Piano students’ conceptions of learning, teaching, assessment, and evaluation

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Abstract
Artistic domains of knowledge, such as music performance, have not raised the interest of researchers focused on conceptual change. By adopting the framework of implicit theories, this article addresses the conceptions of learning and instruction held by students at professional music conservatories. More specifically, our aims were to study the conceptions of learning, teaching, and assessment/evaluation held by piano students at three developmental/instructional levels, and analyze whether their conceptions constitute theoretically consistent profiles. The participants, 215 students of Intermediate and Tertiary levels, were selected according to three levels of the combined variable “Age/Level of Instruction”. Data were collected through a multiple-choice questionnaire, and analyzed with descriptive and non-parametric methods. The findings suggested that: a) students’ conceptions tend to be more sophisticated as their age and education level increase; b) each developmental/instructional group is typically associated to different conceptions; c) three increasingly sophisticated profiles of conceptions can be identified among these students. Implications for conceptual change research and limitations of the study are discussed. Further lines of research are suggested.

Keywords: Conceptual change, implicit theories, conceptions, music students.

Concepciones de estudiantes de piano sobre el aprendizaje, la enseñanza y la evaluación

Resumen
El campo del conocimiento artístico, como la interpretación musical, no ha despertado el interés de los investigadores que estudian el cambio conceptual. Adoptando el marco de teorías implícitas, este estudio aborda las concepciones sobre el aprendizaje y la instrucción de estudiantes de conservatorios de música. Nuestros objetivos eran estudiar las concepciones sobre aprendizaje, enseñanza, evaluación/creditación mantenidas por estudiantes de piano de tres niveles evolutivos/educativos, y analizar si dichas concepciones constituían perfiles teóricamente consistentes. Los participantes, 215 estudiantes de Grado Medio y Superior, fueron seleccionados de acuerdo a tres niveles de la variable combinada “Edad/Nivel de Instrucción”. Los datos fueron recogidos mediante un cuestionario de opción múltiple, y analizados mediante métodos descriptivos y no-paramétricos. Los resultados sugieren que: a) las concepciones de estos estudiantes tienden a ser más sofisticadas a medida que avanza su edad y nivel educativo; b) cada grupo evolutivo/educativo está típicamente asociado a diferentes concepciones; c) entre los estudiantes, pueden identificarse tres perfiles de concepciones de sofisticación creciente. Se discuten las implicaciones para la investigación sobre cambio conceptual, las limitaciones del estudio, y se sugieren futuras líneas de investigación.

Palabras clave: Cambio conceptual, teorías implícitas, concepciones, estudiantes de música.

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As a result of our biological and cultural heritage, human beings spontaneously develop sets of mental representations about mind, knowledge, and the processes of knowledge acquisition and transmission. Research on these intuitive conceptions and their process of conceptual change has almost four decades of history, having been addressed with very different samples (preschoolers, students, teachers), from many theoretical perspectives (epistemological beliefs, theory of mind, phenomenography), and therefore by means of different methodologies (interviews, problem-solving tasks, questionnaires). Regardless of the divergences among these approaches, they all seem to point out that these beliefs about the mind and about knowledge influence the ways in which people learn, teach, and interpret their own ways of knowing (e.g., Hofer & Pintrich, 2002).

By adopting the framework of implicit theories (Pozo et al., 2006), the present article addresses the conceptions of learning and instruction held by students at professional music conservatories. To date, this population has not raised much interest among educational researchers. In Spain, the country where the present study was developed, some research has been conducted with music teachers (e.g., Bautista & Pérez Echeverría, 2008; Bautista, Pérez Echeverría, & Pozo, 2010, 2011; Torrado, Casas, & Pozo, 2005). There is no research study conducted with music students within this theoretical framework.

