Students of higher teacher education institution observing children in a reflexive environment: Conceptions, educational practices, and role of the teachers*

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Abstract

In this article, we introduce the MIROR Focus Group carried out in the framework of the European project MIROR-Musical Interaction Relying On Reflexion, with university students undergoing teacher education (nursery, kindergarten and primary school). The MIROR Focus Group was carried out with the specific aim to investigate teachers' conceptions regarding the novel pedagogical paradigm of "reflexive interaction". This paradigm explores the idea of letting users manipulate virtual copies of themselves, through specifically developed software called interactive reflexive musical systems. We aimed to extrapolate the social representations held by the participants about reflexive interaction, children's music education and educational technologies, and develop more specific hypotheses concerning how the MIROR technologies can be used in the context of music education for teachers and teacher education, and in educational scenarios in general. First, we present the background and aims of the MIROR focus group and then the method, the data analysis and some results. We end the article by presenting the discussion and the conclusions.

Keywords: reflexive interaction pedagogy, MIROR platform, teachers' social representations, teacher education, music education for teachers

Estudantes universitários de curso de formação de professores, observando crianças em um ambiente reflexivo: concepções, práticas educacionais e papel dos professores

Resumo

Neste artigo, apresentamos o MIROR Focus Group realizado no âmbito da projeto europeu MIROR-Musical Interaction Relying On Reflexion, com estudantes universitários de cursos de formação de professores (creche, jardim de infância e escola primária). O MIROR Focus Group foi realizado com o objetivo de investigar as concepções dos professores em relação ao paradigma pedagógico de "interação reflexiva". Este paradigma explora a ideia de deixar os usuários manipular cópias virtuais de si mesmos, através de um software chamado sistemas musicais reflexivos interativos. Nosso objetivo consiste em verificar as representações sociais concebidas pelos participantes sobre a interação reflexiva, a educação musical para crianças e as tecnologias educacionais, e desenvolver hipóteses mais específicas a respeito de como as tecnologias MIROR podem ser usadas no contexto da educação musical de professores e de formação de professores. Inicialmente, nós introduzimos as fundamentações teóricas e os objetivos do MIROR Focus Group e então o método, a análise de dados e alguns resultados. Terminamos o artigo introduzindo a discussão e as conclusões.

Palavras-chave: pedagogia da interação reflexiva, plataforma MIROR, representações sociais dos professores, formação de professores, educação musical de professores

Introduction

The MIROR Focus Group is part of the research design of the European project MIROR-Musical Interaction Relying on Reflexion (ICT-FP7). The project deals with the implementation of a novel device for children's music and dance education, called the MIROR Platform, based on the paradigm of "reflexive interaction" (Addessi, 2014; 2011; Pachet, 2006). The MIROR Focus Group was carried out with the specific aim to investigate teachers' conceptions related to the "reflexive interaction" paradigm. This paradigm explores the idea of letting users manipulate virtual copies of themselves, through specifically deveoped software called *interactive reflexive musical systems* (IRMS)(Pachet, 2006). In a typical session with an IRMS, a user freely plays musical phrases on a (Midi) keyboard, and the system produces an immediate answer, increasingly closer in musical style. As the session develops, a dialogue takes place between the user and the machine, in which the system and the user reply to each other by repeating and varying the musical ideas. The first prototype of IRMS, the Continuator, was originally conceived for adult musicians. However, an exploratory study with children (e.g., Addessi & Pachet, 2005) immediately highlighted the potential of these systems for the development of children's creative musical experiences, bringing a fresh perspective to technological and pedagogical applications. The MIROR project represented the first attempt to apply this paradigm in the field of technology-enhanced learning in music and dance education. In this article, we introduce the MIROR Focus Group carried out with university students, who were undergoing teacher education at the University of Bologna (nursery, kindergarten and primary school). First, we present the background and aims of the MIROR focus group and then the method, the data analysis and the results. We end the article by presenting the discussion and some conclusions.

Background

In this section we introduce the reflexive interaction paradigm, reflexive music education and the problem of music education in generalist teachers.

