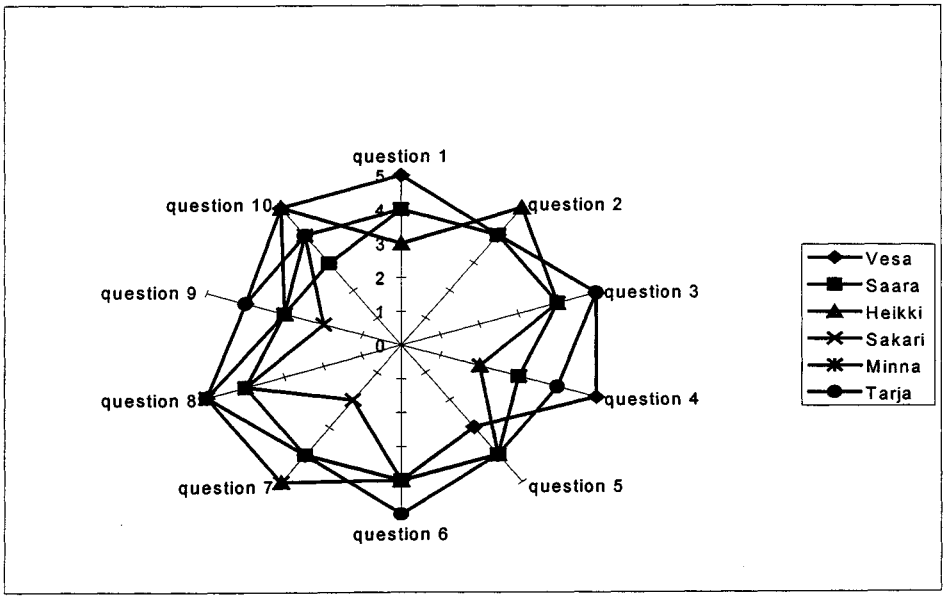


FIGURE 6.2 Students' opinions about the computer-aided solfège learning.

During the school year 1996/97 we followed closely the solfège learning of two music theory groups in the Music College of Länsi-Uusimaa (LUMO), in Finland. The average age of the pupils was 16, suitable for completing high level met cognitive exercises. Insert 6.2 (sp. 84) shows exactly the numbers of testes in the test group. Figure 6.3 demonstrates them typologically.

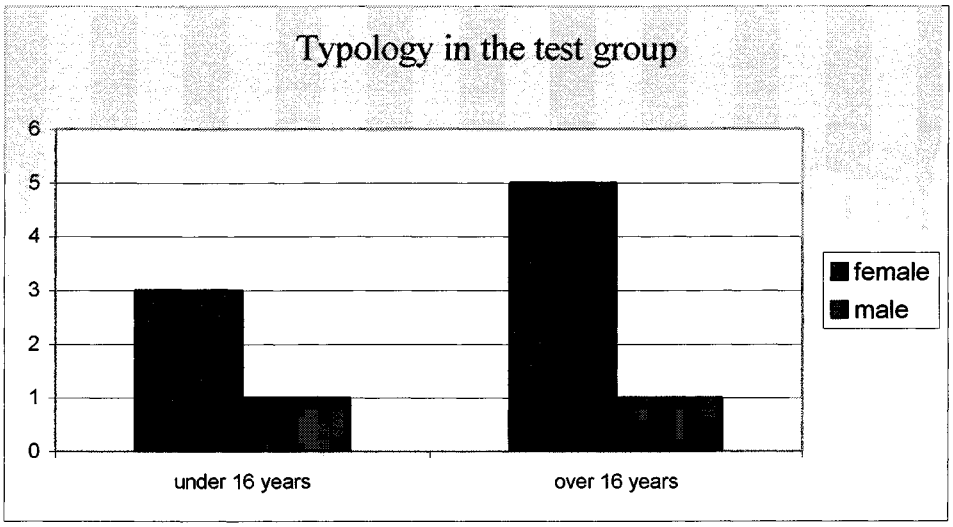


FIGURE 6.3 Typology in case of the test group in Lohja (N=10).

The environment of the test group was a computer lab in Lohja, and the control group was learning in a general classroom with the addition of a computer for assisting the teacher's work in Nummela.

In the test group we had 10 participants, who could use their own learning-basis: ICL (PC 33 SX) computers connected with Sound Blaster interfaces and Yamaha synthetic keyboards. There were 10 participants in the control group, who learned the same material (Solfeggio 1) in a traditional environment, two hours weekly. Insert 6.3 (sp. 85) shows the numbers of testes in the control group. Figure 6.4 shows the data typologically.

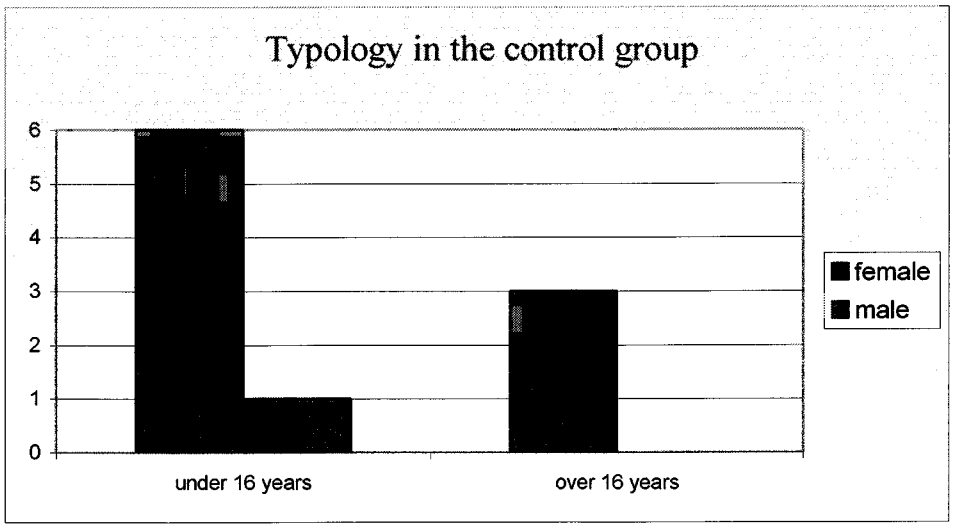


FIGURE 6.4 Typology in case of the control group in Nummela (N=10).

6.3 The problems of the research

1. The theoretical problem of the research was clarifying:
   - The utility of Juhani Karvonen's attitude theory in case of this research
   - The utility of Zoltán Báthory's differentiated model in the computer lab
2. The examination of the pupils' attitudes, motivation, opinions about the solfège education
3. The comparison between the learning outcomes of the students
4. Examining how the new ear-training material work (sp. 83 Ins. 6.1)
5. The suitable environment for solfège learning nowadays

TABLE 6.4

The variables

	Age	Results	Opinions	Attitudes
	1	2	3	4
Testes				
1	14	18	41	75
2	15	24	39	74
3	17	22	45	78
4	15	17	34	76
5	18	22	39	67
6	20	24	36	77
7	19	14	36	68
8	17	24	35	74
9	15	23	38	82
10	17	15	36	73
11	17	16	35	78
12	17	19	38	70
13	14	17	38	81
14	13	18	36	71
15	14	20	38	67
16	14	25	42	74
17	21	20	38	81
18	14	23	40	76
19	14	24	41	73
20	15	23	42	66
X	16	20,4	38,35	74,05
S	2,25	3,44	2,83	4,8

1. Age
2. Results (the summary of all the final exams)
3. Opinions (the summary of all the answers)
4. Attitudes (the summary of all the answers)

TABLE 6.5

The variables in the test group

	Age	Results	Opinion	Attitude
	1	2	3	5
Testes				
1	14	18	41	75
2	15	24	39	74
3	17	22	45	78
4	15	17	34	76
5	18	22	39	67
6	20	24	36	77
7	19	14	36	68
8	17	24	35	74
9	15	23	38	82
10	17	15	36	73
X	16,7	20,3	37,9	74,4
S	1,95	3,92	3,28	4,45

1. Age
2. Results (the summary of all the final exams)
3. Opinions (the summary of all the answers)
4. Attitudes (the summary of all the answers)

One can find the correlation coefficients of the variables in the part of Enclosures. Analysing the result (sp. 114 Encl. 6.1) it looks that the best correlation is (, 4925) between the attitudes and the learning outcomes /N = 20/. Looking separately the groups the correlation in the test group is lower (, 2446), but in the control group is much better (, 9280).

TABLE 6.6

The variables in the control group

	Age	Results	Opinions	Attitudes
	1	2	3	5
Testes				
11	17	16	35	78
12	17	19	38	70
13	14	17	38	81
14	13	18	36	71
15	14	20	38	67
16	14	25	42	74
17	21	20	38	81
18	14	23	40	76
19	14	24	41	73
20	15	23	42	66
$\bar{X}$	15,3	20,5	38,8	73,7
S	2,41	3,1	2,39	5,33

1. Age
2. Results (the summary of all the final exams)
3. Opinions (the summary of all the answers)
4. Attitudes (the summary of all the answers)

6.4 The experimental measures

The heterogeneous ages of pupils were a problem the in measuring (sp. 84-85 Ins. 6.2 & 6.3). This is why the results were analysed always typologically.

Attitudes were examined using the model of 'attitude-differentials' (asennedifferentiaalimittarit) of Juhani Karvonen. The results of the first part of the attitude questions (No. 1 - 6) are described in a 'theoretical attitude-space' consisting of affective, cognitive and active components (Fig. 7.1.1).

We also compared *the opinions* and the motivation of pupils using questionnaires. Pupils' answers to the questionnaires were also analysed statistically. The pupils' opinions about the solfège teaching learning were ascertained by two questionnaires (before the course about the traditional solfège learning, and after the course about the computer-aided solfège method). Pupils' answers to the questionnaires were also analysed statistically.

Analysing the functional and structural parts of their motivation we tried to find the reasons for participation on the course. When measuring *motivation* we looked at the percentage (Fig. 7.2.1).

The *learning results* were measured twice: the placement test was an elementary level one (3/3 PKT level of SML). We used the official material of the state from the year 1993 for it (sp. 86 Ins. 6.4). The final examination was the official material of the solfège 1 examination of SML (Finnish Music-educational Institutes) in 1997 (sp. 87 Ins. 6.5). There was also another problem in the comparison of learning outcomes. The starting and the final level we could not measure with the same type test. So the comparison was not as perfect as it would be.

All the data (sp. 108-113) were examined also statistical with SPSS program. We looked at the results together (N = 20) and also separately in the test group and in the control group. Maybe we got very promising and high alphas in the reliability analysis, but however we have to remember that we had a little random sample, so for analysing of them is not enough would be not clever in this case. Using the SPSS program helped to get accurate means and deviations to do the Figures (Fig. 7.3.1.1). The teacher-researcher herself also used the results of the *personal interviews* in the report. The *teacher's notes* about every lesson were used also in the review. We also recorded by *videotape* the process of the melody dictation at the research.

6.5. Computer-aided melody dictation

Louhivuori examined the learning process of melody in the article of 'Kuinka melodia opitaan?' (Louhivuori 1995, 33-34). Traditionally the solfège education starts with well-known folk songs advancing to more difficult structured music. In this way the pupils' style-knowledge evolves, which is the prior condition of generation. At the same time the tonal assistance-points also develop before long, as the pupils learn the most general music forms.

Because of the development of the process of melody writing, it would be useful to use more and more exercises where the pupils have to complete missing times, phrases, the whole melody. It could be practised e.g. when we give the pupils the assistance sounds (the basic sounds of the melody) and the pupils have to generate the missing parts between the basic sounds. By so doing we could come near to the interpretation-practice of the old music, the ornaments of the slow parts or the diminution-technique of renaissance music.

The systematic practising of typical cadenzas would also be a big help in the development of the note writing-ability. Developing the teaching of melody dictation would be more all-rounded and systematic to help progress the pupils' musical abilities - which are necessary to melodic writing - in a well-balanced manner.

The most important task would be the development of the ability to generate, knowing exactly the writing-strategies and taking the pupils' individual divergences into consideration to a greater extent. With the help of the computer program that was developed at this research in Jyväskylä the teachers are able to have a look at the pupils' melodic writing-style and they can continue to develop systematically the pupils' ability to write melody.

The following comparative example presents the method of the melody dictation in the computer lab and in the traditional classroom if the teacher has one computer. Analysing also the pupils' comments of this process argue their interviews about it.

Table 6.2 summarised the opinions of the university students about the melody dictation traditionally and assisted with the computer. In the research the pupils of the Music College confirmed almost the same.

Table 6.7 demonstrates the process of a melody dictation in the research. We also recorded it by videotape for analysing. The learning-teaching method was common task type. Both groups in Nummela and in Lohja started to learn about the Renaissance. The pupils had an exercise paper (Fig.6.5).

The madrigal score was in three parts. The pupils and the middle part by the teacher sang two of them. The task was to develop sight-reading and memory together. At the same time the pupils had to sing and learn by heart the middle part.

In Lohja the computer played the whole score all the time. On the one hand it is much easier to sing with the help of the machine, on the other hand it helps to recognise the whole material from the beginning. When correcting the exercise papers we saw that the results were better when using the computer. There is another reason, too: the pupils can listen back to what they write, so the correction can be done.

Table 6.7 shows the exact timetable of the melody dictation. The process of melody dictation was easier and quicker with the computer. The 'writing strategy' was different. Those pupils who are 'handy' using the notation program wrote directly for the exercise paper of the own computer. Others wrote first to the paper and then they wrote also for the computer to listen to.

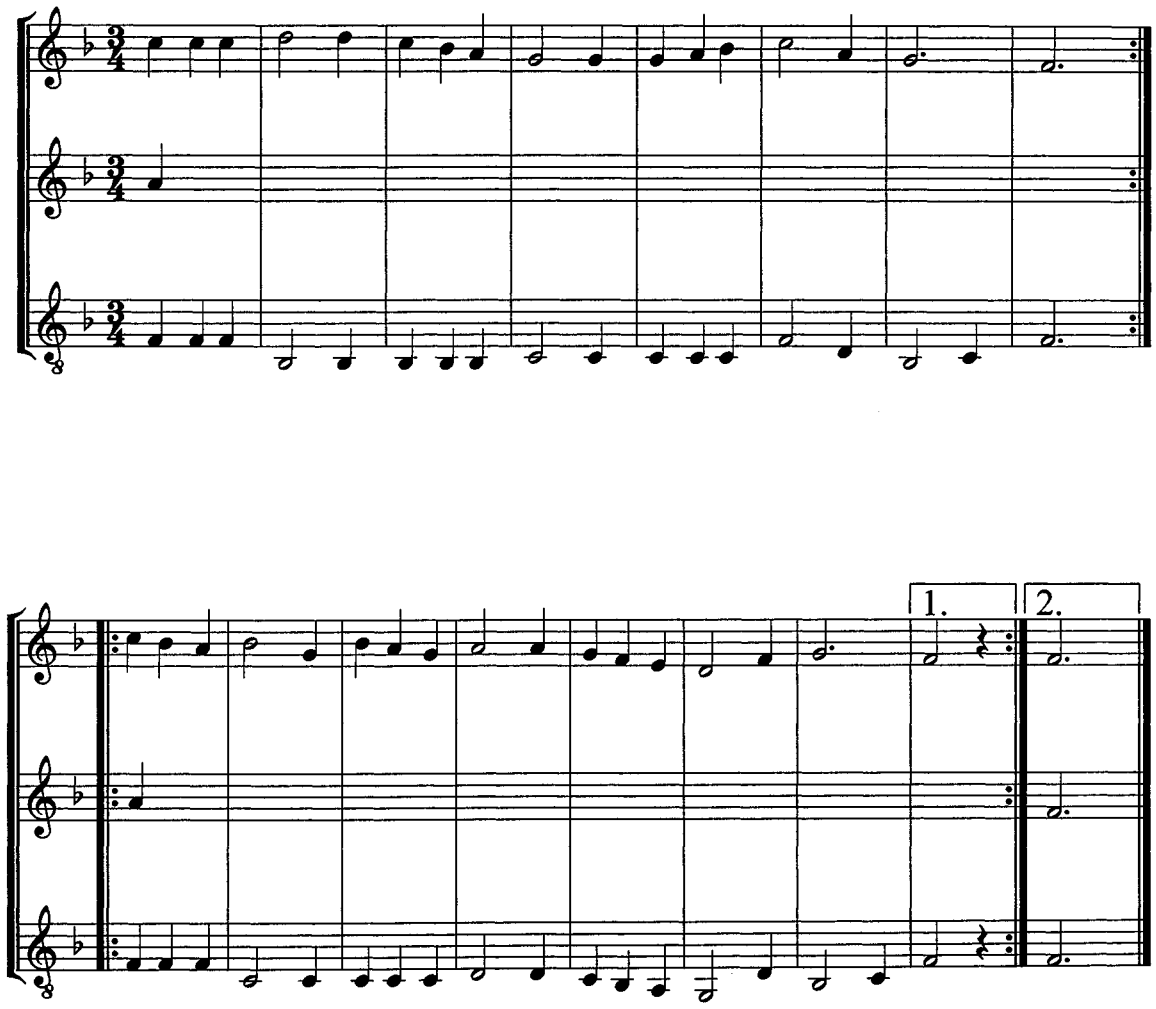


FIGURE 6.5 The task paper of the melody dictation.

TABLE 6.7

The process of the melody dictation

		Traditional		
	Pupils		*Teacher*	
I.	Tenor	Tenor		
II.	Tenor	Tenor	Mezzo	Mezzo
III.	Soprano	Soprano		
IV.	Soprano	Soprano	Mezzo	Mezzo
V.	Tenor + Soprano	Tenor + Soprano		
VI.	Tenor + Soprano	Tenor + Soprano	Mezzo	Mezzo

		Computer-assisted				
	Pupils		*Teacher*		*Computer*	
I.	Tenor	Tenor		Mezzo	Score	Score
II.	Soprano	Soprano		Mezzo	Score	Score
III.	Tenor + Soprano	Tenor + Soprano		Mezzo	Score	Score
IV.	Tenor + Soprano	Tenor + Soprano	Mezzo	Mezzo	Score	Score

The process of computer-aided melody dictation is more effective, faster and easier than the traditional one.

Everybody liked the possibility of the direct feedback for controlling what he or she wrote. This also means that the outcomes were better as in the traditional environment where pupils are not able listen to what they wrote.

The next task was to transpose the material to alto clefs. It can be quite a tiring exercise with pencil and paper. It takes a lot of time. With a computer it is easy and quick to do, plus the presentation is perfect.

Homework is never compulsory only if they have time, the mind and the interest to do it. In order for the students to be motivated the homework must be sufficiently interesting. Pupils wrote their own poems to set to the madrigal for the next lesson. The pupils did a lot of excellent work. We sang all of them and chose together the best work in a competition. The notes were written in our new clefs. The didactical 'learning-by-doing' method worked perfectly. The environment was pleasantly motivating (*singing our own madrigals*) we learned the new clefs without tiresome verbal explanations.

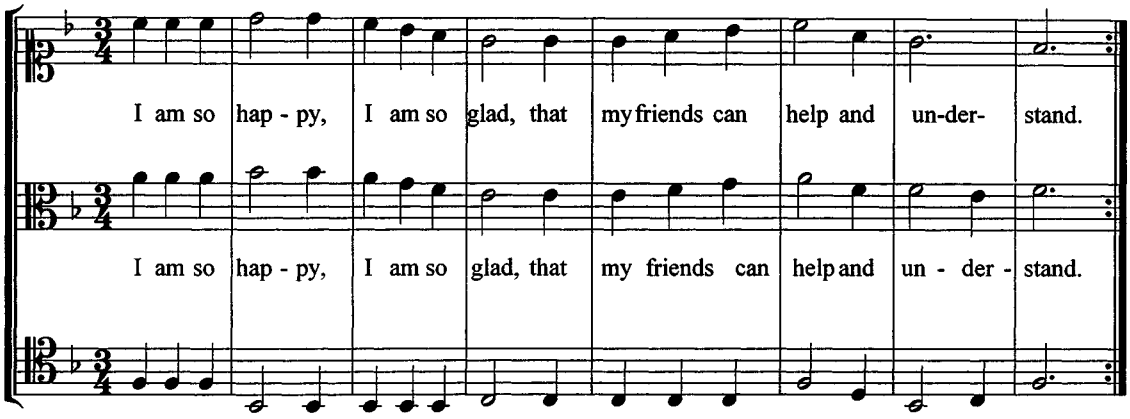
The task of the next solfège lesson was: let's sing the madrigal in the original key. In the same lesson we also sang by 'jumping' the score (starting with the tenor, continuing with another voice immediately, etc.). They enjoyed this exercise as much and they practised in little groups too. After the preparations everything went well, yet everybody knew what a difficult task we had completed successfully. We did not need any help from the computer. At the end of the lesson all the groups sang the madrigal with the real note names in soprano, alto and tenor clefs.

