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How Young Children Teach us to Teach – Steps Towards an Integrative Music Education

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MARKUS CSLOVJECSEK

University of Applied Sciences Aargau, Northwestern Switzerland
markus.cslovjecsek@fhnw.ch

ABSTRACT *The understanding of learning processes has been fundamentally changed by scientific conclusions of the psychology and the neurophysiology of learning. Learning is understood as a construction process on the part of the learner. It is imperative to create the corresponding learning fields in order to be able to efficiently learn. The prelinguistic child is capable of learning its mother tongue without any previous language skills. Based on today's findings on the nature of learning processes, it can be assumed that learning from and with sound signs is decisive for the neonatal cognition. Those learning experiences are the „previous knowledge "and therefore formative for the future learning. However, they are hardly recognized within the academic environment: musical thinking and acting are almost always restricted to music class and are hardly ever connected to extra musical learning by the governmental education plan. Learning with and through music in educational psychology has rarely been discussed and has hardly been explored. It is to be expected that this paradigm shift in the understanding of sound will evoke critical questions from within all fields of education and will have an influence on the formation of teachers as well as on the overall understanding of teaching.*
The way young children learn and the way the school teaches has to be compatible.

KEY WORDS: music education, integrated curriculum, multiple intelligences, multisensorial learning, teacher education

1.Theoretical Framework

This contribution is based on the experiences with different models of the enhanced music education, the examinations of the basics of the learning psychology and the latest findings in neurophysiology. A curriculum with integrative music education, which understands music as an independent art as well as a means for learning and teaching, can create new learning fields and learning possibilities for the school. Children, the knowing learners, take those possibilities seriously. It is crucial, as a first step, to define music the way contemporary artists understand it as well: *everything we do is music* (John Cage). Another precondition is to perceive music in this wider sense as a sign

system of human communication (Spychiger 2001). The close connection of our projects with everyday life generates knowledge as regards the function and the qualities of the learning tool called music (see *Maths made by Music* (Cslovjecsek 2001/2004) and *early learning of foreign languages through music* (Kramer 2002)). Remaining true to the Methods of Grounded Theory (Glaser /Strauss 1967), the observations, experiences and findings are compared with the current discussion of learning theories. As the approach is highly practical and curriculum-oriented, both the teachers' as well as the children's knowledge is integrated into the research. The basis of this activity forms a transdisciplinary research paradigm (Thompson Klein 2001), i.e. the approach is action-oriented, interdisciplinary and participative.

2. Main Contribution

How Young Children Teach us to Teach – Steps Towards an Integrative Music Education

a) The prelinguistic learning and the expertise of young children

When we talk about educational learning of young children, there are at least two reasons to develop an interest in their previous learning experiences:

- New knowledge and skills are based on the already acquired knowledge. In order to successfully learn, the existing structures and skills have to be included.
- Young children have just learnt their mother tongue – they are the experts at least when it comes to learning languages and their methods are highly efficient.

Considering the book *Weltwissen der Siebenjährigen (World Knowledge of the Seven-Year Olds)* by Donata Elschenbroich (2001) and how little children learn languages, it is obvious that musical forms play a major role when children start „entering the world". During the initial phase, sound and movement are the two fundamental means of perception and effect within the cultural development process of humans (Bruner 1983). Only at a later stage, are they being replaced more and more by image and language.

Therefore, children are learning their first tongue entirely without language, but only with their being in the world and the help of their ears, eyes, nose, tongue and their sense of touch. Bruner recapitulates this ability in four "more or less assured statements on the perception, the abilities and the problem-solving skills of the prelinguistic child" as follows:

1. A major part of the cognitive learning process of the infant supports and accompanies outcome-oriented action.
2. A major part of infantile activity during the first year and a half is extremely social and communicative.
3. Many of the early actions show a surprisingly high level of order and systematics.

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4. There is an early ability to follow abstract rules as regards cognitive as well as communicative aspects.

Therefore, young children learn a language by means of dealing with sounds they create themselves or sounds that have an outside origin and their effects on objects and relations. This stimulates simultaneously learning on three different levels:

- Form (syntax): the accordance of linguistic utterances and the rules of grammar
- Meaning (semantics): the interpretation of signs within a context
- Function (pragmatics): the impact and effectiveness in communication

When learning their mother tongue, children focus on sounds. Sounds and noises are structured, the child develops theories on their functions and their efficiency is being assessed and varied by means of their social and target-oriented effects. For young children learning their mother tongue, the most important medium is sound. It appears that small children possess a high level of aural literacy, with which they can decipher the sign system of sound. The question has to be raised, whether this musical ability is similar to what Noam Chomsky (1965) described as the inherent Language Acquisition Device.