The reflexive interaction paradigm

In our studies with children and IRMS (e.g. Addessi & Pachet, 2005, 2006; Ferrari & Addessi, 2014) we observed that the child-machine dialogue is based on the mechanism of *repetition* and *variation*, which lies at the heart of reflexive interaction: the system's repetition of the input given

by the child allows the child to perceive the response of the system as a sort of sound image of her/himself. The interesting thing is that it is not a mere imitation, but rather a repetition that is always constantly varied. The remark "It repeats but is different" expressed by a 5-year-old child after hearing the response of the Continuator for the first time, seems to sum up the attractive power of reflexive interaction. During the course of our experiments it was possible to observe several interesting features that characterise the reflexive interaction: the attention of the child increases when the system imitates the child's input and decreases when the system's replies become more varied; the dialogue that emerges between the child and the machine is not predetermined by the machine, nor realised by the child alone, but is co-constructed by the child along with the machine; this kind of co-regulation (Fogel, 2000) is based on a continuous repetition and variation mechanism between input and output data from the child and the system, where (a) the partners are able to imitate each other, (b) the child recognises being imitated, (c) the repetition of something is always accompanied by the introduction of continuous variations. The interaction is thus based on turn-taking: the child plays, then stops, waiting for the response of the system and when it comes s/he listens to it carefully, perceives its reflexive qualities and responds by imitating and varying the system's response.

Starting from the observation of children interacting with an IRMS, several theories have been put forward to explain the human behaviours engendered during the interaction with a reflexive system (Addessi, 2014). From a systematic musicological perspective, the theoretical framework of the reflexive interaction paradigm could include references ranging from the myth of Echo (Ovid) to the more recent semiological paradigmatic analysis (Ruwet, 1966) and the theory of similarity perception in listening to music (Deliège, 2003; Toiviainen, 2007). The ability to replicate the behaviour of others is to a certain extent grounded on the non-conscious processing known as the *chameleon effect* (Chartrand & Bargh, 1999). Lakin and Chartrand (2003) suggest that the mere perception of another's behaviour automatically increases the likelihood of engaging in that behaviour oneself. Studies in neuroscience root these non-conscious mechanisms in the mirror neuron system (MNS), a network of neurons that becomes active during the execution and observation of actions (Rizzolatti, Fadiga, Gallese, & Fogassi, 2002). The studies presented so far highlight the complexity of the processes set in place during a reflexive interaction: *imitation, imitation recognition, self-imitation, repetition and variation* represent processes that develop in the first months of life and which structure the Self of the child and her/his interaction with the

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surrounding environment (Bruner, 1983; Papoušek, 1995; Trevarthen, 2000; Dissanayake, 2000; Stern, 2004; Imberty, 2005). Anzieu (1996) calls this kind of infant experience a *musical wrapping* of the Self, in which the Self is described as the first embryo of the personality felt as a unit, an individuality, and which expresses one of the most archaic forms of repetition: the *echo*. Another important aspect that we can draw from this literature is the importance of reflexive interaction as a *dynamic process*: as explained by Imberty (2005), the experience of repetition and variation is carried out within affective and emotional conditions, the *amodal* experience that Stern (2004) calls *affective contours*, which are the outcome of the child's experiences of interaction.

Reflexive interaction and music education

The basic hypothesis of the MIROR Project is that reflexive interaction (in short RI) enhances music learning and musical creativity in young children. The pedagogical potential of RI lies in its ability to stimulate the subject to undertake a dialogue during which the repetitions and variations stimulate a cognitive conflict that the child solves during the course of the interaction, giving rise to learning by problem finding and problem solving. In our studies with children, we observed that the reflexive interaction using IRMS stimulated and reinforced exploratory conducts, during which the actions of the child were co-ordinated with the purpose of exploring the new partner and were characterised by the systematic introduction of new and different elements. Furthermore, it prompted inventive conducts, where the aim of the child's actions appeared to be to elaborate particular sounds and musical ideas and to undertake a dialogue with the system through the sounds. Both in the exploration and in the improvisation themselves, we saw very personalised styles in the children's approach to producing sounds, handling the instruments and other equipment, and in how they worked out plans of action to satisfy their own goals. The IRMS seem able to reinforce these individual styles, allowing them to develop and evolve. One of the most interesting aspects is that the invention is, in the end, not individual but collective: the child is playing along with the machine, in a pair, like two musicians improvising together. We observed that RI increases the attention span, stimulates intrinsic motivation, musical creativity, attentive listening, collaborative playing and ability in collaborative improvisation. IRMS also exploit the Vygotskian concept of zone of proximal development (ZPD) (Vygotsky, 1962). In this way, IRMS establish an interaction between pairs, where the mirroring reflection creates a balance between challenges and skills, a basis upon

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which to create flow experiences and creative processes. This characteristic enables the MIROR Platform to enhance collaborative playing, self-regulation, self-initiated activities, and a learner-centred approach.