During the following week we were participants in a pupil-matinee. The winners received valuable scores from the Head of the music school and beautiful roses from the Parents' Association. We sang the first madrigal a cappella, the second accompanied by a guitar. The violinists' played the third madrigal pizzicato and in the fourth madrigal singing came together with a chamber group (Fig 6.6).

For the social aspect of learning this performance was also very important.

MADRIGAL

Words : Leili Guseinova



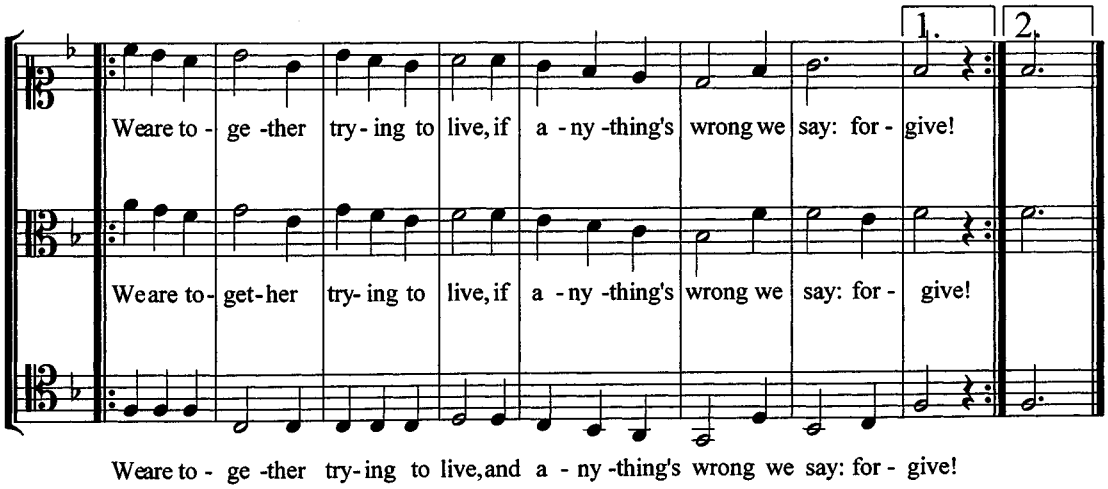


FIGURE 6.6 The winner madrigal.

7 THE RESULTS

7.1 Attitude

7.1.1 First part of the attitude arguments (No. 1 - 6)

Attitudes were examined using the measurements of the "attitude-differential":

I. To measure *the affective component* the following adjective pairs were used: pleasant - unpleasant

II. To measure *the cognitive component* the following adjective pairs were used: useful -detrimental

III. To measure *the active component* the following idiomatic pairs were used: supported - opposed

The attitude questionnaires were served as a model of Juhani Karvonen (sp. 88-101 Ins. 7.1.1 & Ins. 7.1.2). Fig. 7.1.1 shows the attitudes of the test group towards:

- Changing in the solfège education
- Reforms in the music school

The scale of answers was between 1 and 7 in the first part of attitudes. The means of the attitude components were usually higher for the younger pupils. When justifying the results the strongest component is that of cognitive attitude. However, the weakest component was the active one, which was connected to intention to take part in the reality.

In Fig 7.1.2 the attitude of the control group was a little weaker across all the questions. However, the attitudes of the older pupils (over 16 years) were more positive than those of younger pupils (under 16 years) in the control group. It looks that pupils 'knows' and 'feel' very well the importance of reforms, but they are not as much interested to 'participant' in the realisation of them.

TABLE 7.1.1

The attitude-answers in the test group (No. 1-6)

	"A"	"K"	"T"	"A"	"K"	"T"
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
A	7	7	7	6	7	6
A	7	7	6	6	6	6
A	5	6	5	6	6	6
A	7	6	6	6	7	6
B	5	7	6	6	6	7
B	4	4	6	6	5	5
B	6	5	6	6	6	4
B	5	5	5	5	7	6
B	4	5	7	7	7	7
B	6	6	6	6	6	5

"A" = affective
"K" = cognitive
"T" = active

The means and the deviations of the attitudes typologically in the test group

A	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**
X	6,5	6,5	6	6	6,5	6
S	1	0,58	0,82	0	0,58	0
B						
X	5	5,67	6	6	6,17	5,6
S	0,89	1,03	0,82	0,63	0,75	0,89

TABLE 7.1.2

The attitude-answers in the control group (No. 1-6)

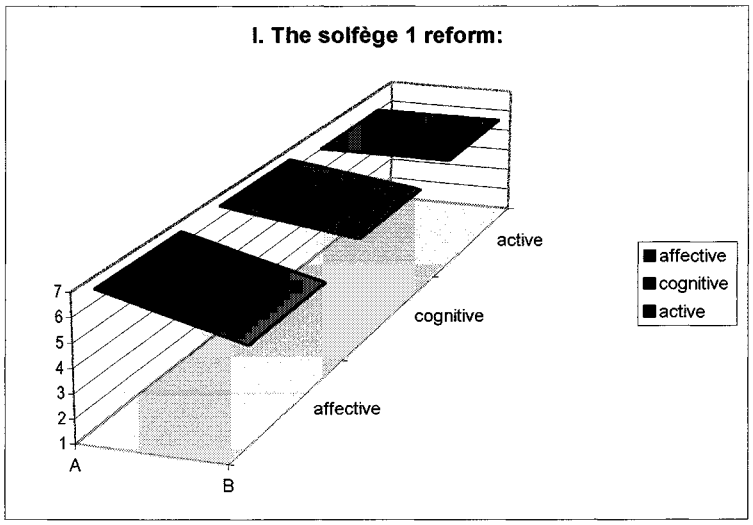
	"A"	"K"	"T"	"A"	"K"	"T"
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
A	5	6	5	5	6	7
A	6	6	4	5	5	5
A	5	5	4	5	5	5
A	5	5	4	5	5	7
A	6	7	6	6	7	7
A	4	4	4	4	5	6
A	5	6	6	5	5	6
B	5	5	6	6	5	7
B	3	4	4	6	6	5
B	6	7	7	7	7	6

"A" = affective
"K" = cognitive
"T" = active

The means and the deviations of the attitudes typologically in the control group

A	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**
X	5,14	5,57	4,71	5	5,43	6
S	0,69	0.98	0,95	0,58	0,79	1
B						
X	4,67	5,33	5,67	6,33	6	6
S	1,53	1,53	1,53	0,58	1	1

Affective:	Cognitive:	Active:
Pleasant = 7	*Useful = 7*	*Supported = 7*
Unpleasant = 1	*Detrimental = 1*	*Opposed = 1*



A = Younger pupils
B = Older pupils

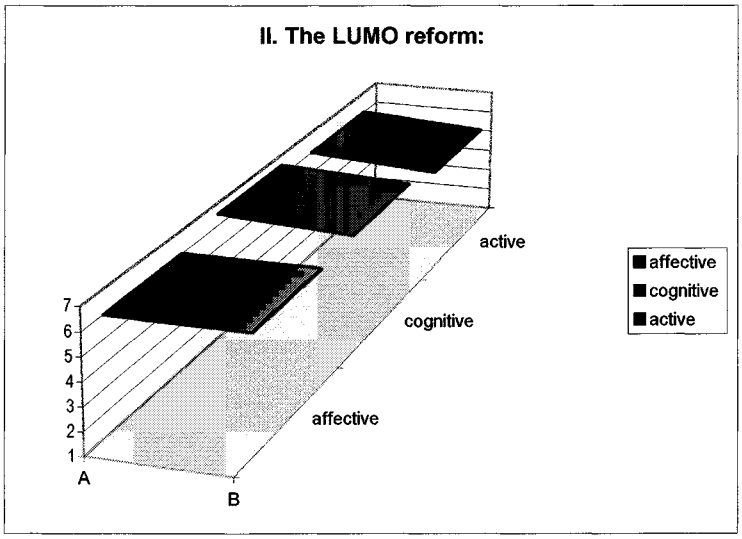
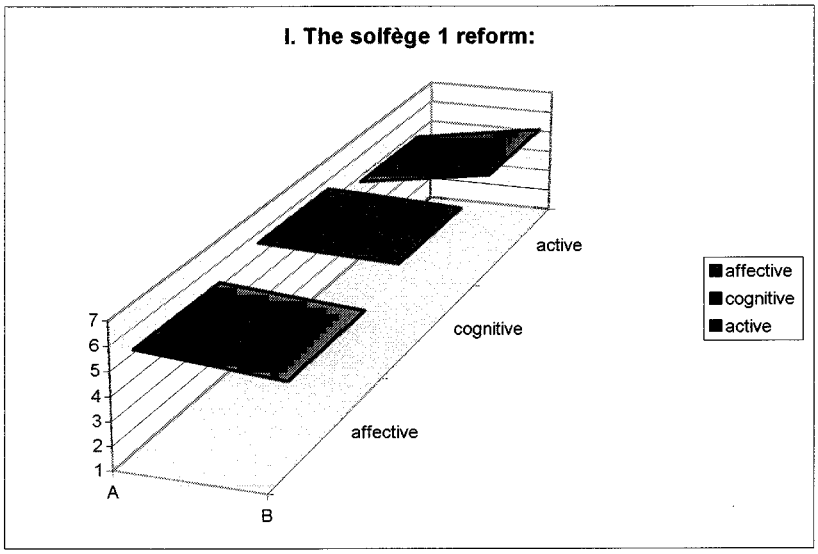


FIGURE 7.1.1 The attitudes of the test group.

Affective:	Cognitive:	Active:
Pleasant = 7	*Useful = 7*	*Supported = 7*
Unpleasant = 1	*Detrimental = 1*	*Oppose d= 1*



A = Younger pupils
B = Older pupils

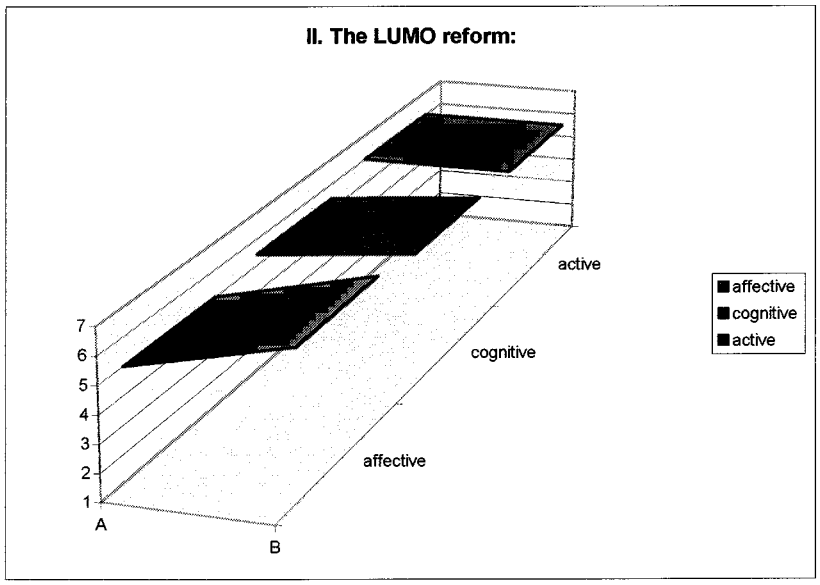


FIGURE 7.1.2 The attitudes of the control group.

7.1.2 Second part of the attitude arguments (No. 7 - 19)

We also used the critical comments of the pilot test results, when planning the 'negative' assertions in the second part of attitude arguments (sp. 45 No. 8 9 11 16). Analysing the second part of the attitude arguments (No. 7 - 18) pupils had to react to the different claims. Scale of the answers was between 5 (my opinion is exactly the same) and 1 (I think just the opposite).

No. 7 Everybody needs their own computer during the solfège lessons.
The test group was more positive. The younger pupils are not sure, but most of the older pupils were of the same opinion.

No. 8 It is enough if the teacher has one.
The test group opposed the claim. The control group was again uncertain.

No. 9 It is enough to sing during the solfège lessons; it is not necessary to use the computer.
Unanimously all of them thought the opposite.

No. 10 It is also better to play our instruments during the solfège lessons, not only to sing.
The younger pupils in the test group were exactly of the same mind. The older both in the test and in the control groups had the same opinion. Only the younger pupils in the control group were not sure if it was better or not.

No. 11 The computer kills the "life" of music.
The pupils under 16 years in the test group did not know the answer. The control group agreed with the statement.

No. 12 Pupils are more interested than in the traditional solfège lessons.
The younger pupils of the test group were of the same mind, the control group was not so sure. I would like to mention here that the attitude was perhaps influenced by the possibility of using own computer basis in the learning process.

No. 13 Abilities develop better with the computer-aided music teaching.
The younger pupils in the test group agreed, the others did not know.

No. 14 The computer voice is unnatural, which disturbs perception.
The younger pupils of the test group held the opposite view, the older ones were not sure. In the control group the older pupils agreed, and the younger ones were not sure. From my experience, the older the student, the stronger the prejudice against "novelty", in this case against the computer-aided experiment. I would suggest that learning and the successful examination of solfège 1 course depends very much on earlier solfège knowledge. If the starting level is quite bad, plus the use of computers unknown, these two elements can demotivate students.

I think using the computer in solfège lesson can be too late when started at the middle level. It would be best at the first level on the 1/3 basic course, when music theory material is also easy. Everybody could learn the fundamentals of music and of using computers playfully.

No. 15 The changeable colour-tones offer more many-sided stimuli to one's perception.
The younger pupils agreed. The older ones of the control group were not sure, and in the test group the older ones' opinion was the same.

No. 16 The computer cannot make music.
The younger pupils of the test group felt the opposite. All the others were not sure. Some of them also wrote comments here. According to one of the older pupils in the test group:
" It depends on what you are expecting from the computer." "Why do you expect to make music with a machine? The computer is only a support to help my learning process. It is our job to sing music and play our instruments. Do not expect too much from this new technical instrument. We use the computer to accelerate and to facilitate the process of our learning, namely in some of the phases of the solfège lessons." I share this opinion. First of all we were interested to find the possible forms and methods - where and how we can use the computer in our solfège learning process successfully - in this period.

No. 17 The computer is a good aid, because of its accuracy and precision.
All the students thought exactly the same. The younger pupils of the control group supported the claim totally.

No. 18 It is better to have a computer course before the computer-aided solfège studies.
Everybody would like it. In the LUMO (Länsi-Uudenmaan Musiikkiopisto) we organised a computer course for the teachers and also for the pupils to learn how to use the Encore computer music program. At the same time we started to reform the music theory teaching from the beginning. We had organised the 1/3 PKT groups on the strengths of the students' expectations. Pupils decided themselves if they wanted to learn music theory in a traditional environment or in the computer classroom. 90 % of the beginners chose the computer-aided learning.

However, it was possible for everybody to try and work with the computer. The results of this experiment show that writing music is much easier with the assistance of a computer. Traditionally, it is a problem for young students to learn how to write musical notation.

Notes written by computer are not only easy to see, but they also form an attractive picture, which inspires pupils to want to write more. It was an important observation that those pupils who first wrote notes with the computer later wrote more pleasant and more exact notes by hand than somebody starting a new exercise book. All the beginners already made their own compositions by the 7^{th} week of learning. It was the 10^{th} week when we used the composer to transpose our melodies to another key.

Transposing is normally a very difficult task to learn. It is usually a slow and tiresome process for beginners in traditional methods. The new technique gives quite the opposite experience. The reason could be that the note of a computer is "tuneful material".

The audio-visual reinforcement was a very motivating element during the learning process. The task changed immediately to being interesting and practical

for everybody. It was another positive moment when the pupils who were afraid of using the computers at the beginning, later also wanted to try it. The early fear dispersed for the first time for everybody when they realised that using the music program was not as difficult as they had previously thought.

The "learning by doing" method of learning is an excellent system in computer-aided music learning. Pupils find their time is purposeful during music theory learning, because every time everybody can have a real sense of achievement actively, which can reinforce the realisation of the learning process.

It seems the Encore music program is just right for the music tasks of the pupils. It is good that almost without any technical knowledge anybody can use it with the control of the teacher. My hypothesis is that starting music theory learning in a suitable computer lab obviates the need for a computer technical course beforehand. Preparation time by the teacher for the lessons certainly increases, because preparing the exercises needs a lot of time before the lessons. Nowadays you cannot find enough ready material in the data shops. If the material is in a foreign language it is not the best for a little child at the beginning.

The success of the teaching-learning process depends on the teacher's qualifications and enthusiasm. Using the computer is never compulsory. It seems the best way if "expert" pupils use it. A study pair can also learn a lot passively from the beginning of the process, keeping an eye on a partner's work.

No. 19 I think the solfège learning with the computer is...
The last statement allowed pupils to complete it in their own words. Are computer-aided solfège learning more perceptible, easier and more motivating or not? Two pupils chose the "easier" answer; six thought that it was "more perceptible" and eight answered that computer assisted solfège learning was more motivating than the traditional way. It must be said that the pupils of the test group had an advantage over the control group. We started using the computer classroom five years before this research in Lohja. It was really the first computer to be used in music theory teaching in Nummela.

TABLE 7.1.3

All the attitudes typologically

Claim	*A*	*A*	*A*	*A*	A	A	A	A	A	A	A	*B*	*B*	*B*	*B*	*B*	*B*	B	B	B
1	7	7	5	7	5	6	5	5	6	4	5	5	4	6	5	4	6	5	3	6
2	7	7	6	6	6	6	5	5	7	4	6	7	4	6	6	4	6	5	4	7
3	7	6	5	6	5	4	4	4	6	4	6	5	4	5	5	5	6	6	4	7
4	6	6	6	6	5	5	5	5	6	4	5	6	6	6	5	7	6	6	6	7
5	7	6	6	7	6	5	5	5	7	5	5	6	5	6	7	7	6	5	6	7
6	6	6	6	6	7	5	5	7	7	6	6	7	5	4	6	7	5	7	5	6
7	4	2	4	4	4	4	2	3	3	3	4	4	3	4	4	3	4	5	2	3
8	2	2	2	3	3	2	4	4	3	4	3	2	1	4	2	2	3	3	4	3
9	1	2	3	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	4	2
10	5	4	4	5	5	4	4	5	4	4	4	4	5	2	4	4	5	5	3	5
11	2	3	4	5	5	3	5	4	3	5	3	4	4	1	3	3	4	4	4	4
12	4	4	3	4	3	3	2	3	4	2	3	3	3	3	4	3	3	3	3	4
13	3	4	3	4	3	3	3	3	3	3	4	3	4	5	4	4	3	3	3	3
14	2	2	3	2	5	4	2	4	2	5	3	4	4	1	3	3	3	4	4	3
15	3	4	4	4	4	4	4	4	3	4	3	4	4	3	3	3	4	4	3	3
16	2	3	4	2	5	3	2	3	2	3	3	3	4	2	3	4	3	2	4	3
17	4	4	3	4	4	4	5	4	4	2	4	4	3	5	4	4	4	5	4	4
18	3	2	5	4	4	4	3	4	4	4	4	5	2	2	4	4	4	4	4	4

The "magic of novelty" is an important factor - I think - because the pupils of the control group in Nummela wrote so many comments for this question. Their experiences were: the computer is different, good, something else, more changeable, not always machine dictation, more interesting. The comments of the test group were: it is very positive, that the computer gives a chance for individual learning, practise for the students.