Breuer and Weuffen's (2000) survey supports the hypothesis that elementary musical skills correlate with the educational success expected at the point of school enrolment. In their empirical studies they demonstrate the effect on the learning success of phonetic-acoustic, kinesthetic-articulatory, melodic and rhythmical abilities to differenciate. Tewes and Warnke (2003) confirm these results and additionally show possibilities to train such skills by practicing.

However, the apparent ability of humans to structure sounds, to add a meaning to them and to detect certain rules does not suffice. New findings clearly demonstrate that parents play a much more active role in their children's language acquisition than, according to Chomsky, merely being a language model. They are partners in the so-called Language Acquisition Support System (Bruner 1983) and enable the language learning by adapting their level of speaking to what the children can understand.

b) Sound and Movement – Learning Media in Theory and Practise

Sound appears to be an extremely helpful means of the language learning process. It is therefore surprising, that sound and movement are hardly discussed as possible learning media. Examining the psychology on learning and teaching, there is indeed a difference between personal and non-personal media and between soft and hardware, different sign systems and sense modalities are being analyzed. We encounter

- the text as a means for learning,
- the illustration as a means for learning,
- film, TV and video as a means for learning,
- the computer as a means for learning.

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However, sound is not an independent means for learning outside of music class. In the research on educational media, sound is merely mentioned in connection with text (spoken text, paraverbal communication) or image (sound track). Since some years one's own body as a learning medium is discussed outside the sports and movement education as well within the context of the so-called embodied learning (Lakoff/Núnez 2002), based on former ideas on reforming education (for example the *rhythmics* by Emile Jacques-Dalcroze).

The questions asked as regards texts, images, video and computer by the educational psychology are also relevant concerning the qualities of sound and movement as a means for learning and teaching:

- How can music enhance learning processes? How does it differentiate from other media?
- How much media is necessary for certain goals, what are the characteristics of learners and the learning situation?
- Which media enables which learning forms?
- What do the respective media demand of the learner? How are they being used by the learner?
- What do the respective media demand of the teacher? How are they being used by the teachers?
- What are the negative influence points of the media on the learner and on learning?

Experience demonstrates that situations generated by music stand out by their volatile nature, their repeatability, their variability, their emotional charge as well as physical coordination, their demanding timing and their distinctive personal dimension. Other players and a differentiated non-verbal communication culture are required for this game; in order to retain an acoustic event, we have to transfer it onto a new medium. Since music can be repeated and varied, there is a possibility to test and to modify the perspective of a musical statement itself or a therewith connected motion sequence as well as a text or a procedure. Such educational approaches are based on Spychiger's understanding of music as a sign system of human communication Spychiger (2001). Gardner also defined his multiple intelligences by means of independent sign systems. However, we distance ourselves from the notion that (a) musical notation is the sign system of music and that (b) there is no transfer between the independent intelligences.

c) Practical Approach:

The sign system of music is sound. Sound itself is the means by which young children learn to develop a language and which accompanies the actions. Musical notation is one (of many) possibilities to transfer sound into a visual sign system. The ratio is similar to the ratio between language and writing, or between quantities, sizes and numbers and the corresponding graphical signs. Let us have a look at a concrete example:

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(clapping game; has to be demonstrated)

1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
O	**X**	**X**	**O**	**-**	**-**	**O**	**X**	**X**	**O**	**-**	**-**	**O**	**X**	**X**	**O**	**-**	**-**	**O**	**-**	**-**	rep.

O = Stamp with left or right foot

x = clap

It obviously is already a part of the learning process to try to repeat this game. However, taking a second look enables us to learn more about learning itself. For example, how our previous knowledge and the current form of education effects the learning: we are structuring sounds (like the prelinguistic infants), we come up with theories (like the prelinguistic infants), and we have difficulties assessing these theories (however, the prelinguistic infants seem to have less of a problem with the latter).

1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
O	X	X	O	-	-	O	X	X	O	-	-	O	X	X	O	-	-	O	-	-	rep.
Doom	**dash**	**dash**	**Doom**	**-**	**-**	**Doom**	**dash**	**dash**	**Doom**	**-**	**-**	**Doom**	**dash**	**dash**	**Doom**	**-**	**-**	**Doom**	**-**	**-**	

We have now amplified the sound of hand and feet by vocal means. It is apparent that we all understand the syllables in a similar way. This happens within the social contact – the most important factor in the acquisition of culture.