In their meta-analysis of the most recent literature on intuitive conceptions and conceptual change, Murphy and Alexander (2008) pointed out that this strand of research “would be enriched by stepping outside of the scientific ‘comfort zone’ to investigate the change process in a range of academic domains” (p. 597). This was one of the motivations for us to choose the field of music performance, an academic domain in which—to the best of our knowledge—no similar research with students has been yet published in the English language. Investigating music students’ conceptions is theoretically relevant due to numerous reasons. Unlike the most investigated domains (e.g., sciences, mathematics), music is an artistic domain. Musical knowledge, in particular instrumental knowledge, is tremendously distinctive because it cannot be (only) verbally or symbolically expressed. It needs to be performed, enacted. Thus, instrumental performance involves more procedural abilities than other subject matters. In addition, music instruction is particularly distinctive because tuition is generally developed in one-to-one settings, which enables the study of teacher-student relationships (Torrado et al., 2005). The second motivation for this study was applied in nature. According to current conceptual change models (e.g., Pozo, 2003; Vosniadou, 2007), if we want to foster changes in the way that music students approach their learning—as recent curricular reforms claim (LOE, 2006)—, their conceptions need to be investigated, described, and taken into account to be able to design the most effective interventions.

Implicit theories as a framework to investigate learning and instruction conceptions

Pozo and his colleagues (2006) have developed a theoretical and empirical framework for the study of learning and instruction conceptions. This framework was called the implicit theories approach (for some publications in English, see Bautista et al., 2010; Scheuer, de la Cruz, Pozo, Huarte, & Sola, 2006). The influences of several well-established research lines can be easily identified in this approach, with postulates coming from theory of mind research (e.g., Wellman, 1990), personal epistemologies (e.g., Hofer & Pintrich,
conceptual change in specific domains (e.g., Vosniadou, 1994), and models about knowledge acquisition grounded in the implicit/explicit cognitive perspective (e.g., Karmiloff-Smith, 1992; Pozo, 2003; Rodrigo, Rodríguez, & Marrero, 1993; Strauss, 2005).

One of the most important postulates of our framework is that conceptions of learning and instruction—regardless of their degree of sophistication—constitute consistent personal theories (Claxton, 1990). Our conceptions are understood to be articulated according to the four features required for a set of mental representations to constitute actual theories: abstraction, coherence, causality, and ontological commitment (Gopnik & Meltzoff, 1997). The importance of constituting “theory-like structures of knowledge,” in Vosniadou’s (2007) terms, lies in the fact that these structures enable individuals to formulate relatively consistent predictions and explanations about educational issues, as well as infer—more or less explicitly—numerous generalizations, categories, and rules from learning and teaching settings (Rodrigo et al., 1993).

From this starting point, and based on research about intuitive knowledge in scientific domains, Pozo and collaborators (2006) have conducted a considerable number of studies with very different samples such as preschoolers, students, and teachers in several subject matters and educational levels, as well as adults (parents). The findings of these studies have pointed out the existence of three increasingly sophisticated theories: direct, interpretative, and constructive. Their epistemological, ontological, and causal assumptions are presented in Table I.

### Table I

**Assumptions of the theories of Learning and Instruction (L&I). Adapted from Pérez Echeverría et al. (2001)**

<table>
<thead>
<tr>
<th>Epistemological</th>
<th>Direct</th>
<th>Interpretative</th>
<th>Constructive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naïve Realism</strong></td>
<td>Knowledge is a faithful and accurate portrait of reality. Subjects need to copy this reality.</td>
<td>Knowledge is a faithful and accurate portrait of reality. Subjects can modify this reality through their active role in the knowing process.</td>
<td>Knowledge is a construction elaborated by the subject, who builds personal models to interpret reality. These models can be more or less accurate.</td>
</tr>
<tr>
<td>Ontological</td>
<td><strong>States – Products</strong></td>
<td>L&amp;I are exclusively conceived in terms of states, products of final outcomes of knowledge.</td>
<td>L&amp;I are also conceived in terms of actions and processes (e.g., cognitive, motivational), which are supposed to be externally managed by the teacher.</td>
</tr>
<tr>
<td><strong>Sophisticated systems</strong></td>
<td>L&amp;I are also conceived in terms of sophisticated psychological systems (e.g., metacognitive, affective, motivational), which are supposed to be internally managed by the learner.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Causal</td>
<td><strong>Simple causality</strong></td>
<td>A direct and linear relationship is established between L&amp;I conditions and outcomes.</td>
<td><strong>Multiple causality</strong></td>
</tr>
<tr>
<td><strong>Interactive causality</strong></td>
<td>A complex and interactive relationship is established among L&amp;I conditions, processes, and outcomes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the following sub-sections, we describe these three learning and instruction theories in-depth. Because there is no previous research in which music students’ theories have been investigated, our literature review is focused on studies conducted in domains other than music. For didactical purposes, the
three theories are presented according to a developmental/educational criterion, that is, following the way in which these learning and instruction theories tend to emerge and evolve from very early ages and educational levels (in particular, 3- to 4-year-old children attending pre-school). Yet readers need to take into account that all three theories can be identified at all developmental/educational levels, as clearly shown in the present study conducted with adolescent and adult music students (this idea will be stressed again below given its importance). In order to illustrate the content of the three theories within the field of music performance, some examples taken from a previous study conducted with piano teachers (Bautista et al., 2010, 2011) will be provided in italics.