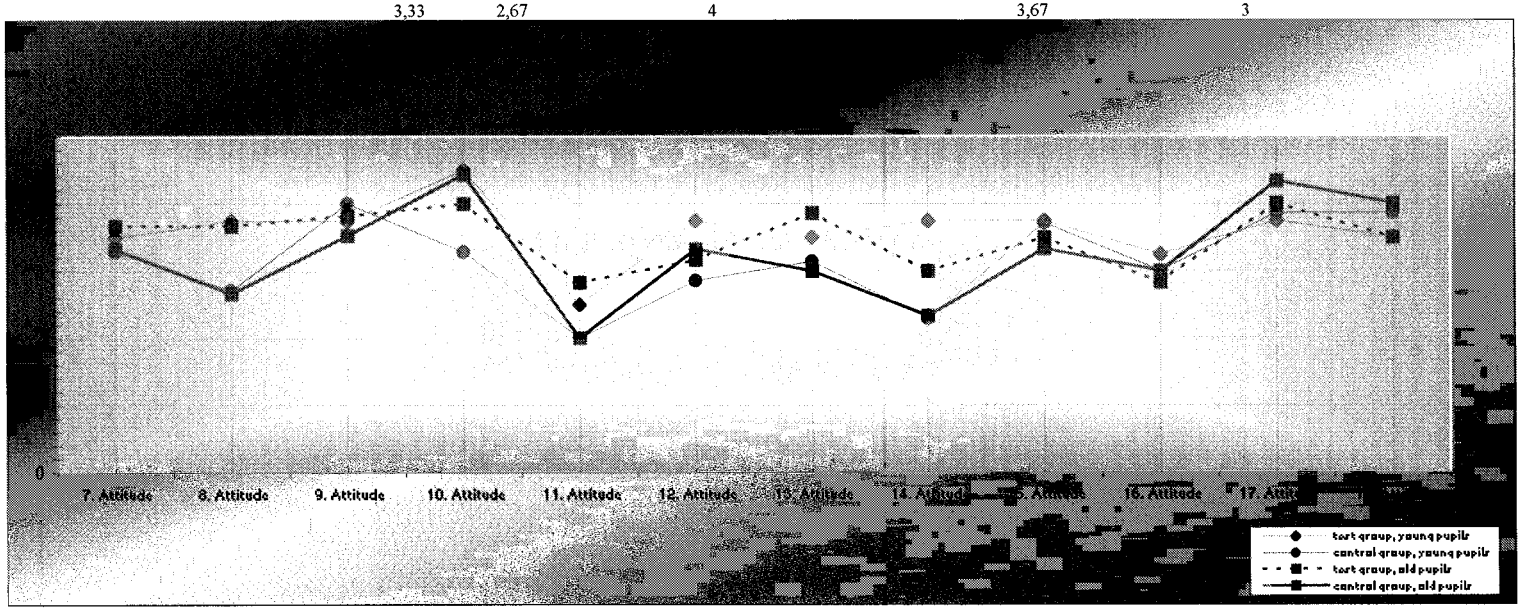
This is the most important comment of all. This reinforces the view that we can develop the satisfaction of pupils in the computer classroom. Because of the computer as a support, in the process of teaching learning our method is more flexible in this new environment, where all the students have their own working-basis.

FIGURE 7.1.3 The attitudes typologically (No. 7 - 18).

	7. Attitude	8. Attitude	9. Attitude	10. Attitude	11. Attitude	12. Attitude	13. Attitude	14. Attitude	15. Attitude	16. Attitude	17. Attitude	18. Attitude
test group, young pupils	3,5	3,75	3,75	4,5	2,5	3,75	3,5	3,75	3,75	3,25	3,75	3,5
control group, young pupils	3,29	2,71	4	3,29	2	2,86	3,14	2,29	3,71	3	3,86	3,86
test group, old pupils	3,67	3,67	3,83	4	2,83	3,17	3,86	3	3,5	2,83	4	3,5
control group, old pupils	3,33	2,67	3,53	4,44	2	3,33	3	2,33	3,33	3	4,33	4

Recoded:

	8. Attitude	9. Attitude	11. Attitude	14. Attitude	16. Attitude
	2,25	2,25	3,5	2,25	2,75
	3,29	2	4	3,71	3
	2,33	2,17	3,17	3	3,17
	3,33	2,67	4	3,67	3



The scale of the answers:

5= my opinion is exactly the same

1= I think just the opposite

7.2 Motivation

TABLE 7.2.1

		Sum	AKM	BKM	AVM	BVM
A	1. I was interested in computer-aided solfège learning.	**2**	0	1	0	1
I	2. I wanted to see what the point of the course was.	**3**	1	0	0	2
O	3. I want to get all kinds of knowledge about music.	**12**	3	3	3	3
I	4. I wanted to make myself master the solfège 1 course.	**17**	4	4	6	3
A	5. I participated in the course because music-learners educate themselves.	**15**	3	4	6	2
O	6. I want to know more about music.	**8**	2	2	3	1
E	7. My parents wanted my participation in the course.	**0**	0	0	0	0
E	8. I participated in the course because my friends also did so.	**1**	0	0	0	1

Functions:

A= appreciation function
I= instrumental function
O= orientation function
E= expressional function

The *appreciation* functions were measured by the claims:

- No. 1 I was interested in computer-aided solfège learning.
- No. 5 I participated in the course because music learners educate themselves.

The *instrumental* functions were measured by the claims:

- No. 2 I wanted to see what the point of the course was.
- No. 4 I wanted to make myself master the solfège 1 course.

The *expressional* functions were measured by the claims:

- No. 7 My parents wanted my participation in the course.
- No. 8 I participated in the course because my friends did so.

The *orientation* functions were measured by the claims:

- No. 3 I want to get all kinds of knowledge about music.
- No. 6 I want to know more about music.

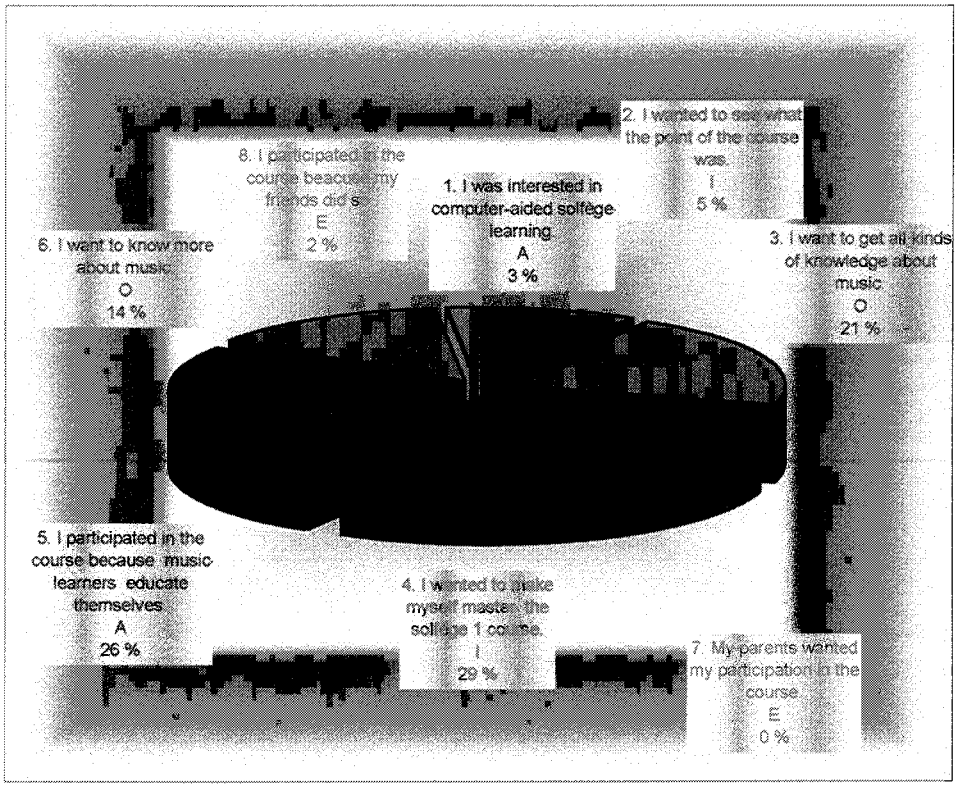


FIGURE 7.2.1 The reasons for participation on the solfège 1 course.

The most important reason for motivation was instrumental, to do well in the examination of the solfège 1 course (29 %). Sharing almost the same importance was "the music learner must educate himself/herself" opinion, which stresses the appreciation function (26 %). The orientation function also got a high percentage, as the pupils want to get all kinds of knowledge about music.

It seems that the expressional functions are not so strong in students of these ages. Usually at a basic level, when the students are only 10, they participate in a music theory course in several cases, because their parents want it or their friends are in the same group. This factor is less important later as they get older.

To summarise: the functional result of the motivations changes in quality at the middle level of music learning. One can find the questionnaires of motivation on the page 102 (Ins. 7.2.1) and on the page 103 (Ins. 7.2.2).

7.3 Opinions

Opinions of the first grade solfège learning

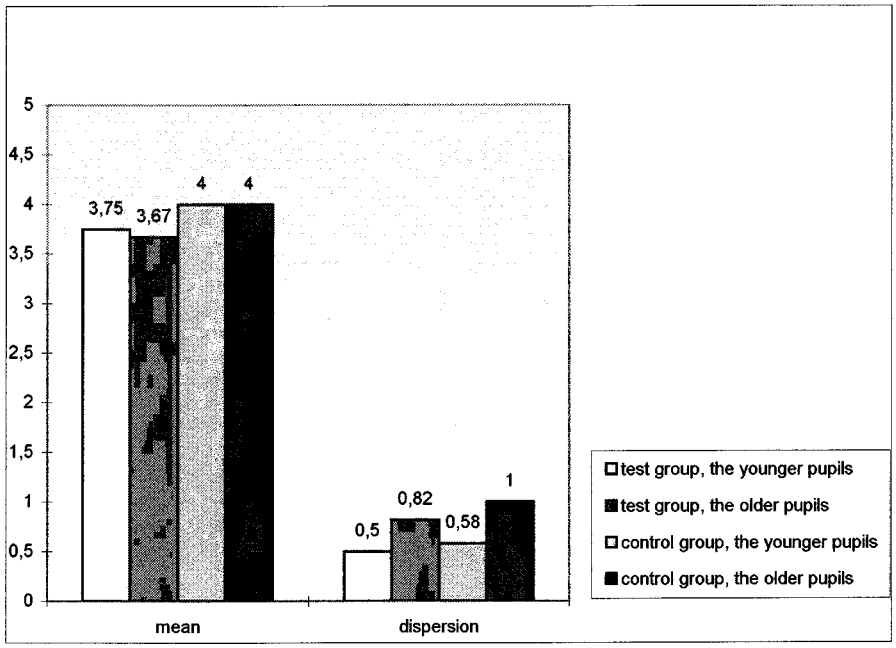


FIGURE 7.3.1.1 The general opinion of solfège before the course.

Both groups completed an opinion-questionnaire before and after the course. Questionnaire A (Table 6.1) was interested in the pupils' opinions of the earlier solfège learning at the basic level (first grade solfège learning). Questionnaire B (Table 6.3) tried to find out the opinions about the learning of the solfège 1 course at the middle level (secondary solfège learning).

Opinions of the secondary solfège learning

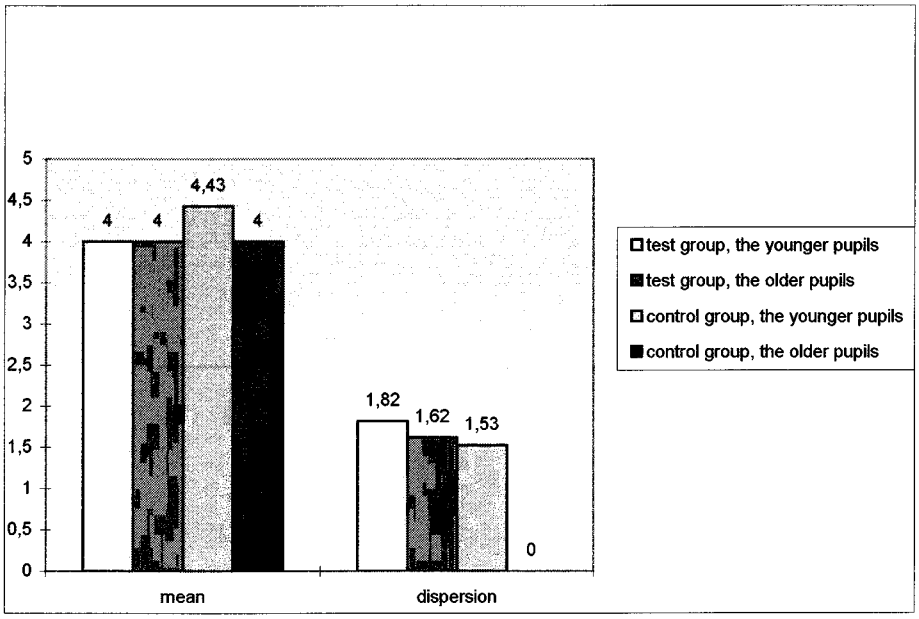


FIGURE 7.3.1.2 The general opinion of solfège after the course.

The Questionnaires and all the answers one can also compare with the help of Ins. 7.3.3 and Ins. 7.3.4 (sp. 106-107).

Question 1 (Fig. 7.3.1) shows that pupils had a good opinion of the earlier solfège learning, which is better after the solfège 1 course.

Question 2 (Fig. 7.3.2) asks how they can profit from their solfège knowledge in their instrumental development. Most of them claim that the situation is the other way round.

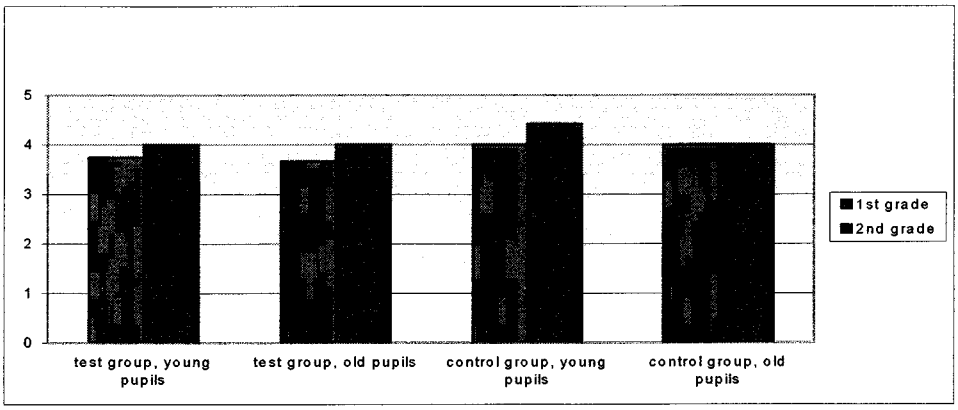


FIGURE 7.3.1 The Opinions (Question 1).

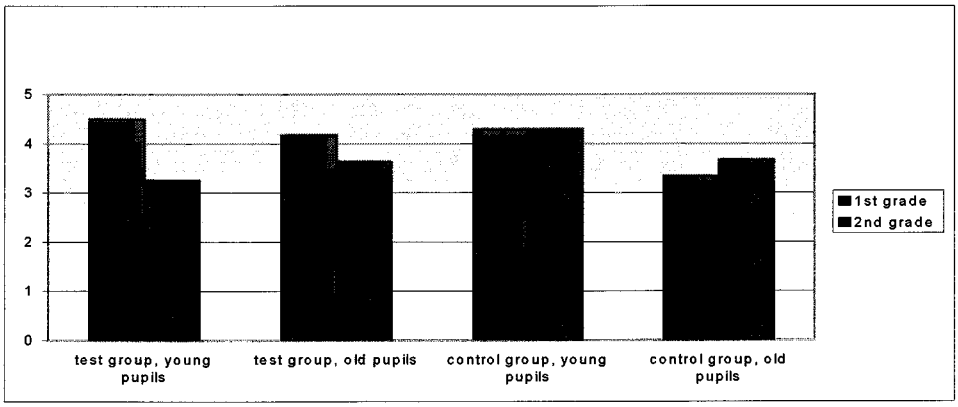


FIGURE 7.3.2 The Opinions (Question 2).

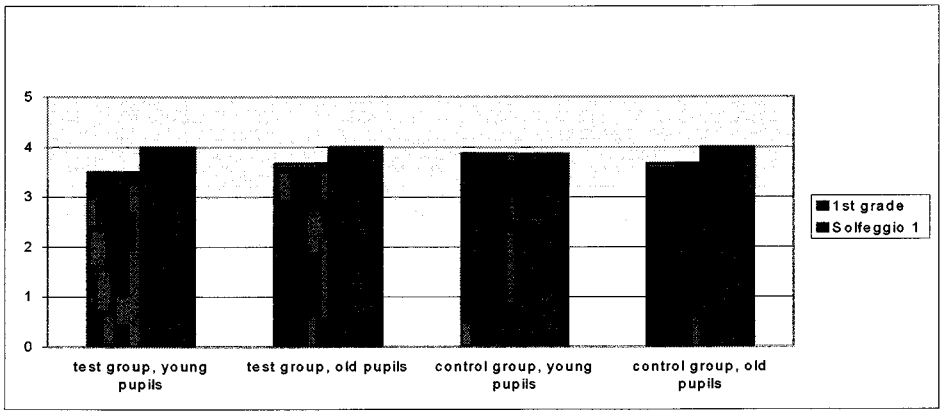


FIGURE 7.3.3 The Opinions (Question 3).

The instrumental knowledge helps the solfège learning. However pupils are not sure that the solfège learning can help enough in their instrumental career. It is a very important reflection: when reforming music education it would be necessary to remember this when planning new aims and objectives. Music theory teaching has to serve instrumental learning and not vice versa.

Question 3 (Fig. 7.3.3) wants to know the opinions about the solfège learning materials. The new material Solfeggio 1 (solfège material for computer aided learning) was welcomer than that tried earlier. The reason could be, because of the possibility of using it also individually for every student. This material is selected from "the pearls" of music history. All the exercises seek to extend the pupils' skills in musical styles (sp.83 Ins. 6.1).

The main profile of the traditional solfège teaching is developing the ear for music mostly in a linear way. In this material the aim is to concentrate on developing the ear for music in a vertical way (choirs, scores, etc.). The examples are also suitable for the music analysis of the theory 1 course of SML.

Question 4 (Fig. 7.3.4) looks at how long we have to prepare for the solfège examination. Most pupils answered that for the basic courses it was enough to use one year in their cases.

The older pupils of the control group told of their difficulties during this course. The reason could be that they tried to do the basic exams too quickly when they were still very young. After that they did not learn any theory and had forgotten a lot of what they had learned earlier.

According to the pupils' opinion it would be very important to learn music theory continuously. The problem is that it is not always that simple. It depends on the financial situation of the music institute as well.

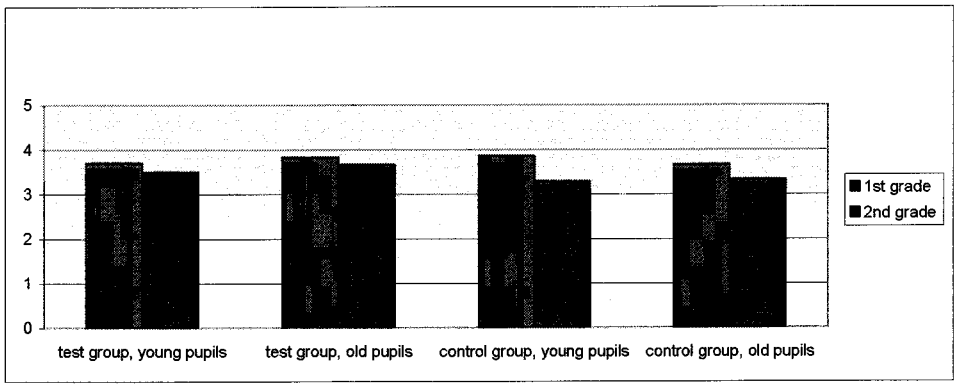


FIGURE 7.3.4 The Opinions (Question 4).

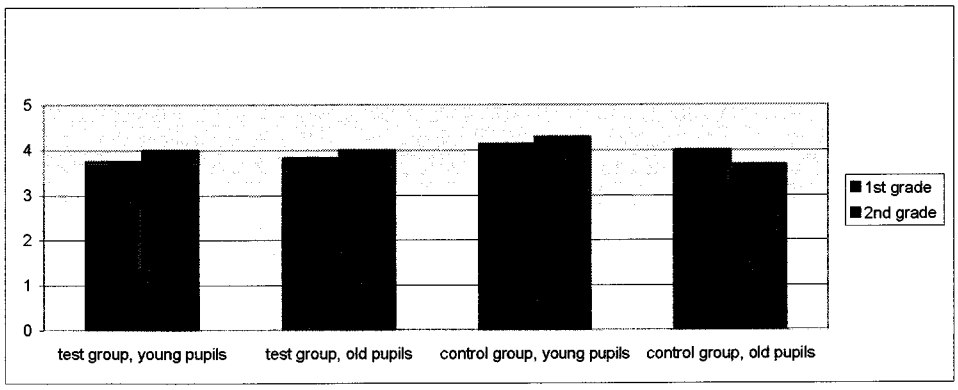


FIGURE 7.3.5 The Opinions (Question 5).