Reflexive interaction and teacher education

The teaching method of the IRMS is based on their mirror effect, and consequently on the strategies of *modelling* and *scaffolding*, as described by Bruner (1981) and Vygotski (1962). Although these strategies are well known in the pedagogical field, they are not always used by teachers, and in particular by music teachers. As the history of western music tells us, teachers lost the ability to teach improvisation during the 19th century when performers stopped improvising, and it is very difficult to bring improvisation back into western music formal education (e.g. Kenny & Gellrich, 2002). An important area of teacher education is that of generalist teachers who teach music education in the nursery, kindergarten and primary schools. According to Hallam et al. (2009) and Holden & Botton (2006), the majority of generalist teachers have a low level of music knowledge and a low perception of self-efficacy and self-esteem. Further studies show that the higher the teacher's education, both theoretical and practical, the better they can modify both their perception of self-efficacy and their social representations of music, music education, musical child and music teacher (Addessi & Carugati, 2010; Seddon & Biasutti, 2008). Thanks to their ability to adapt to the user's musical competences and involve them in a musical dialogue, the MIROR applications can play a useful role in music teacher education and in the education of generalist teachers as music teachers.

Teachers can learn from the IRMS to respect turn-taking, and to act like a mirror, as suggested by the children when they say: "Teacher, look at me". They should try to let the aims establish themselves during the course of the lesson and foster the pleasure of not knowing what will happen, the joy of curiosity, in order to develop autonomy. They should not make assessments during the interaction but stimulate musical communication, developing learner-centred teaching and adapting their teaching practice and method to the cognitive style of the pupils. Moreover, teachers should learn to wait and listen to the pupils (just as the MIROR application "listens" and learns directly from the user) and give immediate and concrete feedback, trying to emphasize the process of musical creation instead of the musical product. Finally, priority should always be given to the knowledge of the pupils.

The MIROR applications can therefore support both teacher and children by creating a framework within which children are able to mix, in an original way, new music experiences with older ones and new

skills with those they have already acquired. It is especially interesting to note how the IRMS can teach the teacher how to stimulate and enhance self-regulation in the daily classroom activities and thus promote an educational style based not only on the teacher-pupils interaction but also on peer-to-peer and group interaction (e.g. Ferrari & Addessi, 2014).

Aims

In our study, we aim to investigate the interactive reflexive paradigm through a focus group consisting of students from a higher teacher education institute. It should be underlined that the focus group is a qualitative methodology which is not intended to provide definitive answers to questions (Acocella, 2008; Frisina, 2010; Greenbaum, 1998). This methodology was considered useful at this stage of the MIROR project to collect a series of inputs in order to extrapolate the educational conceptions and social representations (Moscovici, 1981; Addessi & Cardoso, 2011) held by a group of university students undergoing teacher education, relating to the MIROR platform and reflexive interaction, to gather ideas and develop more specific hypotheses that can be investigated in a more systematic way, for example how the MIROR platform can be used in the context of music education and for teachers and teacher education.

More precisely, we aim to:

- Investigate and observe the students/teachers' conceptions about children's music education, technology and reflexive interaction;
- Investigate how the students/teachers interact with the IRMS, what they learn in terms of musical competences and educational competences;
- Investigate how the students/teachers observe children interacting with the IRMS and what they learn from this observation;
- Investigate how the students/teachers perceive themselves and their role inside a reflexive educational environment;
- Investigate the educational practices that the students/teachers can elaborate with IRMS and children in educational scenarios (activities, the role of children, the role of the teachers);
- Define the role of the teachers in the use of reflexive technology in classroom scenarios;
- Elaborate educational practices aimed at introducing reflexive technology to students/teachers.

Method

The participants

Nine university students from the undergraduate course for "Educator in Childhood Services" and the master course for "Teacher in Kindergarten and Primary School" took part in the focus group. All participants attended the Music Education course between November 2012 and February 2013, held by the moderator of the focus group. The participants were chosen on the basis of their current university studies and future professional role (general teacher in nursery, kindergarten and primary school) and not on the basis of type of person. During the Music Education course the participants acquired some basic knowledge about the MIROR project, reflexive interaction and technology in music education. The participants were volunteers and were invited to attend the MIROR focus group at the end of the Music Education course. The socio-biographic data were collected for each participant by interview and questionnaire. The research team consisted of one moderator (research leader and professor of the Music Education course) and two observers (post-doc MIROR project research fellows).