Direct theory

The interview-studies conducted by Scheuer et al. (2006; also Scheuer, Pozo, de la Cruz, & Baccalá, 2001) have consistently shown that 3- to 4-year-old children hold the direct theory of learning and instruction, which is understood as the most naïve and intuitive. This theory is thought to be implicitly developed as a result of preschoolers’ everyday experiences in cultural settings, and more specifically because of their engagement in formal and informal educational settings. In this early theory, very similar to Wellman’s (1990) copy theory, knowledge is conceived from a realist epistemological perspective (Pecharromán & Pozo, 2008). According to naïve realism, knowledge can be objectively described as right vs. wrong, true vs. false, correct vs. incorrect (e.g., “There is only one way to perform musical pieces correctly: Interpreters need to reproduce the exact notations written by music composers”). The psychological processes whereby knowledge is acquired are completely ignored in this theory. Thus, a simple causal relationship is established between learning conditions and final learning outcomes (e.g., “The amount of time spent in instrumental practice is the most important and determining factor for the learning of musical pieces”). The human mind is understood as a black—and empty—box. Ontologically, learning is conceived of in terms of states, products, or final outcomes of knowledge (e.g., “If the student plays the musical pieces correctly in the exam, with no interruptions, no mistakes, etc. it means that she knows these pieces well and consequently she deserves a good grade”). In the direct theory, in sum, the learner’s role is conceived as reproductive and passive (Pérez Echeverría, Mateos, Pozo, & Scheuer, 2001).

After the age of four, children tend to develop slightly more sophisticated versions of this copy-knowledge theory (Scheuer et al., 2001, 2006). Their discourse progressively acknowledges more learning/teaching conditions (e.g., quality of practice conditions, need for good models to be imitated). In addition, further characteristics of the learning subject (e.g., physical variables, motivation) begin to be considered. These “advanced versions” of the direct theory have been also frequently identified among much older students, and more surprisingly among highly experienced teachers (see Bautista et al., 2010, 2011; Martín, Pozo, Pérez Echeverría, Mateos, & Martín, 2011). According to Strauss (2005), many teachers hold a direct transmission model despite having received instruction designed for them to implement the “constructivist models” currently accepted in academic settings. This fact shows how resistant to change this early direct theory is.

Interpretative theory

The emergence of a more sophisticated implicit theory has been identified among 5- to 6-year-old (pre)school children. Researchers have referred to it as
interpretative theory (Schwanenflugel, Fabricius, & Noyes, 1996). This theory is based on interpretative realism, an epistemological assumption slightly more sophisticated than in direct theory since it acknowledges the subject’s active role in the knowing process (Pecharromán & Pozo, 2008). The explanations and predictions articulated from the interpretative theory generally recognize the importance of behavioural and cognitive factors in learning and instruction. In other words, learning and instruction are ontologically conceived in terms of actions and processes (e.g., “Practicing a lot is not enough to learn a piece of music correctly. To do so, practice needs to be intelligent, strategic...”). Given the acknowledgment of both action and cognition as the “mediators” of learning, the exact and correct reproduction of knowledge is seen as an impossible enterprise. Little changes, distortions, and/or personal transformations are hence considered unavoidable (Scheuer et al., 2006). Only within this epistemological frame it is possible to understand that different people can legitimately represent the same object of knowledge in slightly different ways (e.g., “If the student is not able to play the piece in its original tempo because of his/her technical limitations, at least s/he should try to approach the tempo to the composers’ idea as much as possible”). In order to avoid important distortions of reality in students’ final learning outcomes, an external control and management by the teacher over the learning conditions, actions, and processes is considered to be essential (e.g., “Apart from giving grades to students, the main function of exams and auditions is finding out students’ mistakes so that the teacher can correct them”). In short, the learner in this theory is seen as an active and reproductive agent (Pérez Echeverría et al., 2001).