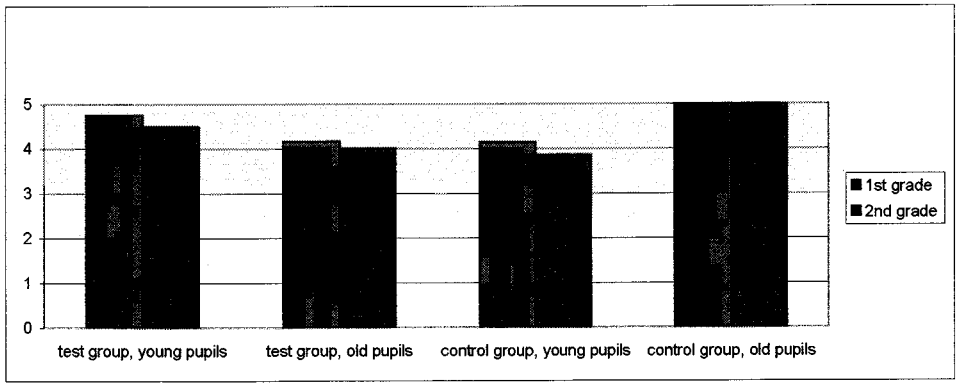


FIGURE 7.3.6 The Opinions (Question 6).

According to general opinion the most ideal situation would be to organise courses for two years in case of basic music theory learning. If that is not possible we must think about starting the music theory learning later, when students understand better the difficult music terms of theory.
Question 5 (Fig. 7.3.5) shows that pupils are satisfied with the materials of the examinations both at the basic and the middle level. The younger pupils preferred the test-material of the solfège 1 course as before.
Answers to *Question 6* (Fig. 7.3.6) show that in the pupils' mind we were singing quite a lot in the solfège lessons. Maybe it would be better to sing more.

Usually the most important task type the sight singing is in the examination. In the melody dictation it is enough if the half of it is right. It is not enough to sing only 'well' in the sight-singing test. The sight singing must be totally exact and musical. So we have to practise it as much as possible.
In *Question 7* (Fig. 7.3.7) we were interested in whether they wanted to play more on their own instruments in the solfège lessons. The most positive answer came from the younger pupils of the control group. We had more time for playing in Nummela, because they did not have their own computers for practising. So we first of all introduced the exercises of the Solfeggio 1 book "live" more than in Lohja.
The answer to *Question 8* (Fig.7.3.8) was the same in every group. The personality of the teacher influences the success of the teaching-learning process. If the teacher is well motivated and interested himself/herself it is really an excellent feeling to learn because he/she can help to iron out the difficulties.

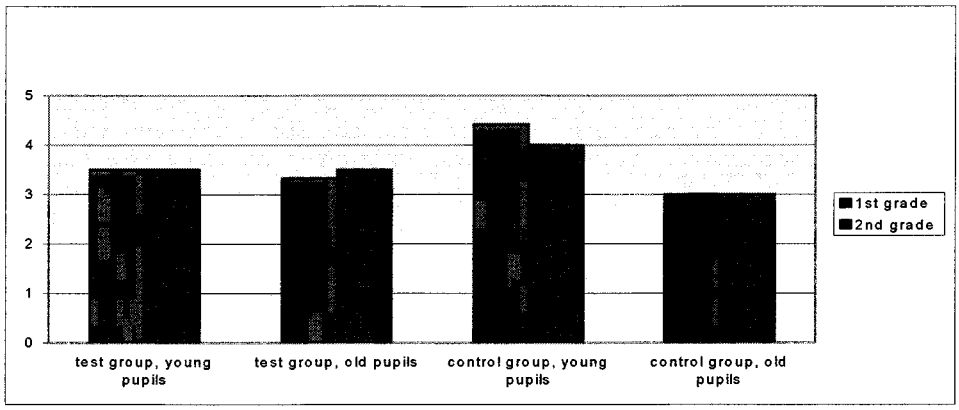


FIGURE 7.3.7 The Opinions (Question 7).

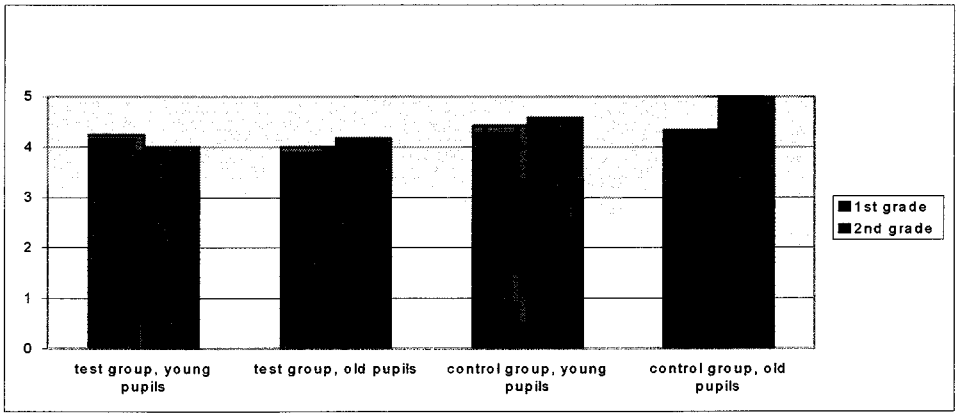


FIGURE 7.3.8 The Opinions (Question 8).

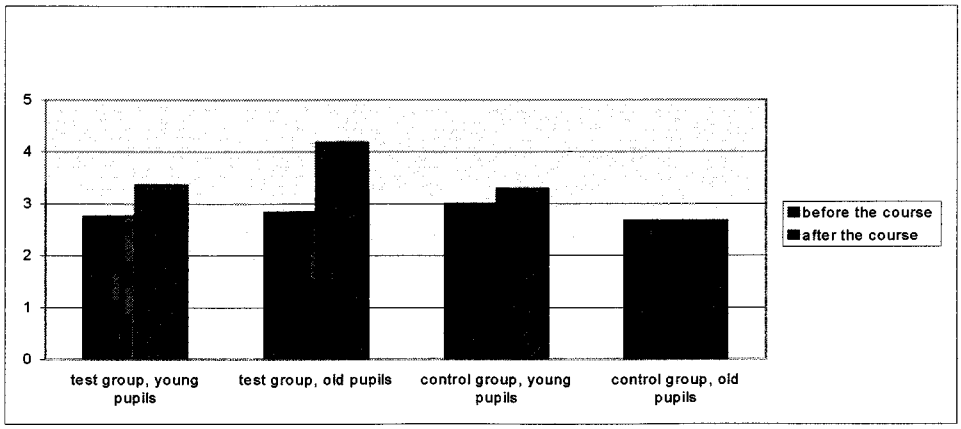


FIGURE 7.3.9 The Opinions (Question 9).

Question 9 (Fig. 7.3.9) sought to ascertain how well they could use the computer. The test group said at the beginning "not well". After the course the answer was usually more positive.

In the measurements of the older pupils before the course the mean was 2.8 and this developed after the course to 4.17. The most important development happened in this group. They had the possibility of using the Encore music program all the time and they really learned very quickly and well how to use it.

The mean of the control group was 3.0, but this was not better at the end of the course. We tried a little bit to learn the basic technical elements of the music program using our one computer. All the students had the possibility of trying to write with the computer. However, it was not enough using only one machine for 10 pupils at the same time. The opinion of the control group was that there was not enough development to speak of.

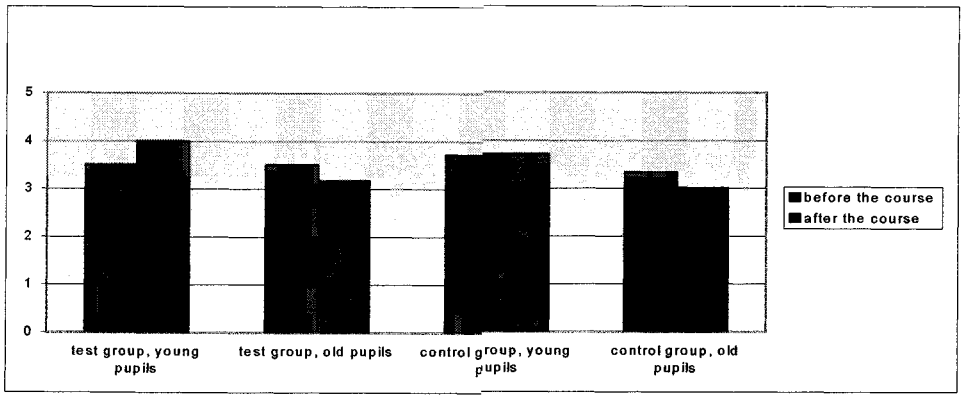


FIGURE 7.3.10 The Opinions (Question 10).

Question 10 (Fig. 7.3.10) was aimed at the future. The answers of the test group were again more positive than in the control group. Working with the computer needs time and a peaceful environment. If we are busy we can make lots of errors. The best is if pupils can work individually or with a work-partner.

P=placement test
E=exam

	1		2		3		4		5		6		7		8		9		10	
	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E	P	E
Dictations:		K.Emmi		H.Emmi		G.Leili		M.Reetta		R.Johanna		S.Teppo		S.Saara		K.Anna		V.Janne		L.Anna
1. Rhythm	4	**4 1/2**	5	**5**	4	**4**	5	**4**	5	**5**	5	**5**	5	**4**	5	**5**	5	**5**	5	**5**
2. Intervals	3 1/2	**3**	4 1/2	**5**	4	**4**	2 1/2	**3 1/2**	3 1/2	**4**	5	**4 1/2**	2 1/2	**1 1/2**	4 1/2	**5**	3 1/2	**5**	2	**2**
3. Chords	4 1/2	**4 1/2**	5	**5**	5	**5**	4 1/2	**3**	5	**4 1/2**	5	**4 1/2**	1 1/2	**3**	4 1/2	**5**	3 1/2	**4 1/2**	2	**2**
4. Cadences	3 1/2	**3 1/2**	4 1/2	**4 1/2**	5	**4 1/2**	2	**2 1/2**	4 1/2	**4 1/2**	5	**5**	4	**3**	5	**4 1/2**	3 1/2	**4**	3 1/2	**2 1/2**
5. Melody	2 1/2	**2 1/2**	5	**4 1/2**	5	**5**	4	**4**	3 1/2	**4 1/2**	5	**5**	3	**3**	5	**5**	5	**5**	4	**4**
	18	**18**	24	**24**	23	**22 1/2**	18	**17**	21 1/2	**22 1/2**	25	**24**	16	**14 1/2**	24	**24 1/2**	20 1/2	**23 1/2**	16 1/2	**15 1/2**

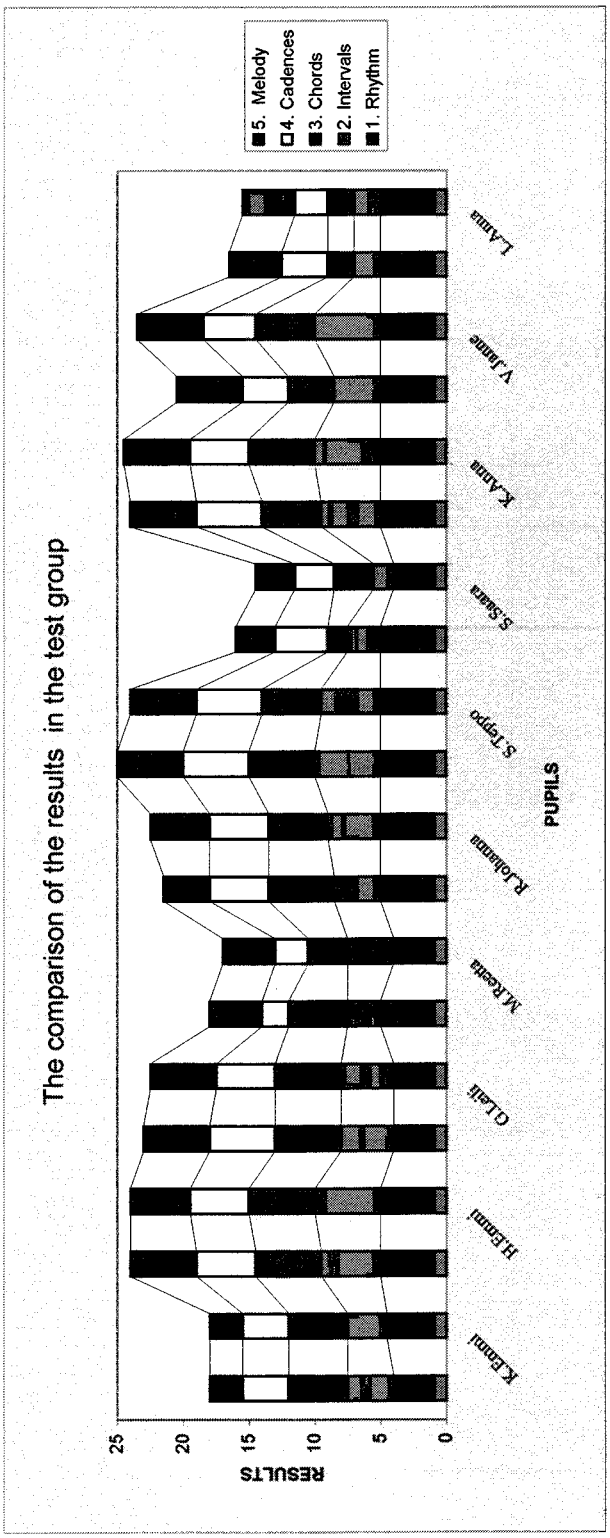


FIGURE 7.4.1 The comparison of the exam-results in the test group (N = 10).

P=placement test
E=exam

	1		2		3		4		5		6		7		8		9		10	
	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**	P	**E**
Dictations:		H.Karoliina		K.Lilli		K.Tanja		K.Tuuli		L.Helmi		R.Riitta-L		R.Tanja		S.Essi		V-K.Touko		Ö.Maija
1 .Rhythm	5	**4 1/2**	5	**4 1/2**	4	**5**	5	**5**	5	**5**	5	**5**	5	**5**	5	**4 1/2**	4	**5**	5	**5**
2. Intervals	4	**3 1/2**	5	**4 1/2**	3	**3 1/2**	4 1/2	**2 1/2**	2	**3**	5	**5**	3 1/2	**3 1/2**	2	**3 1/2**	4 1/2	**4 1/2**	3 1/2	**4 1/2**
3. Chords	4 1/2	**3**	4	**3 1/2**	4 1/2	**4**	4	**4 1/2**	3	**5**	5	**5**	3 1/2	**4 1/2**	2 1/2	**5**	4	**5**	4	**4**
4. Cadences	2	**2 1/2**	4	**4**	4	**2**	4 1/2	**2**	3	**3**	5	**5**	4 1/2	**4**	3	**4 1/2**	5	**5**	3	**2 1/2**
5. Melody	4	**3**	5	**3**	2	**3**	4 1/2	**4 1/2**	4 1/2	**4 1/2**	5	**5**	2 1/2	**3**	5	**5**	4 1/2	**5**	4 1/2	**4 1/2**
	19 1/2	**16 1/2**	23	**19 1/2**	17 1/2	**17 1/2**	22 1/2	**18 1/2**	17 1/2	**20 1/2**	25	**25**	19	**20**	17 1/2	**22 1/2**	22	**24 1/2**	20	**20 1/2**

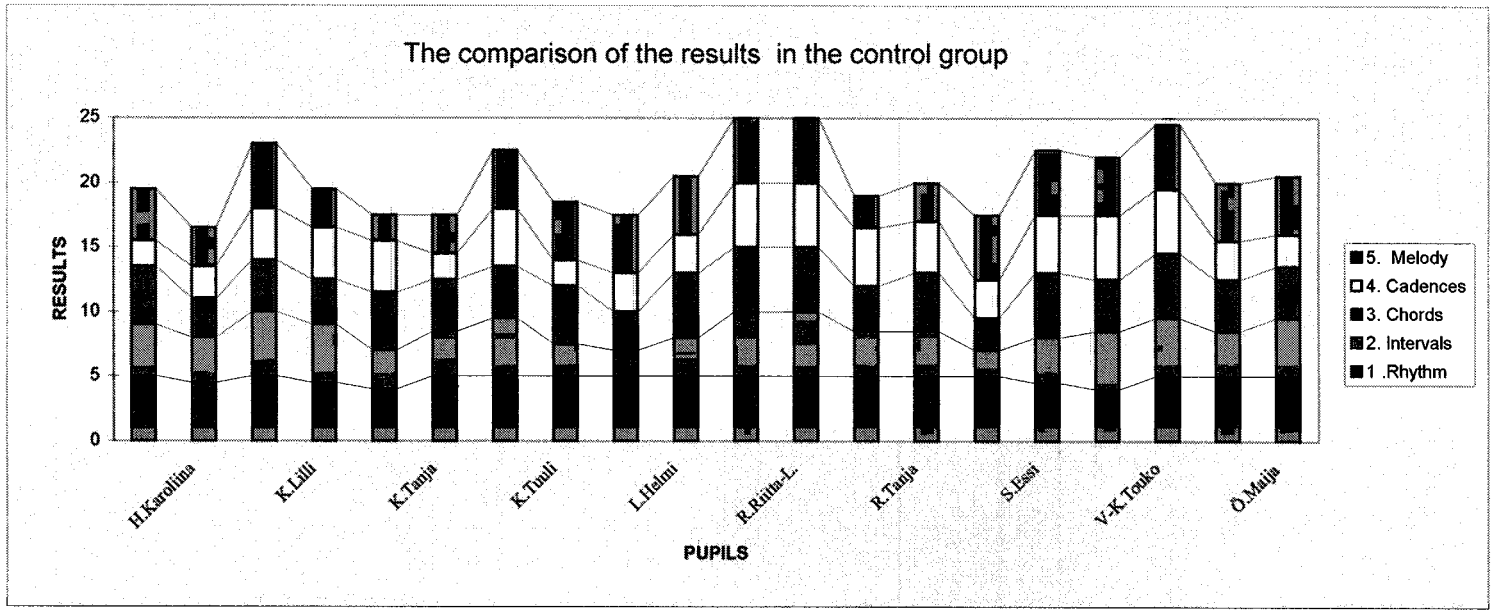


FIGURE 7.4.2 The comparison of the exam-results in the control group (N = 10).

7.4 Result of the examinations

The material of the placement test was from the SML (Finnish Music-educational Institutes). This 3/3 PKT (basic level examination) was an official material in Finland (sp. 86 Ins. 6.4). The material of the final examination was also from the SML (sp. 87 Ins. 6.5), the exam of the solfège 1 course at the middle level.

The *rhythm*-dictation was already the best from the beginning. In the middle level the notation is a little more difficult, but there are no new aspects, the task is only to practise the diminution or augmentation of the well-known old elements. The mean of the placement test was 4.8 and the final exam was nearly as good X=4.75.

The biggest development happened in the *chord*-dictation. At basic level they have to differentiate between the four chords plus the dominant 7 in root position. In the solfège 1 we practise their inversions. The mean of the placement test was 3.97 and in the final exam 4.22.

Aural training is more difficult and needs much more time than with the computer. We had interesting exercises in the computer classroom. E.g. the tonic is given and everybody tries to write for the computer the missing sounds of the chord. The teacher plays on the piano and the pupils write and listen to what they wrote. The possibility of correcting is direct. The exercises were fun and easy as the pupils commented, they enjoyed them.

We used some other exercises too. E.g. the pupil can practise the intervals individually too. The work picture of the computer shows only one sound, but plays both of them. Pupils can listen to the intervals as much as they want to find out what the other sound is. They can write the other sound for the computer and listen to whether or not it needs correcting.

In the *interval*-dictation we used the same method successfully. Recognising intervals is usually more difficult for students than recognising chords. Maybe there are more possibilities from which they have to decide what they hear.

At the basic level we have to practise the intervals of tonic to perfect 4^{th}, 5^{th} and octaves and the major and the minor 2^{nd}, 3rd, 6th, 7th and the triton. Plus at the middle level the major and the minor 9^{th}, 10th. The placement test was 3.6 and the exam 3.78. Perhaps the most difficult task is the cadences. It can be a problem for a lot of pupils at the 3/3 PKT exams too. The cause of this problem I think is in the basic theory teaching.

It would be better to start to teach the chords earlier in music theory. To sing real chords is not required in music theory teaching. I think it would be necessary to reform this. A lot of pupils do not remember the chords or the inversions, not even their functions. It is not the task at middle level to teach them. Could it be possible that there is not enough time to teach everything at basic level in one year?

If the basic music theoretical elements are uncertain how can we expect brilliant and secure chord perception in live music (ELMU) in the solfège 1 course? In my own practice I start to teach chords at the beginning of the 1/3 PKT basic course. It means the chord is not only 'D' (major) or 'm' (minor), but we use the signs e.g. C and Cm too.

The *cadence*-dictation in the 3/3 PKT establishes knowledge of the basic functions (I-IV-V). Usually they get three chords in every task to realise. The subdominant can also be II6. Sometimes the median (VI) can appear after the tonic or at the end, before the dominant I in a quaint position. Then the dominant can be V or V7 or V8-7.Usually those pupils who know the basic elements of the basic theory material well have no problems with the cadences.