Procedure

Nine meetings were held, from March to May 2013. Each meeting included: *Welcome* (15′) + (*Exordium*, *Stimulus* and *Discussion*, *Conclusion*, *Ending questions* (90′) + informal coffee-break/*debriefing* (30′). The meetings were led by the moderator, and an observer/assistant took notes and proposed the final synthesis. At the end of each meeting all participants defined a list of *salient issues*. The participants were informed about the aims of the MIROR project and the focus group, their role and the role of the moderator and the observer. They were invited to express their personal opinions about several topics related to the MIROR research. During the meetings, several moderating techniques and stimuli were used in order to stimulate and lead the conversation: reading papers, videos of children interacting with the MIROR-Impro, one of the 3 applications of the MIROR platform (Pachet, Roy, & Barbieri, 2011), practical work with the MIROR-Impro, sentence completions, list compilation, and so forth. The meetings were audio and video recorded. Each meeting was followed by an informal coffee-break/debriefing. The debriefing was made by the moderator with the observer/assistant: the debriefings were audio recorded. The meetings were carried out at the Department of Music, University of Bologna, in different environments: open space, informatic laboratory, MIROR Studio. See *Figure 1* for examples of settings.
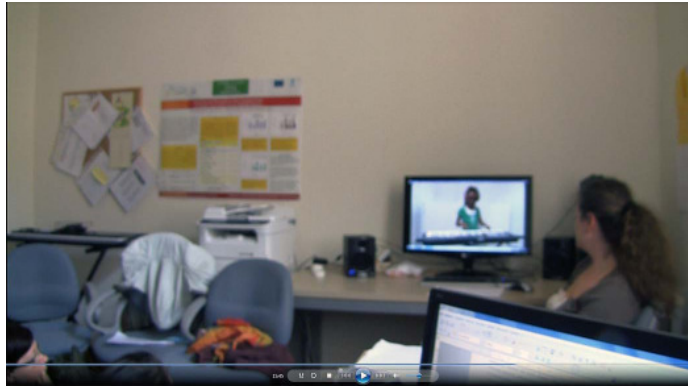
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Figure 1. Setting of meetings 6 and 7 (1a/d), and 8 (1e). Figure 1a shows one student playing the keyboard and then (Figure 1b) listening the system's reply. Figure 1c shows a pair of students playing the keyboard and then (Figure 1d) discussing about the relationship between their musical productions and the system's replies. Figure 1e shows a moment of the observation of video with children interacting with the MIROR-Impro.

Synthesis of the meetings

Meeting 1: *Welcome*: presentation of the participants (including the moderator and the observers), their roles, introduction to the MIROR Project, aims of the focus group. Administrative matters (consent form, etc.). *Stimulus*: the moderator invited the participants to express their opinion about music education, children and technology in compulsory school. *Salient issues*: technologies and learning processes in children; role of teacher/adult in child-computer interaction and development of technologies; creativity and technology; music technology and the MIROR Platform; technology and rehabilitation.

Meeting 2: *Exordium*: synthesis of the previous meeting. *Stimulus*: Topics proposed to be discussed: technology, music and education; Questions: What is your experience in technology and music? What do you mean by the word "music"? *Salient issues*: technology and rehabilitation settings in the educational context; difficulty of the teacher and parents related to using technology; risks associated with the use of technology; the technology as a tool for sharing; greater predisposition to technology of today's children than in the past; need to understand how to develop the technologies; the link between technology-creativity-music.

Meeting 3: *Exordium*: synthesis of the previous meeting. *Stimulus*: Questions: what are the aims of the use of technology in music education in compulsory school? What do the children do? Topic: teacher education in new technology. *Salient issues*: aim of the use of technology in music in the primary school context; aims of

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music education; education of teachers in the use of technology and use of technology for teacher education; technologies and music development; technology-child-teacher relationship; age and related differences in the use of technologies.

MEETING 4: *Exordium*: synthesis of the previous meeting. *Stimulus*: discussion about two articles related to the MIROR project: what are the aims of the MIROR project? What is reflexive interaction? How does technology work within the reflexive environment? What is the educational potential of reflexive interaction? *Salient issues*: reflexive interaction and how this paradigm is linked to the MIROR project; child-mother reflexive interaction; reflexive interaction and mirror neurons; how reflexive technology can help the teacher to change his/her way of teaching; educating to listen and understand, without setting aside the teacher's tutoring.

MEETING 5: *Exordium*: synthesis of the previous meeting; introduction to the experimental activities of the MIROR project. *Stimulus*: Discussion about two articles related to the pedagogical activities with the MIROR platform. *Salient issues*: how much the child's abilities are deepened through the interaction with IRMS; considering the child-machine interaction in a more complex dynamic; flow and attention processes; how the acquisition of competences develops in relation to reflexive technology; difference compared to traditional tools; the role of technology in teacher education; limits of the IRMS; learning, pedagogical context and role of the teacher.

MEETING 6: *Exordium*: synthesis of the previous meeting, preparation and introduction to the MIROR-Impro. *Stimulus*: practical work with the MIROR-Impro; alone and in pairs (see *Figure 1a*). *Salient issues*: interaction with the system, styles of interaction of the participants; how the interaction with the system affect the interaction among participants during the interaction in pairs; how the replies of the system help the pair to co-regulate each other; several ways to elaborate musical ideas arising from the interaction with the system.