1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
O	X	X	O	-	-	O	X	X	O	-	-	O	X	X	O	-	-	O	-	-	rep.
Stomp	**clap**	**clap**	**stomp**			...															
Left	**clap**	**clap**	**right**			...															

Now, we combine terms with actions. According to the research conducted with prelinguistic children, this is one of the fundamental gateways to language. At this point, we are already replacing the sound of stamping and clapping by different linguistic symbols, such as a noun and a verb.

1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
O	X	X	O	-	-	O	X	X	O	-	-	O	X	X	O	-	-	O	-	-	rep.
Un	**deux**	**trois**	**salue**	**-**	**-**	**quatre**	**cinque**	**six**	**salue**	**-**	**-**	**sept**	**huit**	**neuf**	**Salue**	**-**	**-**	**salue**	**-**	**-**	
Eins	**zwei**	**drei**	**di**	**di**	**-**	**di**	**di**	**vier**	**fünf**	**sechs**	**du**	**du**	**du**	**du**	**du**	**sieben**	**acht**	**neun**	**das**	**-**	**ist**	**-**	**schön**	**-**	

Therefore, the process of abstraction continues. What is happening in the brain of the child, more precisely inside the head of the prelinguistic child or in this case inside the head of a person learning a foreign language? A new language, in the beginning, is a succession of sounds – which are the existing structures this series encounters?

Maybe there have been previous ideas developed by children to establish those spaces not only by means of sound, but also in a linguistic or

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physical manner. Creating rhymes is basically a musical phenomenon of stress and measure. This musical approach is important in prelinguistic sound experiments. It contains the first approaches to learning the syntax and the creation and identification of rules.

d) Does primary school maths make music?

Since the classical antiquity music and mathematics have been described as a wonderful pair. Gottfried Wilhelm von Leibniz (17th century) for example says: «Music is arithmetical work of the mind, to which it remains concealed that it thinks in numbers». Yet until now the lucky relation between the two disciplines has been associated neither with primary school mathematics nor with the topics of primary school musical instruction. Topics of an interdisciplinary discussion have rather been questions of harmonics, acoustics, and - for some years - the digitalization of sound or the discussion about the pitch of instruments and the mathematical conceivability of composition and interpretation.

The domains of physics, stochastics, combinatorics and informatics dealing with these topics do not have much in common with the curriculum of primary school. Therefore, it is not surprising that the kick-off to «Mathe macht Musik», a project about educational material, did not develop out of this ancient relationship of the two disciplines but out of the observation of learning children and of successful instruction.

These observations have been supported and promoted by the concept of multiple intelligence formulated in 1983 by Howard Gardner and the sign-system oriented comprehension of musical instruction that has been based on it (Spychiger 2001).

Proceeding from the experiences with a project with "increased musical instruction" the work with the participating classes soon showed that a modified time-table also entailed quite some changes apart from musical instruction. The intense work with music soon urged out of its topical borders and the musical perspective offered interesting practices and tasks in the instruction of languages, mathematics and general studies - or formulated the other way round - we realized that many topics and methods in school are basically full of music.

Regarding the concept of transdisciplinary teaching, it becomes apparent that - apart from the interdisciplinary subjects, which so to say lie "between" subject-matters - activities are important, which illuminate and explore the disciplinary work from the point of view of other subjects (transdisciplinary thinking and acting).

For the realization of this discovery we have created the term of "Music as a teaching principle" (Cslovjecsek and Spychiger 1998). This led to the availability of lessons with much music for all interested teachers and independently of time-tables.

Practical work with many classes has shown since that the elementary connections between instruction in mathematics and music enrich experience-oriented, exploratory and pleasure-centred learning and teaching in many ways.

On the other hand, didactics of mathematics have since the beginning of the nineties developed in direction of John Dewey's (1859-1952)

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concept of exploratory learning. Together with this new orientation, the point of view and way of thinking of children are more and more taken into consideration and approaches are postulated, which are linked to the context of teaching subjects. This change also implies "concentration on fundamental ideas of arithmetic's and geometry" and "turning away from instruction in tiny steps in favour of a conceptual entireness of the learning situation". Based on this concept, the means and ways of visualization are basically discussed as well. The way from perception to mental conception is comprehended as idiosyncratic constructional process (which also depends on the person). It consciously comes with individual and social interpretation and requires openness, time and space for creativity. To facilitate the learning process, specific materials have been introduced into the math classroom. The materials must comply with a number of criteria, such as:

- adequate representation of the structure of the mathematical fact
- manifold possibilities of usage
- possibility of continuation
- simple handling and simple (easily survey able) structure
- simple possibility of transfer to graphical representations
- easy practicability of mental operations
- possibility of discovering individual and differential strategies of solution and of social interchange on it
- continuous availability for all students and demo version for the class
- low price
- stability and environmentally harmless material