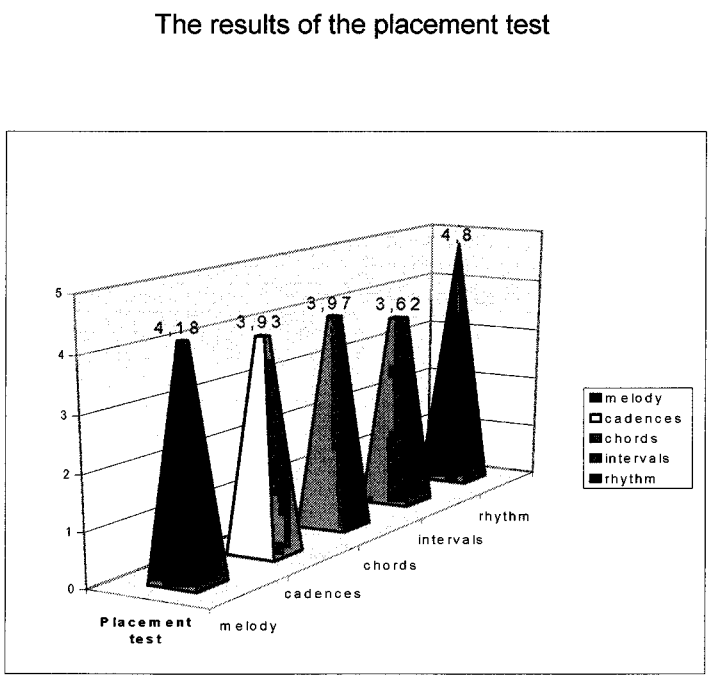


FIGURE 7.4.3.1 The means of the placement tests (N = 20).

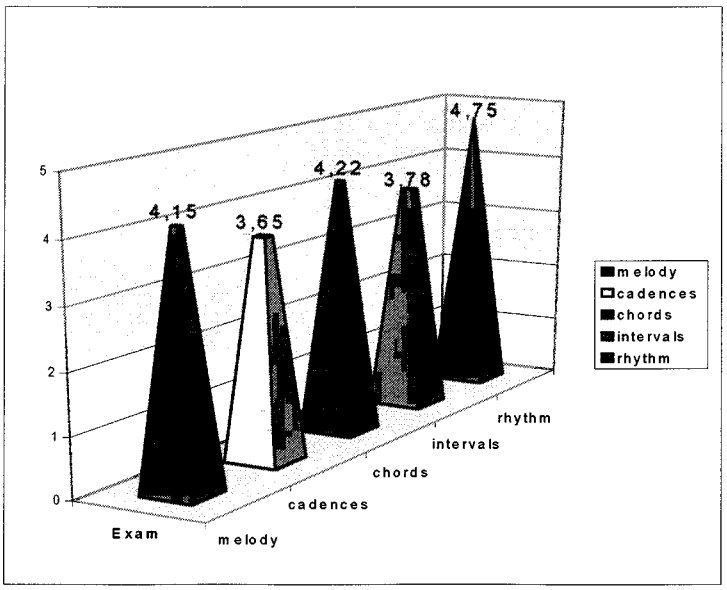


FIGURE 7.4.3.2 The means of the exams (N = 20).

In Finland traditionally instrumental teachers want their pupils to learn solfège 1 course for the first time during the middle level, and only then they go on to the theory 1 course. My opinion is that the opposite would be better. The 'real' level of ear training would be much better if students knew what the intermediate-dominant and the "*tierce de Picardie*" were and so on. First they should learn well all the chords in the theory 1 course and then it would be the 'ideal' time to try to recognise them by ear. The cadence-dictation was still quite good in the exams of the research. The mean of the placement test was 3.93 and the exam 3.78.

The dictation of the *melody* was as good in the placement test as in the final exam. We sang a lot, which underlies the success in this case. We first analysed the sigh reading tasks. We looked at the typical elements of musical style, which musical form and chords were used, etc. We tried to change the training possibilities as much as possible. We used the solmization a lot, but not always. If the song was very quick or not just right for the solmization we sang with 'la-la' for instance. It was also a kind of practising when somebody played us his/her instrument and then we sang again.

Singing without the solmization (e.g. there were too many modulations or it was atonal) we used two systems. First we practised the difficult intervals, by singing only the difficult intervals and later the pupils remembered them. The other way was to create "anchor-sounds" for the difficult part of the sight-reading. First we sang with the " anchor-sounds" and then we concentrated only on those.

Analysing all the exam-results together (Fig. 7.4.3) we cannot find too big differences. The true is that their comparison is not the most excellent idea, because the question is two different levels. Anyway we get a little better picture about the outcomes in the focus of typology.

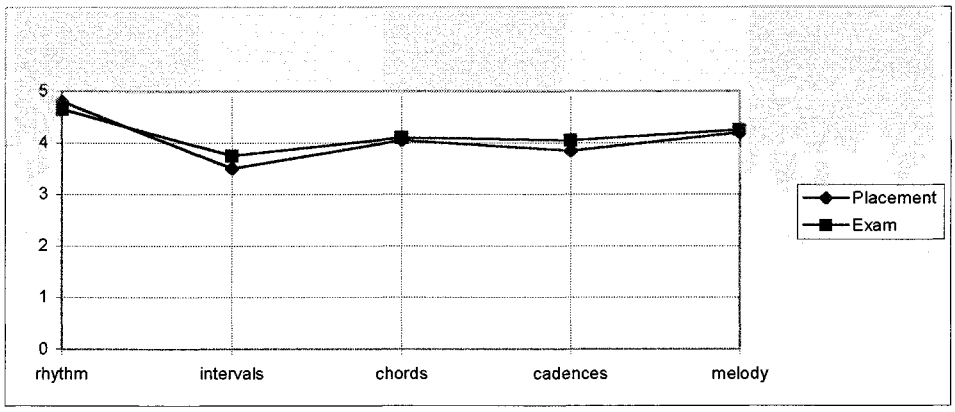


FIGURE 7.4.4 The exam-result of the test group (N = 10).

In case of the control group the chords are better in the final, but the cadences are worse than in the placement test. In the test group the pupils had the possibility not only of using their own computer, but also to play on their own keyboard, which is a very big help e.g. in practising cadences.

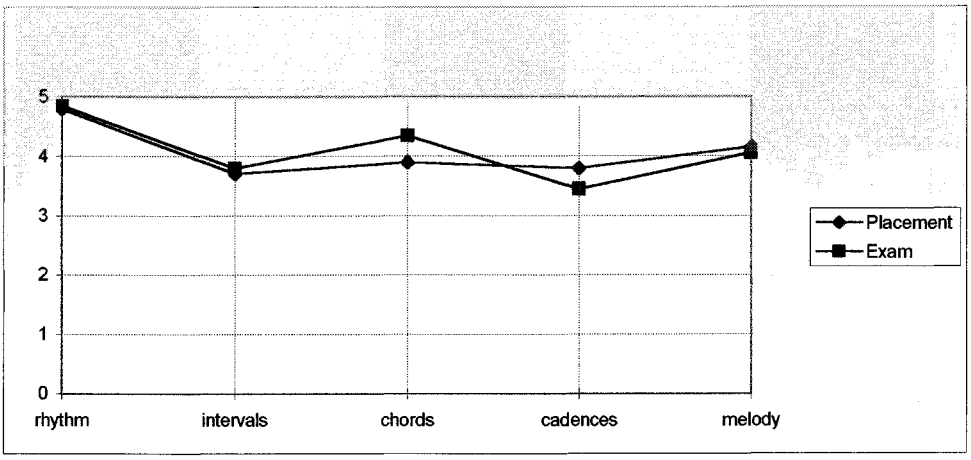


FIGURE 7.4.5 The exam-results of the control group (N = 10).

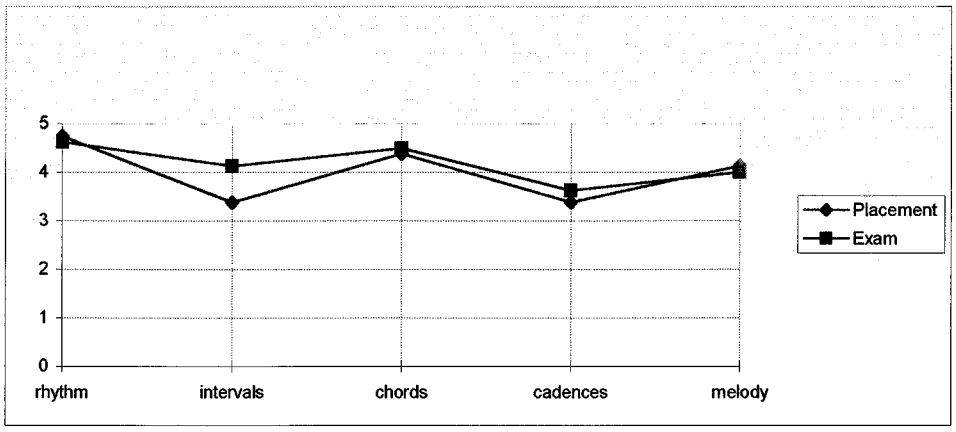


FIGURE 7.4.6 The younger pupils' exam-results of the test group (under 16).

In the test group we had a lot of couple training too. One played and the other listened. Then they could change round. Those who were not so good at playing the piano could use the computer examples to listen to the exercises.

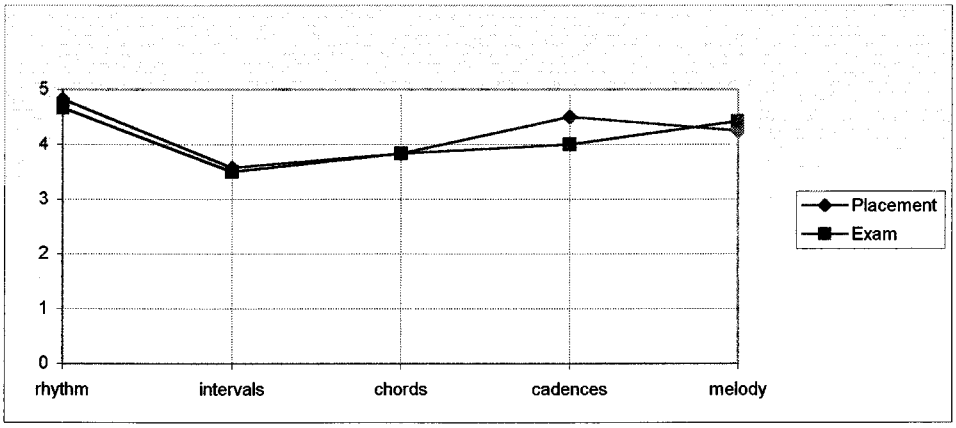


FIGURE 7.4.7 The older pupils' exam-results of the test group (over 16).

At the same time the possibilities in a traditional solfège lesson are really very insignificant. The pupils of the control group can only play at home, and the efficiency of that is not promising on the evidence of the cadences results.

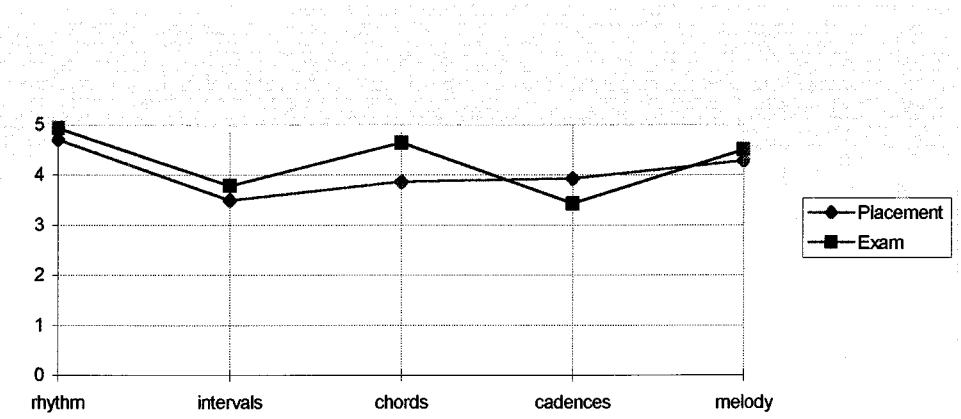


FIGURE 7.4.8 The younger pupils' exam-results of the control group (under 16).

Looking at the four typical figures (Fig. 7.4.6 and Fig. 7.4.9) it seems that the learning process was better in case of the younger pupils.

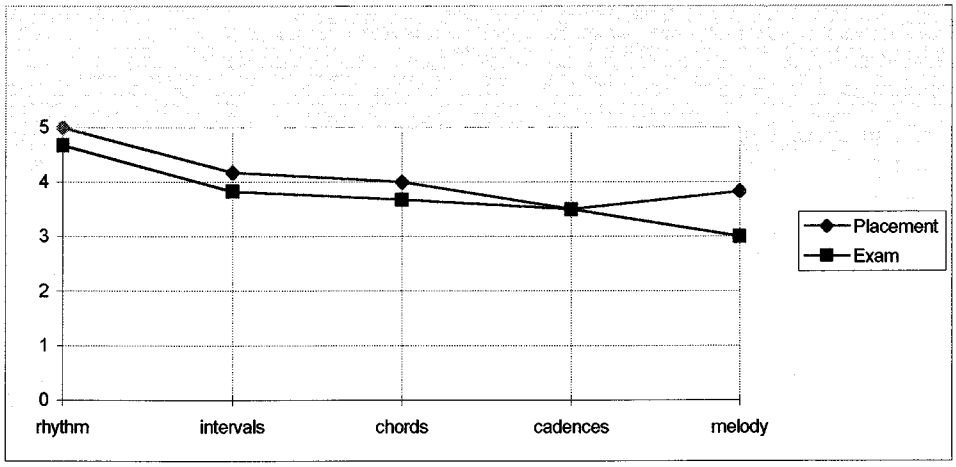


FIGURE 7.4.9 The older pupils' exam-results of the control group (over 16).

TABLE 7.4.1 All the results of the final examinations typologically.

	Rhythm		*Intervals*		*Chords*		*Cadences*		*Melody*		
Testes	Placement	**Exam**	Placement	**Exam**	Placement	**Exam**	Placement	**Exam**	Placement	**Exam**	Originally:
TAT	4	**4.5**	3.5	**3**	4.5	**4.5**	3.5	**3.5**	2.5	**2.5**	1st test
TAT	5	**5**	4.5	**5**	5	**5**	4.5	**4.5**	5	**4.5**	2nd test
TAT	5	**4**	2	**3.5**	4.5	**4**	2	**2.5**	4	**4**	4th test
TAP	5	**5**	3.5	**5**	3.5	**4.5**	3.5	**4**	5	**5**	9th test
TBT	4	**4**	4	**4**	5	**5**	5	**4.5**	5	**5**	3rd test
TBT	5	**5**	3.5	**4**	5	**4.5**	4.5	**4.5**	3.5	**4.5**	5th test
TBT	5	**4**	2.5	**1.5**	1.5	**3**	4	**3**	3	**3**	7th test
TBT	5	**5**	4.5	**5**	4.5	**4**	5	**4.5**	5	**5**	8th test
TBT	5	**5**	2	**2**	2	**2**	3.5	**2.5**	4	**4**	10th test
TBP	5	**5**	5	**4.5**	5	**4.5**	5	**5**	5	**5**	6th test
TVAT	4	**5**	3	**3.5**	4.5	**4**	4	**2**	2	**3**	3rd control
TVAT	5	**5**	4.5	**2.5**	4	**4.5**	4.5	**2**	4.5	**4.5**	4th control
TVAT	5	**5**	2	**3**	3	**5**	3	**3**	4.5	**4.5**	5th control
TVAT	5	**5**	5	**5**	5	**5**	5	**5**	5	**5**	6th control
TVAT	5	**4.5**	2	**3.5**	2.5	**5**	3	**4.5**	5	**5**	8th control
TVAT	5	**5**	3.5	**4.5**	4	**4**	3	**2.5**	4.5	**4.5**	10th control
TVAP	4	**5**	4.5	**4.5**	4	**5**	5	**5**	4.5	**5**	9th control
TVBT	5	**4.5**	4	**3.5**	4.5	**3**	2	**2.5**	4	**3**	1st control
TVBT	5	**4.5**	5	**4.5**	4	**3.5**	4	**4**	5	**3**	2nd control
TVBT	5	**5**	3.5	**3.5**	3.5	**4.5**	4.5	**4**	2.5	**3**	7th control

Codes:

TAT= test group, exam, young, female
TAP= test group, exam, young, male
TBT= test group, exam, old, female
TBT= test group, exam, old, male

TVAT= control group, exam, young, female
TVAP= control group, exam, young, male
TVBT= control group, exam, old, female
TVBT= control group, exam, old, male

All the dictations were presented traditionally. The teacher sang or played them by the piano. There was also an important opinion connected with it: "how could it be possible to present the same exam material in the same mode to every-body all over Finland?"

- The traditional way is quite a subjective and it depends on the teacher.
- On the other hands the computer is not enough 'musical'.

According to the personal interviews it would be the best to get the central ear-training tests in electric form. The' inventor' teacher would present all the tasks for a CD. Moreover it would be also interactive software.

Pupils would do the whole test alone assisted with a computer. It would be an objective form to everybody. However this could maybe so in the future, let's see how long we have to wait for the realisation of it.

8 SUMMARY

The aim of this research was to map out the process of ear-training learning in the computer classroom. We tried to get the answers by using questionnaires and personal interviews for measuring the pupils' attitudes, opinions and learning outcomes. The best results show the correlation between pupil's attitudes and learning outcomes. Computer is a good help in learning but we need suitable software programs.

8.1 The problems of the research and their results:

Problem 1

J. Karvonen's attitude model helped me creating the attitude questionnaires of my research. His 'theoretical attitude-space' was also suitable in my research for describing the affective, cognitive and active components together in the same diagram. Maybe his model was inventing for measuring the attitudes of adult, but it was not problem in my measuring.

The hypothesis of Báthory (Fig. 3.1) works excellently in the computer classroom. At the beginning we have to learn and practise using the computers and the programs. It must be as peaceful and complex as possible.

Choosing the learning method the task system shows the highest level of the pupils' activity. The learning concept and the differential measures are highest generally looking at the persons also looking at the class. Our research confirmed that independent learning is the most active mode of learning.

Problem 2

According to pupils' *attitudes* reforms are welcome in the music education. The stronger component was the cognitive attitude and the weaker the active one. It means that they understand and feel the importance of innovation in solfège teaching learning, but the need of participation in the realization is low.

The most important reasons for *motivation* were instrumental and the less important expressional. We got the reasons for participation on the solfège 1 course with the help of Karvonen's model. It seems that the functional results changes in quality at the middle level of music learning.

The pupils' *opinion* confirmed Báthory's differentiated theory. They need also improving the balance between the normative and the experimental functions in the education. When reforming music education we have to remember that music theory and solfège have to serve instrumental learning and not vice versa. They have to help more pupils' instrumental career in the future. Continuous music theory learning is only the effective way to make we master the music courses. The role of well-motivated and interested teachers grows in the computer classroom. The teacher becomes a companion who helps the pupils to iron out the difficulties.

Problem 3

The typological comparison gave nuances in analysing the results of the exams. The finals of the groups were nearly as good or better as the results of the basic level finals. The biggest development happened in the chord - dictation. Exercises were fun and easy with assistance of the computer. Analysing the results it seems that in case of the younger pupils the learning process was more effective, because their final result shows a better development.

Problem 4.

The new solfège material for computer-aided learning was welcomer than the one tried earlier. Pupils were satisfied because the material was full with "real music". Earlier they had got so many "artificial examples". Especially cadences were so 'strange' before. They didn't know why to learn them, what is the benefit of them. During this course we had time to 'hunt' chords in the original music styles when they came into the world. We were playing or listening to the big master's cadences and it was not as 'boring' anymore. As they said all the exercises came nearer to the practical music.

Problem 5.

When comparison the learning models the environment is a new aspect in Báthory's differentiated model (Fig. 5.1). In case of computer-assisted learning the suitable environment is a central factor. Our test group was all the year in a computer lab and our control group in a traditional classroom where only the teacher had one computer. According to all of my pupils in the music college it seems that the combination of them would be the best environment for solfège learning.

In 2000 we have designed our *'suitable computer classroom'* in the music college. *Pupils* can learn traditionally in the centre of the room, where they have enough place for writing, drawing as before. At the same time they can also use their own computer work pad if they want it. They have the possibility to scan or print their work anytime. We have different notation programs and we can discover in the Internet. This is a quite *big classroom* where one can find also the grand piano and also the electric piano. *Teacher* can use the black board with chalk or the white boar with felt-tip pen in case of frontal teaching method. One can find the traditional instruments as CD-player, amplifier, TV and VCR equipment or the overhead projector. He/she can also use a portable computer connected with a portable beamer. This apparatus is useful if the teacher has to travel a lot and he/she has to teach in different places.