MEETING 7: *Exordium*: synthesis of the previous meeting, preparation and introduction to the MIROR-Impro. *Stimulus*: practical work with the MIROR-Impro; alone and in pairs. *Salient issues*: interaction with the system, styles of interaction of the participants; how the interaction with the system affects the interaction among the participants, during the interaction in pairs; how the replies of the system help the pair to co-regulate each other, several ways to elaborate musical ideas arising from the interaction with the system.

Meeting 8: *Exordium*: synthesis of the previous meeting. *Stimulus*: Observation of video of child interacting with MIROR-Impro (see *Figure 1b*); list compilation: child's gestures to produce sound, musical ideas, child's listening, child-machine dialogue. *Salient issues*: analysis of how the child interacts with the MIROR-Impro; different feelings that the child conveys through the video; considerations on child-machine interaction, musical experience, musical learning; gestures to produce sounds; musical ideas; listening; child-machine interaction.

Meeting 9: *Exordium*: synthesis of the previous meeting. *Stimulus*: Observation of videos of 7 and 2 y.o. children interacting with MIROR-Impro; list compilations: pedagogical practices with MIROR-Impro; how MIROR-Impro can be used for teacher education. *Salient issues*: analysis of dialogue between the child and the MIROR-Impro; educational practices with the MIROR-Impro; proposals on how to use the MIROR-Impro in teacher education.

Data analysis

For each focus group we collected the following data: video recordings, audio recordings, syntheses of the discussed topics, notes, and list of key-ideas (by the observer), completed lists (by the participants), questionnaires (participants), notes (by the moderator). For each debriefing (moderator + observer): audio recordings. Firstly, the focus group discussions were transcribed. The automated content analysis (qualitative and quantitative analysis) by means of a specific software (T-Lab, version 8.1.3, Lancia, 2011) was made with the aim to highlight the students' conceptions and social representations of music education, music education and technology, reflexive interaction, role of the teacher, MIROR platform, reflexive learning strategies, teacher education.

Results

In this section we report some results of the automated content analysis. More precisely, Concept mapping and Correspondence analysis were performed for each meeting.

Concept mapping of each meeting

Concept mapping analysis is useful to find out and map relationships between single keywords or relationships between/within small clusters. The data used to perform the analysis are the keywords co-occurrences

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(two words co-occur when they are members of the same elementary context, a short sentence or part of long sentence). We observed two phases of development of the focus group: meetings 1 to 5 and then meetings 6 to 9. The concept mapping of meeting n. 1 showed a limited use of words and concepts. Over the following meetings, the discussion improved in both the number of words and the concepts. Similarly, in meeting 6 the discussion was minimal and then became more intense over the next meetings. It seems that the practical work with MIROR-Impro (meetings 6 and 7) and then the observation of children interacting with the MIROR-Impro (meetings 8 and 9) affected the development of the meetings.