Sound and motion highly comply with these conditions. Due to the missing tradition of a corresponding approach, the two have until now hardly been brought into consideration as working or illustrative material - as tools for teaching and learning. If they appear in educational material, corresponding patterns of action are applied quite accidentally now and then and mostly as a means of decoration. This deficit is often compensated by music-minded teachers and their imaginative teaching and methodical skills. But this is no justification for the limitation of educational material to verbal, visual, haptic and mathematically-abstract approaches; acoustical (sound), kinesthetical (motion) and tactile (touch) impulses are of high value, especially with respect to acting and experiencing of children of primary school age. The integration of this type of experiences in mathematical instruction can make accessible important active learning paths of children in classroom; simultaneously, the insight of teachers in unexpected 'thinking paths' of their pupils is promoted.

The present website "Music by Maths" (based on the volume «Mathe macht Musik») wants to help to cultivate approaches to mathematics via sound and motion and to enrich musical instruction.

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Training ideas and impulses for a "musical" realisation of actual subjects of the mathematical curriculum as "patterns and orders", "numerical series and the concept of "number", "estimating", "calculating", "measuring", "arithmetic operations", "chance and hazard", "decimal system", "problem based learning", "calculating with money", "forms", "shapes and spaces in the world around us", "clock and timing" and "mathematical series" are shown. Games of perception, instructions to motion, songs, rhythmical games, concentration and observation tasks and exercises for creativity are used to transdisciplinarily exploit the musical potential and to create a positive atmosphere for learning. This type of instruction also supports the relaxed access of children to music and transdisciplinary acting and thinking.

Many of the proposed musical impulses for mathematical topics and many of the musical exercises and applications of mathematical questions are by themselves not spectacular and they do not imply an extraordinary musical talent of the teacher. Yet the impact of their consistent application on individual children and on classes as a whole, especially on motivation and the learning climate, is remarkable. Due to their inborn musical potential, impulses are always fun to play with. The mathematical and musical processes of exercise and automation stimulated by them often can be combined with the tasks of daily mathematical training.

3. Implications

It is a quality of sound and movement as a learning media, that they enable the learner to gain access to a broad learning field with many possibilities and that we as learning tutors have restricted access to what is happening inside the head of a child. The medium possesses multiple dimensions and they are at the same time a chance and an obstacle. We have to ask the following question:

Why have sound and movement hardly ever been systematically researched as a means for learning? Maybe because they can hardly be materialized and it is difficult to firmly grasp the concept. However, these cannot be justified reasons for not understanding sound and movement as a means for learning.

Within the scope of postgraduate studies, we have been involved for some time now with the connection of early foreign language learning and music as well as with mathematics and music.

The children are important factors in those projects, as they are the true experts when it comes to efficient and eager learning. The younger they are, the closer they are to the primary experience. Those projects are interdisciplinary, action-oriented and participative. The participants - teachers, students, principals, professors – act, observe and reflect from different perspectives such as music, foreign language, motivation, fun, and much more. It is this interdisciplinary approach which makes the project so exciting and promising.

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MARKUS CSLOVJECSEK,
UNIVERSITY OF APPLIED SCIENCES AARGAU, NORTHWESTERN SWITZERLAND

Markus Cslovjecsek, *diploma as a primary school generalist teacher, holds diplomas in school music education, in church music, in violoncello and in solo vocal studies at the Lucerne University of Applied Sciences and Arts. He is a professor of Music Education and head of the Chair of Music Pedagogy at the School of Teacher Education of the University of Applied Sciences Northwestern Switzerland.*
He oversaw the project called «Erweiterter Musikunterricht» (Swiss school experiment with extended music teaching) in the canton of Solothurn. He was the first president of the delegates of music education in the Conference of the Ministers of education in the Northwestern part of Switzerland and on the Board of «Extended Music Teaching» in the canton of Aargau.
The focus of his work is on the development of new perspectives within the scope of music in learning and teaching environments. He coordinates the international network on «Practice and Research in Integrated Music Education» (PRIME). For Klett und Balmer Editors he leads the project «Mathe macht Musik» www.mamu.ch; for the Ministery of Education of Baden-Württemberg (Germany) he runs a project «Fremdsprachenlernen mit Musik» and for schools he developed the multisensorial educational playground «creafon» www.creafon.com. He has published widely on the development of new perspectives concerning the role and place of music at school and is involved in workshops and lectures in Switzerland as well as abroad.

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