The most important would of course be if the computers would always work well. This is not always so in the practice. I can tell you a personal example what I will never forget in my life. Try to imagine what a terrible feeling at eight a.m. on Monday and the computers don't work. There is nobody in the house of Music Academy to help me. Not to mention that there is no time for technical preparing. This is really a big trouble. Usually music teachers cannot go earlier to the schoolroom to try if everything is OK or not. The basic technical education of a music teacher is not always enough for preparing the computers. Usually there is not enough well educated *personal support advisor* in music schools to help music teachers. I think this is the most important problem today why teachers are not as interested at the computer-aided teaching as they would be.

I want to mention an important practical notice. The users of computers need more *ethical and social education*. I mean that when I finished my work in the classroom I have also to take care of the next users. I must remember that if I change some settings I must change back after the lesson, other case my college teacher cannot work. On the music lesson there is not time to find the problems, why the machine doesn't work. This is really a very bad feeling if I cannot action of the computer lab.

8.2 Some other problems

Some other problems came later what I did not know when I started the research. *Comparison* of the learning outcomes is a not exact enough. The trouble is that two different levels are compared. They would be at the same level, but practically it was impossible.

My research is almost old in this moment. I started in 1996 and now we are in 2000s. As a *'more teacher as researcher'* I needed and hoped more help when I started the whole process.

My biggest problem was to find *the suitable language for reporting.* First I wrote it Hungarian, but I had to translate into English. Correcting the text I got a lot of help from my friends, but there is always the risk if the words doesn't mean anymore the same what I was intended at the beginning.

However, it was really a pleasurable year both for the pupils and the teacher. We tried to find the best systems to use computers as well, so that our teaching-learning process could be much more enjoyable, more effective and more successful than before. The result of the research shows that we can find these systems in a well-functioning, modern environment with the help of a keen and well-educated teacher. Finally the most important aspect is having well-motivated pupils, because if their attitudes are positive all the "time on task", it is almost sure to make the "learning by doing "process will be successful.

9 DISCUSSION

The results give food for thought. Is it possible that, because the learning attitudes and the opinions of the younger pupils were more positive, their results in the final examinations were also better than those of the older pupils? It seems so by analysing the results of learning outcomes and attitudes differentially. Any case it was only one research and the participants were together only 20, not to mention the different ages. Some older pupils told me in the control group that it was really a complicating factor all the time that the ages were so different in the group. We can find so many differences: not only age but also e.g. sex can be a problem too. Especially at basic level I see boys like to the groups with other boys and girls prefer the groups with other girls. It is impossible to organise perfect groups where everything is the best for everybody. There is another unfortunate problem in traditional lessons that those who excel in class do worse in examinations, sight-reading, etc. This can be a real problem, but need not be if we can teach in a computer classroom, where all the pupils can work individually at their own level.

9.1 Did I get answers for my original questions?

1. Computer-aided music theory and ear-training learning has new dimensions, not only can one look at the notes, but one can also listen to them simultaneously. In this method the process of teaching and learning music is different from before. It is possible to get feedback at any time. This *new w*ay enables one to play the entire score of all the music any time. The *old way* is more linear, the new one more vertical, global. This means that the brain works in a different way and so one can learn more easily, more quickly and more effectively. This increases the learner's motivation and makes learning more fun, and more successful in a computer-aided environment.

According to J. Louhivuori's instructional target (1990, 201) learning by doing and discovery learning are just right methods for preserving motivation and memory. Only problem of them is 'slowness'. He suggests deduction of the informative aims. In our experience these methods in the computer lab did not work as slow as in a traditional classroom. Combining the learning methods (Table 4.1) we can find the balance between the "behaviourist" and the "practical" lines.

2. The new solfège material works well and pupils like it. My opinion is that it is impossible to wait from every teacher to write own textbooks. I hope that also Finnish teachers could use more and more good educational software. We need also programs like Midisaurusaus, Music Ace and Rhythm Tutor teach children though engaging, interactive formats. As Julia Baker says: "Teaching the joy of music has never been so easy"(2000). Her music lessons are presented through games and interactive activities, which advance as the student's ability progresses as she writes in the article "Teaching Children Music Theory is Easier Than ever (not to mention fun!)".

My opinion is the same it would be the best way for us too. Personally I would also take time with all of my family over the summer to learn about the "Mozart

Effect" but if my children speak only Finnish or Hungarian we have not enough chance for enjoying it. What I mean it is a problem that these programs are not translated, so we cannot use them in case of little children.

As my research results show it is important to start the computer using as soon as possible. We needs suitable program from the beginning. If all the day nurseries have this kind music programs then we have magnificent possibilities for the new generation. In the moment we can only hope that the new MOVE (Music education in network) project gets away also with this problem.

9.2 What happened after the research in our music college and outside?

In autumn 1999 I started four *new preparation solfège courses*, where the average age of the children was 7 years. After half year of starting the music learning I made personal interviews (N = 22) with them to know what is the best in the computer music lessons in their mind? 'Using the colours' was the answer. Usually we use funny games to learning using the mouse. Then we can draw pictures, own illustrations to our songs.

Also when learning a new song first we draw with the computer an illustration or we colour the syllables in the notes. It is more pleasure teaching the solmization with the help of colours, like 'SO' is red and 'FA' is blue and so on. Colours are also used systematically in the Solfeggio 1 book. In perceiving the musical functions it helps very much (dominant is red, subdominant is blue).

We have a lot of exercises for practising the sigh reading and singing. E.g. pupils write the syllables of solmization and rhythm under the notes. Then they listen to and sing or read with them.

I made also a larger interview with all of my pupils (129) in January of 2000 to know more about the pupils' experiences in the computer lab. We have a lot of exercises for practising the sigh reading and singing. Pupils at the basic level write the syllables of solmization and rhythm under the notes. Then they listen to and sing or read with them. Pupils told that these exercises were the best,

because they could write the melody and the rhythm much better after these exercises.

In the middle level we started to use the Internet. Pupils get homework by the electronic mail. All the tasks are personal and they can use as much time as they want at home. This is again a new source for developing the motivation. In the computer classroom we have maximum 90 minutes for a group. Every task is personal and they can use as much time as they want at home.

Outside the music college I also started to examine the possibilities of using computers in choir and orchestra teaching learning. I wrote the whole score of Pergolesi's 'Stabat Mater' for the computer. We had only two months for learning. We were listening to all the score assisted with the computer in the process of the different choir parts learning.

When we had the first common rehearsal with the orchestra the problem was that orchestra did not play correct rhythm. The day after the rehearsal all the players got the disc of the score in MID files. It was unbelievable that next time there was no any trouble with the rhythm. The concert was excellent. It was really a very short term for learning and the performers enjoyed very much the new learning method. Their motivation had also seemed in the brilliant performance.

In future studies it would be useful to investigate the examining of the instrumental music teaching-learning process assisted with the computer.

10 CONCLUSIONS AND EPILOGUE

As Veijo Meisalo thinks: the biggest result of computer-assisted education would be to destroy the 'routine' of the process of future teaching. I would like to know if it could ever be possible to find a synthesis between the old and the new purposes in the field of music didactics by using the computer? I hope that the possibility could be realised if we found a more agreeable and effectual way of learning. Then we could once again have enough time to take care of our " inheritor" as Keith Swanwick tells. I would like to know if it really is as effective a way when everybody can discover more easily and with more pleasure the "next step" in the imagination as Zoltán Kodály already mentioned in 1949. It would be a real mission in the future for computer-assisted music education. The possibility of realisation depends on the 'researcher-teachers': if they can successfully use the achievements of the sciences, technology and modern psychology.

Just as the body needs regular practice, the same applies to the ear. The point is that our musical capacity develops better and better. It means we can sing better, we can play an instrument better, we can note more quickly, we can recognise the music we listen to more easily and in the end we are better musicians. What can be done if there is no opportunity for learning with the group? The next step in teaching and learning is open and distance learning, in a virtual environment, independent of time and space. Only a computer and a (mobile) phone with net connection are needed. Also, contact with the peer group in real time is needed and the teacher can help you and the others in the virtual classroom. You may be on a beach in South Africa, when it's time for the solfège lesson. You just contact the teacher-computer and at that moment you are welcome to enjoy the trip to find the secrets of Renaissance or to complete a beautiful Bach Choral.

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APPENDIX

Figures

Tables

SOLFEGGIO 1

Learning independent of time and space

For ear-training Solfeggio 1 is a new challenge. It is a computer-aided program, which anybody can use in a computer classroom or at home with a PC. Solfeggio 1 is computer-aided ear-training material for anybody interested in a venture into old music styles, like those of the Renaissance, Baroque or Viennese Classical music, with the help of modern computer technique. The material of Solfeggio I is only the first part of the series.

The aim of this software is to develop musical capacity as highly as possible in order for the learner to be able to recognise and reproduce music from the past right through to the atonal, modern music of the present. The material is selected from among the pearls of music history. All the exercises seek to extend the pupils' skills in music styles. They are also suitable for the analysis of music. One can practise the reading/writing of music just by listening to the harmonies and the learning process happens in a virtual, well-prepared environment. These exercises are perfect for developing musical abilities. This is a new type of solfège material.

There is an exercise book for pupils and a CD. The orchestra and choir of the Länsi-Uusimaa Music College have performed all music recorded for the program. Solfeggio 1 may also be used via the Internet. Only Encore 4.2 software is needed and the tasks of Solfeggio 1 can be linked into it.

INSERT 6.2

The number of Testes in the test group (N = 10).

TEST GROUP

A = upper level, female, 13 years old	
B = upper level, female, 14 years old	1
C = upper level, female, 15 years old	2
D = upper level, male, 15 years old	1
E = upper level, male, 16 years old	
F = high school, female, 17 years old	3
G = high school, female, 18 years old	1
H = high school, female, 19 years old	1
I = adult, male, 20 years old	1
J = adult, female, 21 years old	

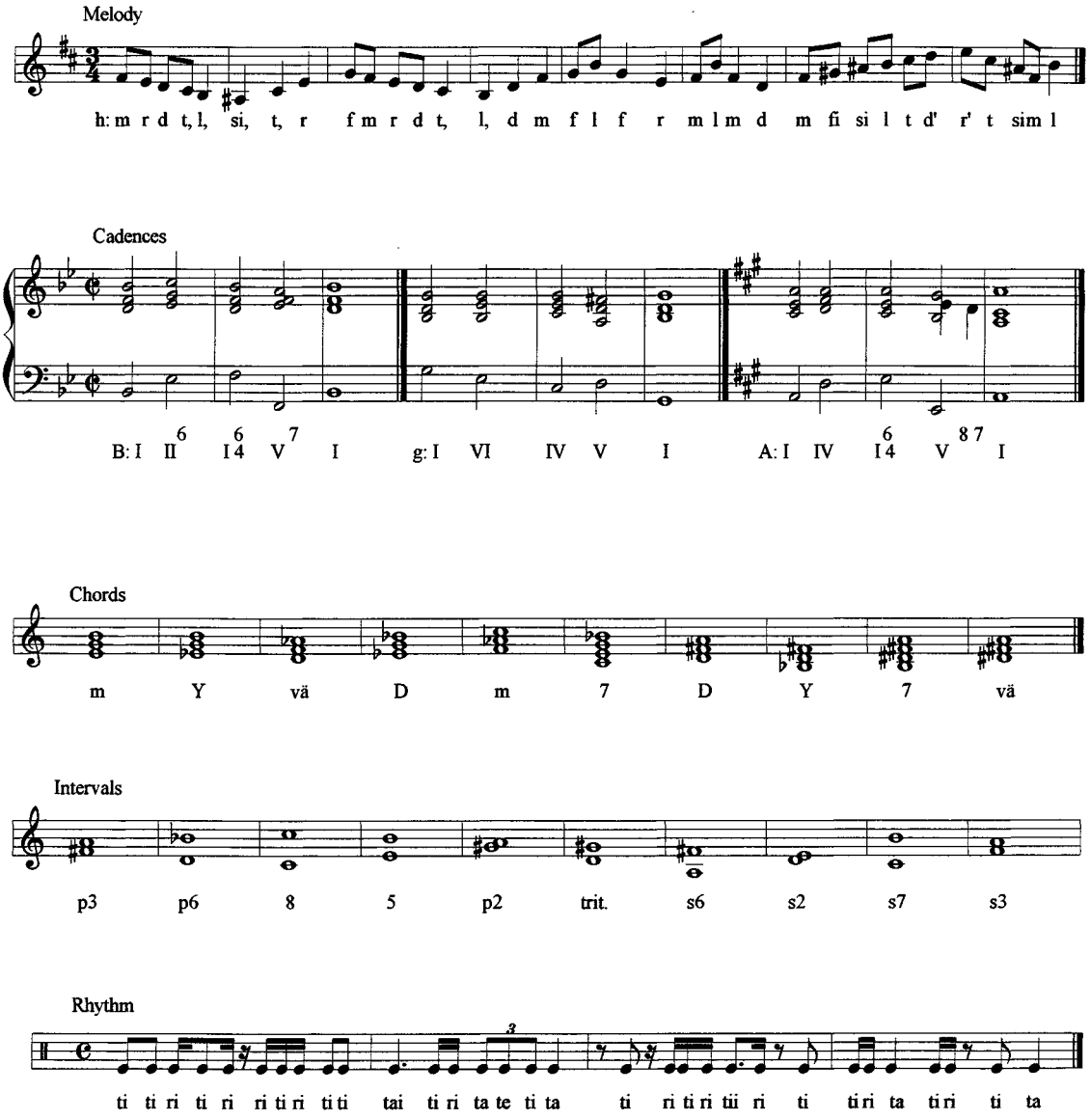
INSERT 6.3

The number of Testes in the control group (N = 10).

CONTROL GROUP

A = upper level, female, 13 years old	1
B = upper level, female, 14 years old	4
C = upper level, female, 15 years old	1
D = upper level, male, 15 years old	1
E = upper level, male, 16 years old	
F = high school, female, 17 years old	2
G = high school, female, 18 years old	
H = high school, female, 19 years old	
I = adult, male, 20 years old	
J = adult, female, 21 years old	1

INSERT 6.4 The placement test.



INSERT 7.1.1		The attitude-answers of the test group									
TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
1. Development the solfège-education:	1 (unpleasant)										
	2										
pleasant (7)	3										
unpleasant (1)	4					4					4
	5			5	5				5		
	6						6	6			
	7 (pleasant)	7	7							7	
2. Development the solfège-education:		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
	1 (detrimental)										
useful (7)	2										
detrimental (1)	3										
	4					4					4
	5										
	6				6		6	6	6	6	
	7 (useful)	7	7	7							
3. Participation in the solfège-regeneration:		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
	1 (opposed)										
	2										
supported (7)	3										
opposed (1)	4					4					
	5			5	5			5	5		5
	6		6				6			6	
	7 (supported)	7									

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
4. The changes in the music college :	1										
	2										
pleasant (7)	3										
unpleasant (1)	4										
	5								5		
	6	6	6	6	6	6	6	6		6	
	7										7
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
5. The changes in the music college:	1										
	2										
useful (7)	3										
detrimental (1)	4										
	5					5					
	6		6	6	6		6	6		6	
	7	7							7		7
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
6. I try in my music learning:	1										
	2										
	3										
to try all new things (7)	4							4			
to oppose uncertain tests (1)	5					5	5			5	
	6	6	6		6				6		
	7			7							7

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
7. Everybody needs their own computer											
during the solfège lessons											
I think just the opposite	1										
my opinion is the opposite	2		2								
I don't know	3					3					3
I'm of the same mind	4	4		4	4		4	4	4	4	
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
8. It is enough if the teacher has one											
I think just the opposite	1					1					
my opinion is the opposite	2	2	2	2	2				2		2
I don't know	3						3			3	
I'm of the same mind	4							4			
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
9. It is enough to sing during the solfège											
lessons, it's not necessary to use the computer											
I think just the opposite	1	1									
my opinion is the opposite	2		2	2		2	2		2		2
I don't know	3				3			3		3	
I'm of the same mind	4										
my opinion is exactly the same	5										

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
10. It is also better to play our instruments											
during the solfège lessons, not only to sing											
I think just the opposite	1										
my opinion is the opposite	2							2			
I don't know	3										
I'm of the same mind	4		4	4	4				4		4
my opinion is exactly the same	5	5				5	5			5	
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
11. The" life" of music is killed by the computer.											
I think just the opposite	1							1			
my opinion is the opposite	2	2									
I don't know	3		3						3		3
I'm of the same mind	4			4	4	4	4				
my opinion is exactly the same	5									5	
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
12. Pupils are more interested than											
in the traditional solfège-lessons											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3			3	3	3	3	3			3
I'm of the same mind	4	4	4						4	4	
my opinion is exactly the same	5										

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
13. Abilities develop better											
with the computer-aided music teaching											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3	3		3	3		3				
I'm on the same mind	4		4			4			4	4	4
my opinion is exactly the same	5							5			
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
14. The computer voice is unnatural,											
which disturbs perception											
I think just the opposite	1							1			
my opinion is the opposite	2	2	2							2	
I don't know	3				3		3		3		3
I'm of the same mind	4			4		4					
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
15. The changeable colour-tones offer more											
many-sided stimuli to one's perception											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3	3						3	3		3
I'm of the same mind	4		4	4	4	4	4			4	
my opinion is exactly the same	5										

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
16. The computer cannot make music											
I think just the opposite	1										
my opinion is the opposite	2	2						2		2	
I don't know	3		3	3			3		3		
I'm of the same mind	4				4	4					4
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
17. The computer is a good aid, because											
of its accuracy and precision											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3				3	3					
I'm of the same mind	4	4	4	4			4		4	4	4
my opinion is exactly the same	5							5			
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
18. It. is better to have a computer course											
before the computer-aided solfège studies											
I think just the opposite	1										
my opinion is the opposite	2		2			2		2			
I don't know	3	3									
I'm of the same mind	4						4		4	4	4
my opinion is exactly the same	5			5	5						

TEST GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
19. I think the solfège learning											
with the computer is:											
more perceptible				x	x	x	x			x	
easier			x								
more motivating		x	x					x	x		x
it gives opportunity for individual learning			x								

INSERT 7.1.2		The attitude-answers of the control group									
CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
1. Development the solfège-education:	7 (pleasant)										
	6				6			6	6		
pleasant (7)	5	5		5		5	5			5	
unpleasant (1)	4										4
	3		3								
	2										
	1 (unpleasant)										
2. Development the solfège-education:		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
	1 (detrimental)										
useful (7)	2										
detrimental (1)	3										
	4		4								4
	5	5				5	5				
	6			6	6					6	
	7 (useful)							7	7		
3. Participation in the solfège-regeneration:		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
	7 (supported)							7			
	6	6							6	6	
supported (7)	5			5							
opposed (1)	4		4		4	4	4				4
	3										
	2										
	1 (opposed)										

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
4. The changes in the music college :	1										
	2										
pleasant (7)	3										
unpleasant (1)	4										4
	5			5	5	5	5			5	
	6	6	6						6		
	7							7			
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
5. The changes in the music college:	1										
	2										
useful (7)	3										
detrimental (1)	4										
	5	5			5	5	5			5	5
	6		6	6							
	7							7	7		
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
6. I try in my music learning:	1										
	2										
	3										
to try all new things (7)	4										
to oppose uncertain tests (1)	5		5		5	5					
	6							6		6	6
	7	7		7			7		7		

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
7. Everybody needs their own computer											
during the solfège lessons											
I think just the opposite	1										
my opinion is the opposite	2		2			2					
I don't know	3						3	3	3		3
I'm of the same mind	4			4	4					4	
my opinion is exactly the same	5	5									
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
8. It is enough if the teacher has one											
I think just the opposite	1										
my opinion is the opposite	2				2						
I don't know	3	3		3				3	3	3	
I'm of the same mind	4		4			4	4				4
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
9. It is enough to sing during the solfège											
lessons, not necessary to use the computer											
I think just the opposite	1										
my opinion is the opposite	2	2		2	2	2	2	2	2	2	2
I don't know	3										
I'm of the same mind	4		4								
my opinion is exactly the same	5										

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
10. It is also better to play our instruments											
during the solfège lessons, not only to sing											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3		3								
I'm of the same mind	4				4	4			4	4	4
my opinion is exactly the same	5	5		5			5	5			
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
11. The" life" of music is killed by the computer.											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3				3				3	3	
I'm of the same mind	4	4	4				4	4			
my opinion is exactly the same	5			5		5					5
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
12. Pupils are more interested than											
in the traditional solfège lessons											
I think just the opposite	1										
my opinion is the opposite	2		2			2					2
I don't know	3	3		3	3		3			3	
I'm of the same mind	4							4	4		
my opinion is exactly the same	5										

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
13. Abilities develop better											
with the computer-aided music teaching											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3	3	3	3	3	3	3	3	3		3
I'm of the same mind	4									4	
my opinion is exactly the same	5										
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
14. The computer voice is unnatural,											
which disturbs perception											
I think just the opposite	1										
my opinion is the opposite	2					2			2		
I don't know	3							3		3	
I'm of the same mind	4	4	4		4		4				
my opinion is exactly the same	5			5							5
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
15. The changeable colour-tones offer more											
many-sided stimuli to one's perception											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3		3					3	3	3	
I'm of the same mind	4	4		4	4	4	4				4
my opinion is exactly the same	5										

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
16. The computer cannot make music											
I think just the opposite	1										
my opinion is the opposite	2	2				2			2		
I don't know	3				3		3	3		3	3
I'm of the same mind	4		4								
my opinion is exactly the same	5			5							
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
17. The computer is a good aid, because											
of its accuracy and precision											
I think just the opposite	1										
my opinion is the opposite	2										2
I don't know	3										
I'm of the same mind	4		4	4	4		4	4	4	4	
my opinion is exactly the same	5	5				5					
		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
18. It. is better to have a computer course											
before the computer-aided solfège studies											
I think just the opposite	1										
my opinion is the opposite	2										
I don't know	3					3		3			
I'm of the same mind	4	4	4	4	4		4		4	4	4
my opinion is exactly the same	5										

CONTROL GROUP											
Variable		Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
19. I think the solfège learning											
with the computer is:											
more perceptible								x			
easier			x								
more motivating						x		x		x	
different		x									
good		x									
a little bit different				x							
more changeable					x						
nothing special						x					
not always machine dictation							x				
more interesting									x		

INSERT 7.2.1			The reason for participation in the course in the test group							
	Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
1. I was interested in computer-aided solfège learning.				x						
2. I wanted to see what the point of the course was.			x							
3. I want to get all kinds of knowledge about music.	x	x	x	x	x	x				
4. I wanted to make myself master the solfège 1 course.	x	x	x		x	x	x	x	x	
5. I participated in the course because music learners educate themselves.	x	x	x		x	x	x			x
6. I want to know more about music.		x	x	x			x			
7. My parents wanted my participation on the course										
8. I participated the course because my friends did so.										