Correspondence analysis

In this section we report the correspondence analysis using the "meeting" as variable. Correspondence analysis is a factorial statistical technique whose aim is to reduce the dimensionality of the data space in order to find hidden latent structures, the factors. Once the factors have been extracted it is possible to study the relation characterizing the elements constituting the table. *Figures 2a/b/c* show the graphical representations of the distribution of the values for each factor analysed.
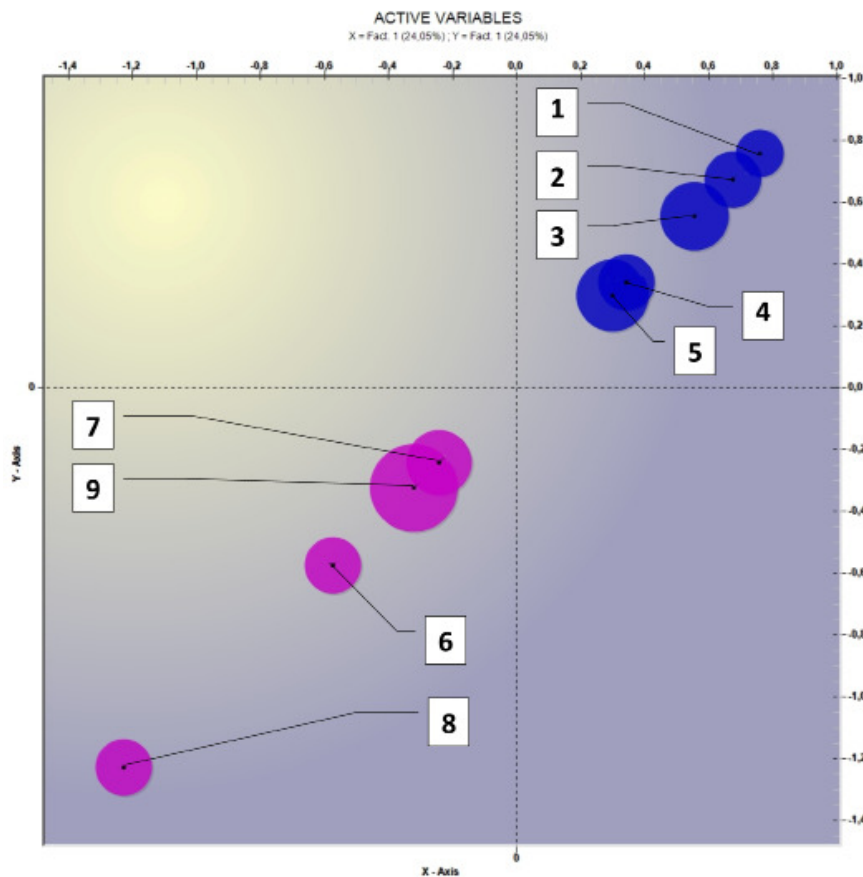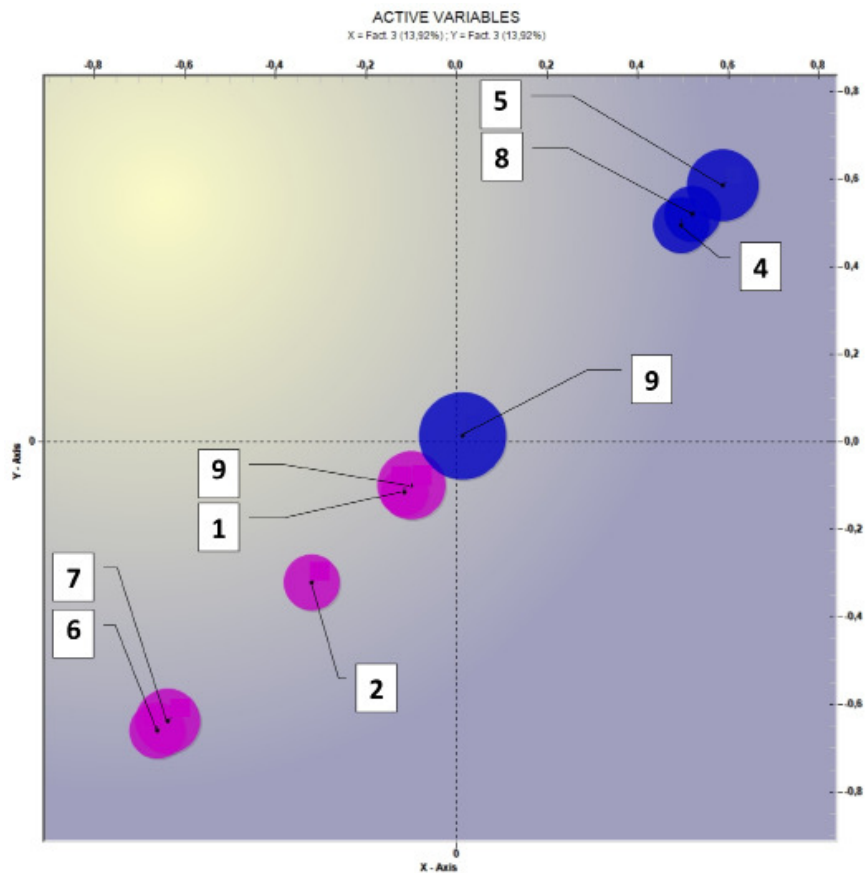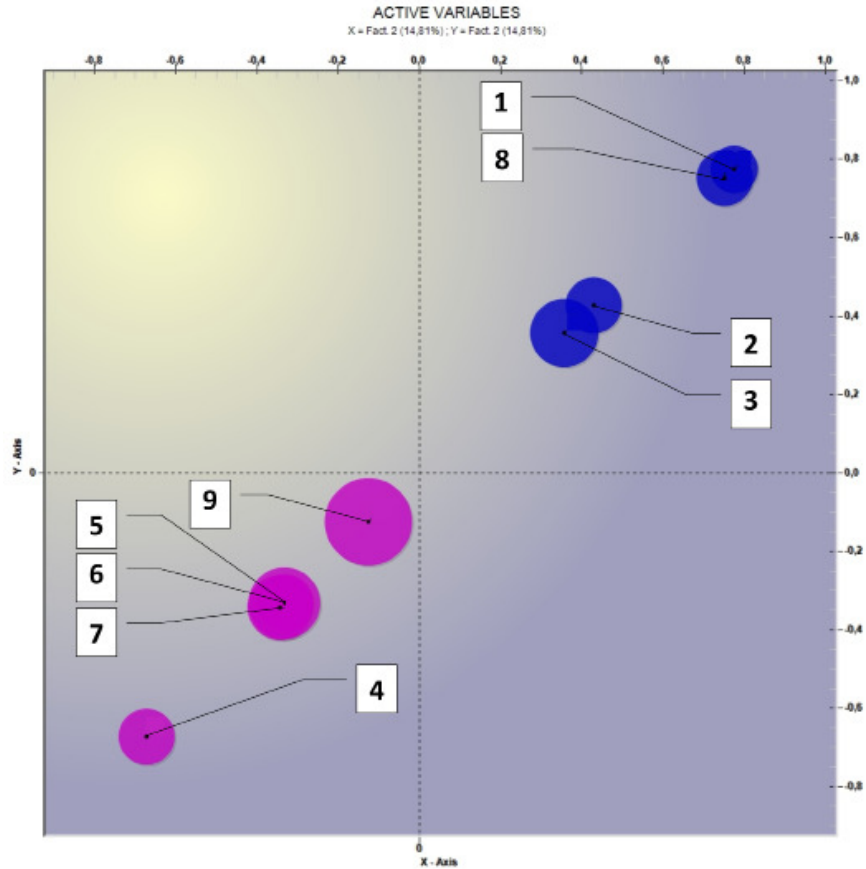
Figure 2. Graphical representation of the distribution of the values for factor 1 (2a), factor 2 (2b), and factor 3 (2c).