INSERT 7.2.2		The reason for participation in the course in the control group								
	Pupil 1	Pupil 2	Pupil 3	Pupil 4	Pupil 5	Pupil 6	Pupil 7	Pupil 8	Pupil 9	Pupil 10
1. I was interested in computer-aided solfège learning.									x	
2. I wanted to see what the point of the course was.							x	x		
3. I want to get all kinds of knowledge about music.	x			x			x	x	x	x
4. I wanted to make myself master the solfège 1 course.	x	x	x	x		x	x	x	x	x
5. I participated in the course because music learners educate themselves.	x		x	x	x	x		x	x	x
6. I want to know more about music.	x		x		x			x		
7. My parents wanted my participation on the course										
8. I participated the course because my friends did so.								x		

INSERT 7.3.1

Question 1	EAR1	EBR1	EAVR1	EBVR1
	4	5	4	3
	4	4	3	5
	4	3	5	4
	3	3	4	
		3	4	
		4	4	
			4	
$\bar{X}$	3,75	3,67	4	4
S	0,5	0,82	0,58	1
Question 2	EAR2	EBR2	EAVR2	EBVR2
	4	5	4	3
	5	4	4	4
	4	5	5	3
	5	4	4	
		4	4	
		3	4	
			5	
$\bar{X}$	4,5	4,17	4,29	3,33
S	0,58	0,75	0,49	0,58
Question 3	EAR3	EBR3	EAVR3	EBVR3
	4	4	4	3
	4	4	3	3
	3	4	4	3
	3	4	4	
		3	5	
		3	4	
			3	
$\bar{X}$	3,5	3,67	3,87	3,67
S	0,58	0,52	0,69	0
Question 4	EAR4	EBR4	EAVR4	EBVR4
	3	5	4	3
	3	4	4	4
	3	5	5	4
	5	3	3	
		4	5	
		2	3	
			3	
$\bar{X}$	3,7	3,83	3,86	3,67
S	1	1,17	0,9	0,58
Question 5	EAR5	EBR5	EAVR5	EBVR5
	4	4	4	4
	4	4	4	4
	4	4	5	4
	3	4	3	
		4	4	
		3	5	
			4	
$\bar{X}$	3,75	3,83	4,14	4
S	0,5	0,41	0,69	0

Question 6	EAR6	EBR6	EAVR6	EBVR6
	5	3	4	5
	4	5	4	5
	5	4	4	5
	5	4	5	
		4	4	
		5	4	
			4	
$\bar{X}$	4,75	4,17	4,14	5
S	0,5	0,75	0,38	0
Question 7	EAR7	EBR7	EAVR7	EBVR7
	4	5	4	3
	4	3	4	3
	3	3	4	3
	3	3	5	
		3	5	
		3	5	
			4	
$\bar{X}$	3,5	3,33	4,43	3
S	0,58	0,82	0,53	0
Question 8	EAR8	EBR8	EAVR8	EBVR8
	5	5	4	5
	5	4	4	4
	5	4	5	4
	2	4	4	
		3	5	
		4	4	
			5	
$\bar{X}$	4,25	4	4,43	4,33
S	1,5	0,63	0,53	0,58
Question 9	EAR9	EBR9	EAVR9	EBVR9
	3	3	3	3
	2	2	2	2
	2	4	2	3
	4	2	2	
		3	3	
		3	4	
			5	
$\bar{X}$	2,75	2,83	3	2,67
S	0,96	0,75	1,15	0,58
Question 10	EAR10	EBR10	EAVR10	EBVR10
	3	3	3	3
	4	4	5	3
	4	3	3	4
	3	3	2	
		3	4	
		5	4	
			5	
$\bar{X}$	3,5	3,5	3,71	3,33
S	0,58	0,84	1,11	0,58

Codes:

EAR1= answer 1st, test group, before the course, young

EBR1= answer 1st, test group before the course, old

EAVR1= answer 1st, control group, before the course, young

EBVR1= answer 1st, control group, before the course, old

JAR1= answer 1st, test group, after the course, young

JBR1= answer, test group, after the course, old

JAVR1= answer 1st, control group, after the course, young

JBVR1= answer 1st, control group, after the course, old

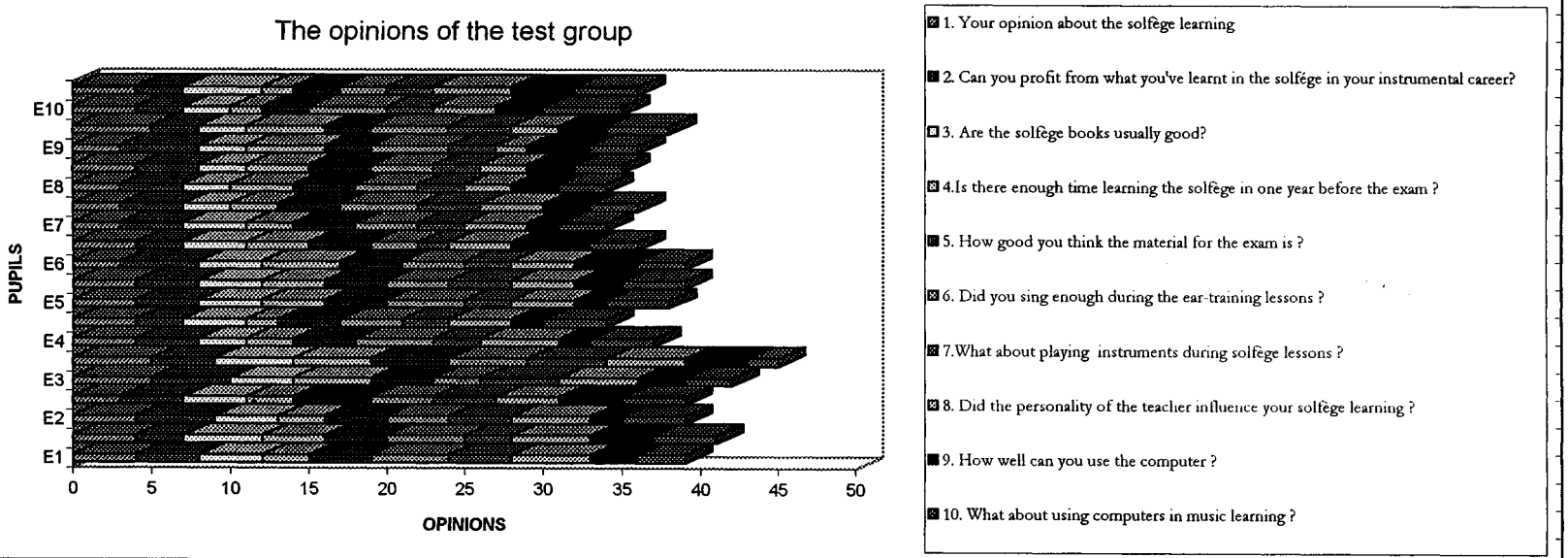
INSERT 7.3.2

Question 1	JAR1	JBR1	JAVR1	JBVR1
	4	5	4	4
	3	4	4	4
	4	4	5	4
	5	3	4	
		4	4	
		4	5	
–			5	
X	*4*	*4*	*4,43*	*4*
S	*1,82*	*1,62*	*1,53*	*0*
Question 2	JAR2	JBR2	JAVR2	JBVR2
	3	4	4	3
	4	4	4	4
	3	3	5	4
	3	4	4	
		4	4	
		3	5	
–			4	
X	3,25	3,63	4,29	3,67
S	*0,5*	*0,52*	*0,49*	*0,58*
Question 3	JAR3	JBR3	JAVR3	JBVR3
	5	5	3	4
	4	4	4	4
	4	4	4	4
	3	3	4	
		3	4	
		5	5	
–			3	
X	4	4	3,86	4
S	*1,82*	*0,89*	*0,69*	*0*
Question 4	JAR4	JBR4	JAVR4	JBVR4
	4	5	3	3
	3	4	3	4
	2	4	5	3
	5	3	3	
		4	4	
		2	2	
–			3	
X	3,5	3,67	3,29	3,33
S	*1,29*	*1,03*	*0,95*	*0,58*
Question 5	JAR5	JBR5	JAVR5	JBVR5
	4	5	4	4
	5	4	4	4
	4	4	5	3
	3	4	3	
		4	4	
		3	5	
			5	
X	*4*	*4*	*4,29*	*3,67*
S	*0,82*	*0,63*	*0,76*	*0,58*

Question 6	JAR6	JBR6	JAVR6	JBVR6
	5	5	4	5
	4	4	5	5
	4	3	4	5
	5	5	4	
		4	3	
		3	4	
–			3	
X	*4,5*	*4*	*3,86*	*5*
S	*0,58*	*0,89*	*1,69*	*0*
Question 7	JAR7	JBR7	JAVR7	JBVR7
	3	5	3	3
	4	4	3	3
	3	2	4	3
	4	4	5	
		3	5	
		3	4	
–			4	
X	3,5	3,5	4	3
S	*0,58*	*1,05*	*0,82*	*0*
Question 8	JAR8	JBR8	JAVR8	JBVR8
	5	5	4	5
	4	4	4	5
	4	4	5	5
	3	4	5	
		3	5	
		5	4	
–			5	
X	4	4,17	4,57	5
S	*0,82*	*0,75*	*0,53*	*0*
Question 9	JAR9	JBR9	JAVR9	JBVR9
	4	4	3	3
	4	3	3	2
	2	5	2	3
	3	4	3	
		4	3	
		5	4	
–			5	
X	3,35	4,17	3,29	2,67
S	*0,96*	*0,75*	*0,95*	*0,58*
Question 10	JAR10	JBR10	JAVR10	JBVR10
	4	2	4	2
	4	4	4	3
	4	3	3	4
	4	3	3	
		3	4	
		4	4	
			4	
X	*4*	*3,17*	*3,71*	*3*
S	*0*	*0,75*	*0,49*	*1*

INSERT 7.3.3

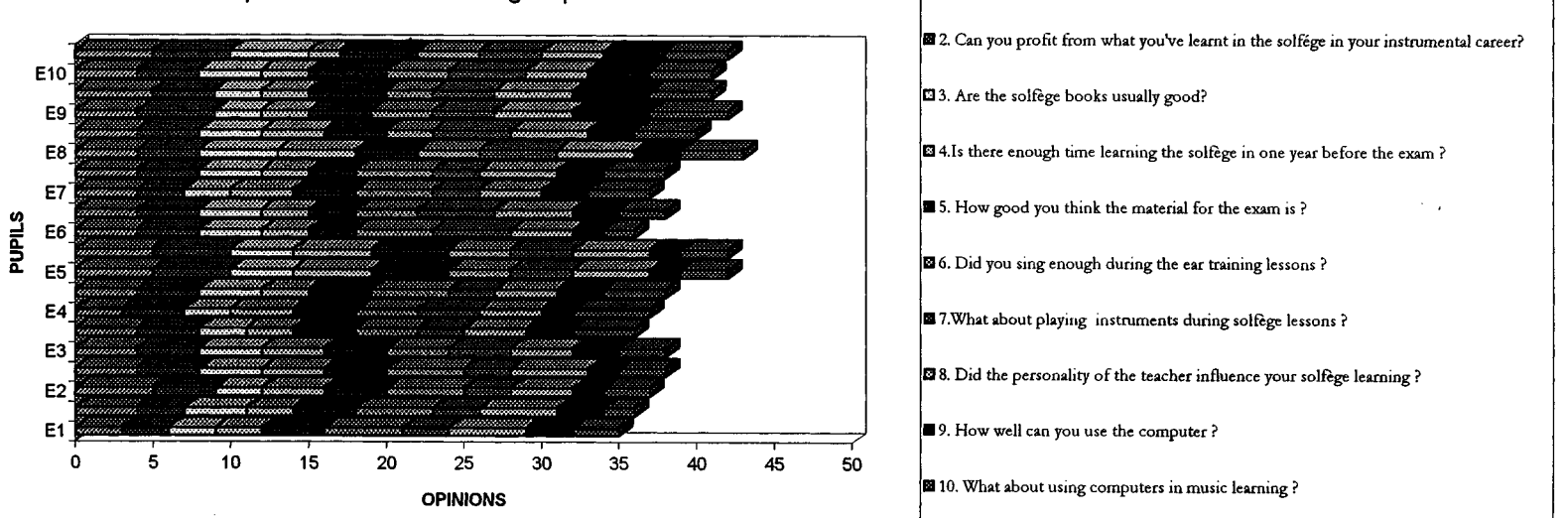
	K.Emmi		H.Emmi		G.Leili		M.Reetta		R.Johanna		S.Teppo		S.Saara		K.Anna		V.Janne		L.Anna-Liisa	
	E1	J1	E2	J2	E3	J3	E4	J4	E5	J5	E6	J6	E7	J7	E8	J8	E9	J9	E10	J10
1. Your opinion about the solfège learning	4	4	4	3	5	5	4	4	4	4	3	4	3	3	3	4	3	5	4	4
2. Can you profit from what you've learnt in the solfége in your instrumental career?	4	3	5	4	5	4	4	3	4	4	5	3	4	4	4	4	5	3	3	3
3. Are the solfège books usually good?	4	5	4	4	4	5	3	4	4	4	4	4	4	3	3	3	3	3	3	5
4.Is there enough time learning the solfège in one year before the exam ?	3	4	3	3	5	5	3	2	4	4	5	4	3	3	4	4	5	5	2	2
5. How good you think the material for the exam is ?	4	4	4	5	4	5	4	4	4	4	4	4	4	4	4	4	3	3	3	3
6. Did you sing enough during the ear-training lessons ?	5	5	4	4	3	5	5	4	5	4	4	3	4	5	4	4	5	5	5	3
7.What about playing instruments during solfège lessons ?	4	3	4	4	5	5	3	3	3	4	3	2	3	4	3	3	3	4	3	3
8. Did the personality of the teacher influence your solfège learning ?	5	5	5	4	5	5	5	4	4	4	4	4	4	4	3	3	2	3	4	5
9. How well can you use the computer ?	3	4	2	4	3	4	2	2	2	3	4	5	2	3	3	3	4	3	3	4
10. What about using computers in music learning ?	3	4	4	4	3	2	4	4	4	4	3	3	3	3	3	3	3	4	5	4
Scale : 5= very good / well, 1= very bad / poorly	39	41	39	39	42	45	37	34	38	39	39	36	34	36	34	35	36	38	35	36



E= before the course J= after the course

INSERT 7.3.4

	Karoliina		Lilli		K.Tanja		Tuuli		Helmi		Riitta-Liisa		R.Tanja		Essi		Touko		Maija	
	E1	J1	E2	J2	E3	J3	E4	J4	E5	J5	E6	J6	E7	J7	E8	J8	E9	J9	E10	J10
1. Your opinion about the solfège learning	3	4	5	4	4	4	3	4	5	5	4	4	4	4	4	4	4	5	4	5
2. Can you profit from what you've learnt in the solfége in your instrumental career?	3	3	4	4	4	4	4	4	5	5	4	4	3	4	4	4	5	4	4	5
3. Are the solfège books usually good?	3	4	3	4	4	3	3	4	4	4	4	4	3	4	5	4	3	3	4	5
4.Is there enough time learning the solfège in one year before the exam ?	3	3	4	4	4	3	4	3	5	5	3	3	4	3	5	4	3	3	3	2
5. How good you think the material for the exam is ?	4	4	4	4	4	4	4	4	5	5	3	3	4	3	4	4	4	5	5	5
6. Did you sing enough during the ear training lessons ?	5	5	5	5	4	4	4	5	4	4	5	4	5	5	4	3	4	3	4	4
7.What about playing instruments during solfège lessons ?	3	3	3	3	4	3	4	3	4	4	5	5	3	3	5	5	4	4	5	4
8. Did the personality of the teacher influence your solfège learning ?	5	5	4	5	4	4	4	4	5	5	4	5	4	5	5	5	5	5	4	4
9. How well can you use the computer ?	3	3	2	2	3	3	2	3	2	2	2	3	3	3	3	3	5	5	4	4
10. What about using computers in music learning ?	3	2	3	3	3	4	5	4	3	3	2	3	4	4	4	4	5	4	4	4
Scale : 5= very good / well, 1= very bad / poorly	35	36	37	38	38	36	37	38	42	42	36	38	37	38	43	40	42	41	41	42



E= before the course J= after the course

DATA 6.1 Variables

IKA	ASENNE	MIELIP	KOETULOS
14,00	75,00	41,00	18,00
15,00	74,00	39,00	24,00
17,00	78,00	45,00	22,00
15,00	76,00	34,00	17,00
18,00	67,00	39,00	22,00
20,00	77,00	36,00	24,00
19,00	68,00	36,00	14,00
17,00	74,00	35,00	24,00
15,00	82,00	38,00	23,00
17,00	73,00	36,00	15,00
17,00	78,00	35,00	16,00
17,00	70,00	38,00	19,00
14,00	81,00	38,00	17,00
13,00	71,00	36,00	18,00
14,00	67,00	38,00	20,00
14,00	74,00	42,00	25,00
21,00	81,00	38,00	20,00
14,00	76,00	40,00	23,00
14,00	73,00	41,00	24,00
15,00	66,00	42,00	23,00

DATA 6.2 Variables of the test group

KIKA	KASENNE	KMIELIP	KKOE
14,00	75,00	41,00	18,00
15,00	74,00	39,00	24,00
17,00	78,00	45,00	22,00
15,00	76,00	34,00	17,00
18,00	67,00	39,00	22,00
20,00	77,00	36,00	24,00
19,00	68,00	36,00	14,00
17,00	74,00	35,00	24,00
15,00	82,00	38,00	23,00
17,00	73,00	36,00	15,00

DATA 6.3 Variables of the control group

VIKA	VASENNE	VMIELIPI	VKOETULO
17,00	78,00	35,00	16,00
17,00	70,00	38,00	19,00
14,00	81,00	38,00	17,00
13,00	71,00	36,00	18,00
14,00	67,00	38,00	20,00
14,00	74,00	42,00	25,00
21,00	81,00	38,00	20,00
14,00	76,00	40,00	23,00
14,00	73,00	41,00	24,00
15,00	66,00	42,00	23,00

DATA 7.1.1 The attitude-answers of the test group

ASEKOEA1	A2	A3	A4	A5	A6	ASEKOEB1	B2	B3	B4	B5	B6
7,00	7,00	7,00	6,00	7,00	6,00	5,00	7,00	5,00	6,00	6,00	7,00
7,00	7,00	6,00	6,00	6,00	6,00	4,00	4,00	4,00	6,00	5,00	5,00
5,00	6,00	5,00	6,00	6,00	6,00	6,00	6,00	5,00	6,00	6,00	5,00
7,00	6,00	6,00	6,00	7,00	6,00	5,00	6,00	5,00	5,00	7,00	6,00
						4,00	5,00	5,00	7,00	7,00	5,00
						6,00	6,00	6,00	6,00	6,00	5,00

DATA 7.1.2 The attitude-answers of the control group

ASEKONA1	A2	A3	A4	A5	A6	ASEKONB1	B2	B3	B4	B5	B6
5,00	6,00	5,00	5,00	6,00	7,00	5,00	5,00	6,00	6,00	5,00	7,00
6,00	6,00	4,00	5,00	5,00	5,00	3,00	4,00	4,00	6,00	6,00	5,00
5,00	5,00	4,00	5,00	5,00	5,00	6,00	7,00	7,00	7,00	7,00	6,00
5,00	5,00	4,00	5,00	5,00	7,00						
6,00	7,00	6,00	6,00	7,00	7,00						
4,00	4,00	4,00	4,00	5,00	6,00						
5,00	6,00	6,00	5,00	5,00	6,00						

DATA 7.1.3 All the attitudes typologically

AKR7	AKR8	AKR9	AKR10	AKR11	AKR12	AKR13	AKR14	AKR15	AKR16	AKR17	AKR18
4,00	2,00	1,00	5,00	2,00	4,00	3,00	2,00	3,00	2,00	4,00	3,00
2,00	2,00	2,00	4,00	3,00	4,00	4,00	2,00	4,00	3,00	4,00	2,00
4,00	2,00	3,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00	3,00	5,00
4,00	3,00	3,00	5,00	5,00	4,00	4,00	2,00	4,00	2,00	4,00	4,00

BKR7	BKR8	BKR9	BKR10	BKR11	BKR12	BKR13	BKR14	BKR15	BKR16	BKR17	BKR18
4,00	2,00	2,00	4,00	4,00	3,00	3,00	4,00	4,00	3,00	4,00	5,00
3,00	1,00	2,00	5,00	4,00	3,00	4,00	4,00	4,00	4,00	3,00	2,00
4,00	4,00	3,00	2,00	1,00	3,00	5,00	1,00	3,00	2,00	5,00	2,00
4,00	2,00	2,00	4,00	3,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00
3,00	2,00	2,00	4,00	3,00	3,00	4,00	3,00	3,00	4,00	4,00	4,00
4,00	3,00	2,00	5,00	4,00	3,00	3,00	3,00	4,00	3,00	4,00	4,00

AVR7	AVR8	AVR9	AVR10	AVR11	AVR12	AVR13	AVR14	AVR15	AVR16	AVR17	AVR18
4,00	3,00	2,00	4,00	5,00	3,00	3,00	5,00	4,00	5,00	4,00	4,00
4,00	2,00	2,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	4,00	4,00
2,00	4,00	2,00	3,00	5,00	2,00	3,00	2,00	4,00	2,00	5,00	3,00
3,00	4,00	2,00	4,00	4,00	3,00	3,00	4,00	4,00	3,00	4,00	4,00
3,00	3,00	2,00	3,00	3,00	4,00	3,00	2,00	3,00	2,00	4,00	4,00
3,00	4,00	2,00	3,00	5,00	2,00	3,00	5,00	4,00	3,00	2,00	4,00
4,00	3,00	2,00	3,00	3,00	3,00	4,00	4,00	3,00	3,00	4,00	4,00

BVR7	BVR8	BVR9	BVR10	BVR11	BVR12	BVR13	BVR14	BVR15	BVR16	BVR17	BVR18
5,00	3,00	2,00	5,00	4,00	3,00	3,00	4,00	4,00	2,00	5,00	4,00
2,00	4,00	4,00	3,00	4,00	3,00	3,00	4,00	3,00	4,00	4,00	4,00
3,00	3,00	2,00	5,00	4,00	4,00	3,00	3,00	3,00	3,00	4,00	4,00

DATA 7.1.4 All the attitudes (N = 20)

A1	A2	A3	AP4	AV5	AV6	AV7	AV8	AV9	AV10
7,00	7,00	5,00	7,00	5,00	6,00	5,00	5,00	6,00	4,00
7,00	7,00	6,00	6,00	6,00	6,00	5,00	5,00	7,00	4,00
7,00	6,00	5,00	6,00	5,00	4,00	4,00	4,00	6,00	4,00
6,00	6,00	6,00	6,00	5,00	5,00	5,00	5,00	6,00	4,00
7,00	6,00	6,00	7,00	6,00	5,00	5,00	5,00	7,00	5,00
6,00	6,00	6,00	6,00	7,00	5,00	5,00	7,00	7,00	6,00
4,00	2,00	4,00	4,00	4,00	4,00	2,00	3,00	3,00	3,00
2,00	2,00	2,00	3,00	3,00	2,00	4,00	4,00	3,00	4,00
1,00	2,00	3,00	3,00	2,00	2,00	2,00	2,00	2,00	2,00
5,00	4,00	4,00	5,00	5,00	4,00	4,00	5,00	4,00	4,00
2,00	3,00	4,00	5,00	5,00	3,00	5,00	4,00	3,00	5,00
4,00	4,00	3,00	4,00	3,00	3,00	2,00	3,00	4,00	2,00
3,00	4,00	3,00	4,00	3,00	3,00	3,00	3,00	3,00	3,00
2,00	2,00	3,00	2,00	5,00	4,00	2,00	4,00	2,00	5,00
3,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	4,00
2,00	3,00	4,00	2,00	5,00	3,00	2,00	3,00	2,00	3,00
4,00	4,00	3,00	4,00	4,00	4,00	5,00	4,00	4,00	2,00
3,00	2,00	5,00	4,00	4,00	4,00	3,00	4,00	4,00	4,00

AVP11	B1	B2	B3	B4	B5	BP6	BV7	BV8	BV9
5,00	5,00	4,00	6,00	5,00	4,00	6,00	5,00	3,00	6,00
6,00	7,00	4,00	6,00	6,00	4,00	6,00	5,00	4,00	7,00
6,00	5,00	4,00	5,00	5,00	5,00	6,00	6,00	4,00	7,00
5,00	6,00	6,00	6,00	5,00	7,00	6,00	6,00	6,00	7,00
5,00	6,00	5,00	6,00	7,00	7,00	6,00	5,00	6,00	7,00
6,00	7,00	5,00	4,00	6,00	7,00	5,00	7,00	5,00	6,00
4,00	4,00	3,00	4,00	4,00	3,00	4,00	5,00	2,00	3,00
3,00	2,00	1,00	4,00	2,00	2,00	3,00	3,00	4,00	3,00
2,00	2,00	2,00	3,00	2,00	2,00	2,00	2,00	4,00	2,00
4,00	4,00	5,00	2,00	4,00	4,00	5,00	5,00	3,00	5,00
3,00	4,00	4,00	1,00	3,00	3,00	4,00	4,00	4,00	4,00
3,00	3,00	3,00	3,00	4,00	3,00	3,00	3,00	3,00	4,00
4,00	3,00	4,00	5,00	4,00	4,00	3,00	3,00	3,00	3,00
3,00	4,00	4,00	1,00	3,00	3,00	3,00	4,00	4,00	3,00
3,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00	3,00	3,00
3,00	3,00	4,00	2,00	3,00	4,00	3,00	2,00	4,00	3,00
4,00	4,00	3,00	5,00	4,00	4,00	4,00	5,00	4,00	4,00
4,00	5,00	2,00	2,00	4,00	4,00	4,00	4,00	4,00	4,00

DATA 7.3.1 All the opinions after the solfège 1 course

VAR00001	VAR00002	VAR00003	VAR00004	VAR00005	VAR00006	VAR00007	VAR00008	VAR00009	VAR00010
4,00	3,00	5,00	4,00	4,00	4,00	3,00	4,00	5,00	4,00
3,00	4,00	4,00	3,00	4,00	3,00	4,00	4,00	3,00	3,00
5,00	4,00	5,00	4,00	4,00	4,00	3,00	3,00	3,00	5,00
4,00	3,00	5,00	2,00	4,00	4,00	3,00	4,00	5,00	2,00
4,00	5,00	5,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00
5,00	4,00	5,00	4,00	4,00	3,00	5,00	4,00	5,00	3,00
3,00	4,00	5,00	3,00	4,00	2,00	4,00	3,00	4,00	3,00
5,00	4,00	5,00	4,00	4,00	4,00	4,00	3,00	3,00	5,00
4,00	4,00	4,00	2,00	3,00	5,00	3,00	3,00	3,00	4,00
4,00	4,00	2,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00

VAR00011	VAR00012	VAR00013	VAR00014	VAR00015	VAR00016	VAR00017	VAR00018	VAR00019	VAR00020
4,00	3,00	4,00	4,00	4,00	4,00	4,00	4,00	5,00	5,00
3,00	3,00	4,00	4,00	4,00	3,00	4,00	4,00	4,00	5,00
4,00	4,00	3,00	4,00	4,00	4,00	4,00	4,00	3,00	5,00
3,00	4,00	3,00	3,00	2,00	3,00	3,00	4,00	4,00	2,00
4,00	4,00	4,00	4,00	5,00	3,00	3,00	4,00	5,00	5,00
5,00	4,00	4,00	5,00	4,00	4,00	5,00	3,00	3,00	4,00
3,00	3,00	3,00	2,00	3,00	4,00	3,00	5,00	3,00	4,00
5,00	5,00	4,00	4,00	3,00	5,00	5,00	5,00	5,00	4,00
3,00	1,00	3,00	3,00	1,00	3,00	3,00	3,00	5,00	4,00
2,00	2,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00	4,00

DATA 7.3.2 The opinions of the test group typologically

EA1	JA1	EA2	JA2	EB1	JB1	EA3	JA3	EB2	JB2
4,00	4,00	4,00	3,00	5,00	5,00	4,00	4,00	4,00	4,00
4,00	3,00	5,00	4,00	5,00	4,00	4,00	3,00	4,00	4,00
4,00	5,00	4,00	4,00	4,00	5,00	3,00	4,00	4,00	4,00
3,00	4,00	3,00	3,00	5,00	5,00	3,00	2,00	4,00	4,00
4,00	4,00	4,00	5,00	4,00	5,00	4,00	4,00	4,00	4,00
5,00	5,00	4,00	4,00	3,00	5,00	5,00	4,00	5,00	4,00
4,00	3,00	4,00	4,00	5,00	5,00	3,00	3,00	3,00	4,00
5,00	5,00	5,00	4,00	5,00	5,00	5,00	4,00	4,00	4,00
3,00	4,00	2,00	4,00	3,00	4,00	2,00	2,00	2,00	3,00
3,00	4,00	4,00	4,00	3,00	2,00	4,00	4,00	4,00	4,00

EBP6	JBP6	EB3	JB3	EB4	JB4	EAP4	JAP4	EB5	JB5
3,00	4,00	3,00	3,00	3,00	4,00	3,00	5,00	4,00	4,00
5,00	3,00	4,00	4,00	4,00	4,00	5,00	3,00	3,00	3,00
4,00	4,00	4,00	3,00	3,00	3,00	3,00	3,00	3,00	5,00
5,00	4,00	3,00	3,00	4,00	4,00	5,00	5,00	2,00	2,00
4,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00	3,00	3,00
4,00	3,00	4,00	5,00	4,00	4,00	5,00	5,00	5,00	3,00
3,00	2,00	3,00	4,00	3,00	3,00	3,00	4,00	3,00	3,00
4,00	4,00	4,00	4,00	3,00	3,00	2,00	3,00	4,00	5,00
4,00	5,00	2,00	3,00	3,00	3,00	4,00	3,00	3,00	4,00
3,00	3,00	3,00	3,00	3,00	3,00	3,00	4,00	5,00	4,00

EAV5	JAV5	EAV6	JAV6	EAV7	JAV7	EAV8	JAV8	EAV9	JAV9
4,00	4,00	3,00	4,00	5,00	5,00	4,00	4,00	4,00	4,00
4,00	4,00	4,00	4,00	5,00	5,00	4,00	4,00	4,00	4,00
4,00	3,00	3,00	4,00	4,00	4,00	4,00	4,00	5,00	4,00
4,00	3,00	4,00	3,00	5,00	5,00	3,00	3,00	5,00	4,00
4,00	4,00	4,00	4,00	5,00	5,00	3,00	3,00	4,00	4,00
4,00	4,00	4,00	5,00	4,00	4,00	5,00	4,00	4,00	3,00
4,00	3,00	4,00	3,00	4,00	4,00	5,00	5,00	5,00	5,00
4,00	4,00	4,00	4,00	5,00	5,00	4,00	5,00	5,00	5,00
3,00	3,00	2,00	3,00	2,00	2,00	2,00	3,00	3,00	3,00
3,00	4,00	5,00	4,00	3,00	3,00	2,00	3,00	4,00	4,00

EAV10	JAV10	EBV7	JBV7	EBV8	JBV8	EBV9	JBV9	EAV11	JAV11
4,00	5,00	3,00	4,00	5,00	4,00	4,00	4,00	4,00	5,00
4,00	5,00	3,00	3,00	4,00	4,00	3,00	4,00	5,00	4,00
4,00	5,00	3,00	4,00	3,00	4,00	3,00	4,00	3,00	3,00
3,00	2,00	3,00	3,00	4,00	4,00	4,00	3,00	3,00	3,00
5,00	5,00	4,00	4,00	4,00	4,00	4,00	3,00	4,00	5,00
4,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00	4,00	3,00
5,00	4,00	3,00	3,00	3,00	3,00	3,00	3,00	4,00	4,00
4,00	4,00	5,00	5,00	4,00	5,00	4,00	5,00	5,00	5,00
4,00	4,00	3,00	3,00	2,00	2,00	3,00	3,00	5,00	5,00
4,00	4,00	3,00	2,00	3,00	3,00	4,00	4,00	5,00	4,00

DATA 7.4.1 All the exam-results

RTASOKOE	RTENTTI	ITASOKOE	ITENTTI	STASOKOE	STENTTI	KTASOKOE	KTENTTI	MTASOKOE	MTENTTI
4,00	4,50	3,50	3,00	4,50	4,50	3,50	3,50	2,50	2,50
5,00	5,00	4,50	5,00	5,00	5,00	4,50	4,50	5,00	4,50
5,00	4,00	2,50	3,50	4,50	3,00	2,00	2,50	4,00	4,00
5,00	5,00	3,50	5,00	3,50	4,50	3,50	4,00	5,00	5,00
4,00	4,00	4,00	4,00	5,00	5,00	5,00	4,50	5,00	5,00
5,00	5,00	3,50	4,00	5,00	4,50	4,50	4,50	3,50	4,50
5,00	4,00	2,50	1,50	1,50	3,00	4,00	3,00	3,00	3,00
5,00	5,00	4,50	5,00	4,50	4,00	5,00	4,50	5,00	5,00
5,00	5,00	2,00	2,00	2,00	2,00	3,50	2,50	4,00	4,00
5,00	5,00	5,00	4,50	5,00	4,50	5,00	5,00	5,00	5,00
4,00	5,00	3,00	3,50	4,50	4,00	4,00	2,00	2,00	3,00
5,00	5,00	4,50	2,50	4,00	4,50	4,50	2,00	4,50	4,50
5,00	5,00	2,00	3,00	3,00	5,00	3,00	3,00	4,50	4,50
5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00
5,00	4,50	2,00	3,50	2,50	5,00	3,00	4,50	5,00	5,00
5,00	5,00	3,50	4,50	4,00	4,00	3,00	2,50	4,50	4,50
4,00	5,00	4,50	4,50	4,00	5,00	5,00	5,00	4,50	5,00
5,00	4,50	4,00	3,50	4,50	3,00	2,00	2,50	4,00	3,00
5,00	4,50	5,00	4,50	4,00	3,50	4,00	4,00	5,00	3,00
5,00	5,00	3,50	3,50	3,50	4,50	4,50	4,00	2,50	3,00

ENCLOSURE 6.1 Correlation coefficients of the variables.

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Number of valid observations (listwise) = 20,00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
IKA	16,00	2,25	13,00	21,00	20	
KOETULOS	20,40	3,44	14,00	25,00	20	
MIELIP	38,35	2,83	34,00	45,00	20	
ASENNE	74,05	4,80	66,00	82,00	20	

- - Correlation Coefficients - -

	ASENNE	IKA	KOETULOS	MIELIP
ASENNE	1,0000	,1025	,0434	-,0517
	(20)	(20)	(20)	(20)
	P= ,	P= ,667	P= ,856	P= ,829
IKA	,1025	1,0000	-,1157	-,2644
	(20)	(20)	(20)	(20)
	P= ,667	P= ,	P= ,627	P= ,260
KOETULOS	,0434	-,1157	1,0000	,4925
	(20)	(20)	(20)	(20)
	P= ,856	P= ,627	P= ,	P= ,027
MIELIP	-,0517	-,2644	,4925	1,0000
	(20)	(20)	(20)	(20)
	P= ,829	P= ,260	P= ,027	P= ,

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

TEST GROUP

Number of valid observations (listwise) = 10,00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
KIKA	16,70	1,95	14,00	20,00	10	
KKOE	20,30	3,92	14,00	24,00	10	
KMIELIP	37,90	3,28	34,00	45,00	10	
KASENNE	74,40	4,45	67,00	82,00	10	

- - Correlation Coefficients - -

	KASENNE	KIKA	KKOE	KMIELIP

KASENNE	1,0000	-,4077	,3937	,1856
	(10)	(10)	(10)	(10)
	P= ,	P= ,242	P= ,260	P= ,608
KIKA	-,4077	1,0000	,0131	-,2140
	(10)	(10)	(10)	(10)
	P= ,242	P= ,	P= ,971	P= ,553
KKOE	,3937	,0131	1,0000	,2446
	(10)	(10)	(10)	(10)
	P= ,260	P= ,971	P= ,	P= ,496
KMIELIP	,1856	-,2140	,2446	1,0000
	(10)	(10)	(10)	(10)
	P= ,608	P= ,553	P= ,496	P= ,

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

CONTROL GROUP

Number of valid observations (listwise) = 10,00

Variable	Mean	Std Dev	Minimum	Maximum	Valid N	Label
VIKA	15,30	2,41	13,00	21,00	10	
VKOETULO	20,50	3,10	16,00	25,00	10	
VMIELIPI	38,80	2,39	35,00	42,00	10	
VASENNE	73,70	5,33	66,00	81,00	10	

- - Correlation Coefficients - -

	VASENNE	VIKA	VKOETULO	VMIELIPI
VASENNE	1,0000	,4147	-,3191	-,3010
	(10)	(10)	(10)	(10)
	P= ,	P= ,233	P= ,369	P= ,398
VIKA	,4147	1,0000	-,2458	-,2584
	(10)	(10)	(10)	(10)
	P= ,233	P= ,	P= ,494	P= ,471
VKOETULO	-,3191	-,2458	1,0000	,9280
	(10)	(10)	(10)	(10)
	P= ,369	P= ,494	P= ,	P= ,000
VMIELIPI	-,3010	-,2584	,9280	1,0000
	(10)	(10)	(10)	(10)
	P= ,398	P= ,471	P= ,000	P= ,

(Coefficient / (Cases) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed

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CURRICULUM VITAE

Zsuzsánna Király has got her diploma in 1981 in Hungary at the Liszt Ferenc Music Academy as a "secondary-school singing-teacher and choir-master". She has worked as a piano teacher in Finland between 1984-1990. During this time she was also the choir leader in several Finnish choirs. From 1991 on she is the lecturer of music theory in the music college of Länsi-Uusimaa. Between 1995-1997 she has also worked at the Sibelius Academy as an ear-training teacher.

She started her post grade studies in 1991 and has prepared her licentiate's thesis between 1995-1999 at the University of Jyväskylä under the guidance of professor Jukka Louhivuori.

She would like to develop the Kodály-method combined with the most important discoveries of the modern technology.

She started her pilot research at the Sibelius Academy. During this period she wrote four electronic solfège-books for the professional music students, entitled Solfeggio I - IV. The research of her thesis was made in the Länsi-Uusimaa Music College in 1996/97. The target was to examine the possibilities of computer-assisted music teaching-learning and also to design an ear-training book.

Principal areas of her research interest are:

- **Solfège**
- **Cognitive Psychology**
- **Open and distance learning**
- **Network based learning**

Király Zsuzsánna