Figure 2a (Factor 1): meetings 1, 2, 3, 4, and 5 are shown at one extreme (top right) and meetings 6, 7, 8, and 9 at the other (bottom left). As meetings 6, 7, 8, and 9 were devoted to practical work with MIROR-Impro and the observation of videos of children interacting with MIROR-Impro, it could be said that the use of MIROR-Impro and the observation of child-Impro interaction was a determinant factor for the participants, which effected a turning point in the vocabulary and conceptions discussed during the focus group.

Figure 2b (Factor 2): in the centre we find meeting 9, which represents the final moment of summary of all the meetings. We can observe that meetings 1 and 8 are shown at one extreme (top right), near to meetings 2 and 3, and meeting 4 at the other (bottom left), near to meetings 5, 6, and 7. It could be said that the observation of a child interacting with MIROR-Impro during meeting 8 raised several issues correlated with the issues of meetings 1, 2, and 3, that is to say technology and children's (music) education. Instead meetings 4, 5, 6, and 7 focused on the issue of the reflexive interaction paradigm, through the discussion of articles (4 and 5) and practical work with the system (6 and 7).

Figure 2c (Factor 3): in this figure it is possible to see meetings 4, 5 (discussion of the articles), and 8 (observation of child-MIROR interaction) at one extreme, and 6 and 7 (practical work with MIROR-Impro) at the other. It could be said that the participants separate their personal experience with the MIROR-Impro from the experience of observation of child-machine interaction. The observation of child-machine interaction is correlated with the discussion about the papers (meetings 4 and 5). In the centre there are meetings 1, 3 (general discussion), and 9 (pedagogical practice with MIROR, teacher education with MIROR), which represent the final moment of summary of all meetings.

Discussion

It was possible to observe that the most important "turning point" in the students' conceptions about children's music education, reflexive interaction and new technology, occurred in meetings 6, 7, 8, and 9, that is when the participants used the MIROR-Impro and then observed the children interacting with the system (*Factor 1*). It was also possible to observe that the practical work with the MIROR-Impro allowed the participants to better understand the concept of reflexive interaction pedagogy presented in the articles.

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The practical work with the system allowed the participants to live the same experience as children, and in doing so discover the pleasure of musical dialogue, explore in first person the domain of reflexive interaction with reflexive technology and deduce, as we already observed with children, the rules of the interaction (turn-taking, repetition/variation, imitation, etc.) and collaborative playing with the partners. The sessions were attended and discussed by all the group, and each participant was encouraged to observe and express her/his opinion and considerations. An interesting topic arising during the two meetings devoted to the practical pair-work sessions, was the way the reflexive answers of the system had stimulated them to listen attentively to the musical production of the partner, developing a triadic musical dialogue between the system and the pair of participants. Another common observation was that each participant/musician had an individual musical style and that her/his style changed over the session on the basis of the style of the partner who was playing with them. It was also observed that each individual musical style reflected the personality of each "musician": for example, in one couple it was observed that the contemplative personality of one partner was expressed by a careful exploration of long sounds and attentive listening to the system's answer, while the exuberant personality of the other partner was expressed through several attempts to play without waiting for the system's reply and the partner's turn. However, during the course of the reflexive playing, these personalities/musical styles gradually changed, producing a musical dialogue where the exuberant participant started to listen to and appreciate the long sounds produced by the friend, and the contemplative participant started to produce a closer and more interactive dialogue.

The other important step was in meetings 8 and 9, where the participants watched videos of children interacting with the MIROR-Impro. During meeting 8, an observation grid was distributed as a stimulus, focusing the attention of the participants on the observation of the musical conducts of the children and on their interaction with the system. The student teachers made a detailed analysis of the gestures the children used to produce the sounds (striking the keys with one finger, or with the hand, stroking various keys, pressing the keys with the forearm, etc.), the musical ideas that arose during the musical dialogue, the way the children listened to the system's replies and to their own production and that of the partner. Finally, they discussed the different modes of child-machine interaction. This detailed observation helped the participants to discover a certain way of looking at the musicality of children, their way of expressing themselves through sounds and gestures. Furthermore, they discovered the effect that reflexive inter-

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action can have on children's musicality and on their ability to invent music. In meeting 9, the participants passed from the observation of children interacting with the system, to the elaboration of educational activities with children and the MIROR-Impro, the musical aims they might achieve and the role of the teacher in a reflexive environment.

In synthesis, the IRMS could be used in teacher education with the following goals:

- to develop teachers' basic musical competences: the teachers can use the MIROR platform to make music (improvisation and composition), to listen to it, to express themselves by means of sounds, to create musical dialogues and interactions;
- to develop teachers' professional competences related to child-machine interaction, children's musical development, child-teacher interaction, children's musical creativity. In particular, observing child-IRMS interaction could be a fruitful tool for teachers to learn about the musical child, the way children use the sounds and the music to make interaction and meaningful dialogues;
- to enhance teachers' ability to plan new practices and paths with children and the MIROR platform in the classroom context.

From a methodological point of view, the focus group proved to be an effective tool to highlight their implicit conceptions about music, children's music education, technology and reflexive technologies. Some weaknesses were observed in meetings 4 and 5, as the participants expressed difficulty in reading and understanding the articles they received as stimuli for the discussion. There were too many articles (4) and there was not enough time for discussion.

Conclusions and future steps

In our study, we aimed to investigate the reflexive interaction paradigm through a focus group consisting of students from a higher teacher education institute. A particular software was used to carry out the concept mapping of each meeting and the correspondence analysis to highlight several factors which indicate the implicit conceptions and structure of the discourse recorded during the meetings. The results showed that the practical work with a reflexive interactive musical system (namely the MIROR-Impro) and the observation of children interacting with the same system generate some "turning points", that is to say changes, in the conceptions held by the participants about music, technology, and children's music education. It could be said that the use of reflexive

technologies can affect the implicit knowledge held by teachers about the 'musical child' and about themselves as musicians and music teachers. Used alongside the observation of children interacting with the system, this kind of technology also seems to aid the acquisition of methodological skills regarding the use of reflective techniques in music education, such as mirroring, *modeling*, and scaffolding. For example, playing together with the children, as the MIROR-Impro does, giving rise to a musical dialogue with the child/ren based on question/answer, imitation, repetition, variation, turn-taking, etc. And also trying to foster and build educational scenarios which allow children to express their emotions and ideas by means of sounds and music. Baroni states "We believe it is possible to maintain a rigid position of principal, that is, the absolute necessity for the pre-eminence of expression over learning: and this is not only because the construction of expressive objects can be considered the principal goal, but also because it constitutes the only valid and persuasive motivation for learning activities" (1997, p. 147). In the context of reflexive environments, music education consists primarily in giving children the opportunity to express their emotions and interior experiences, which often remain unexpressed, through the language of sounds. The role of the teacher, in this context, is not the transmission of musical knowledge but rather to dialogue with the children in a musical way and set up appropriate scenarios for children to express themselves by music.

The next steps will be to analyse the key-ideas of participants emerging during the focus group related to the salient issues, the lists made by the participants about the child's gestures to produce sound, musical ideas, the child's listening, child-machine dialogue, the lists made by the participants about pedagogical practices with MIROR-Impro, in the nursery, kindergarten and primary school. We will then analyse the List made by the participants concerning the question: how the MIROR-Impro can be used for teacher education, and what the teacher can learn by using the MIROR systems (musical and professional competences, child-machine interaction, child musical development, child-teacher interaction, child creativity, MIROR systems in the classroom). These findings will be further discussed in order to prepare the MIROR Platform Teacher's Guide, to plan teacher education courses with the MIROR Platform, and to develop more specific hypotheses about reflexive pedagogy and music teachers' education that can be investigated by means of a controlled procedure.

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Acknowledgments

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