Constructive theory

According to the constructive theory, learning involves sophisticated constructive processes that necessarily transform the “external world” (Pecharromán & Pozo, 2008). Thus, knowledge is epistemologically conceived as idiosyncratic interpretations of reality (e.g., “Music performers need to find their personal «identity» as interpreters...”). This theory emphasizes the importance of internal agency, self-regulation, and metacognition (Schwanenflugel et al., 1996). For learners to acquire knowledge in a constructive way, they need to be able to develop their own interpretations and/or models, which need to be socially-acceptable (“... performers need to be aware of the stylistic features of each historical period to make their interpretative choices in a justified way”). Learning and instruction are ontologically conceived from a systemic perspective, and their outcomes are causally explained in terms of interactions between both learning conditions and processes (e.g., “Learning a musical piece is much more than reproducing its notes. It requires learning how to practice that piece, how to communicate emotions with it, how to motivate oneself to practice that piece, etc.”). In a nutshell, the learner is viewed as an active and constructive agent (Pérez Echeverría et al., 2001). The presence of an authentic constructive theory has been rarely identified among children (among the exceptions, Schwanenflugel et al., 1996), and to a certain extent among older students, adults, and teachers (see Bautista et al., 2011; Martín et al., 2011).

Conceptual change as a process of hierarchical integration

The implicit theories approach owes its name to the first two theories (direct and interpretative) given that it is postulated that both have implicit
cognitive nature, i.e., they are tacit and unconscious (Karmiloff-Smith, 1992). The assumptions on which these two theories are based are developed with no deliberate instruction. The shift from direct to interpretative theory does not require a theoretical “rupture” (i.e., a radical conceptual change) but rather the inclusion of more elements and relationships. Certainly, the “essence” of their assumptions is so similar that the change towards the interpretative theory tends to be the result of cognitive development. Although these two implicit theories have great “pragmatic potential” (Rodrigo et al., 1993), their degree of sophistication, complexity, and explanatory power cannot be compared with those of the constructive theory. Constructive theory is postulated to be explicit, conscious, and based on scientific knowledge (e.g., educational, psychological, epistemological). Its acquisition does involve a strong “rupture” with the two previous implicit theories—which are very resistant to change (Strauss, 2005)—and consequently requires a long and deliberate process of education, that is, an “instruction-induced conceptual change” (Vosniadou, 2007).

In our framework, conceptual change is understood as a process of hierarchical integration between implicit and explicit knowledge (Pozo, 2003). We consider that the development of the most sophisticated theory (constructive) does not require the replacement—or substitution—of the intuitive ones (direct and interpretative) but rather the capacity to integrate multiple perspectives. More specifically, conceptual change towards constructivism requires the capacity to re-describe our implicit assumptions into more complex networks of explicit knowledge. It is precisely for this reason that different representations of the same reality can co-exist within the same person. Thus, these representations can be elicited differently depending on the particular constraints of the scenarios that we approach (Entwistle, 2007). This idea is known as “representational multiplicity.” The consequence of this idea is that people’s theories of learning and instruction can be composed of sets of situated/contextual conceptions based on relatively different assumptions, forming profiles theoretically “hybrid” to a certain extent. In this regard, several studies have pointed out that interpretative assumptions generally co-exist with both direct and constructive assumptions (Martín et al., 2011). Interpretative theory, therefore, needs to be conceptualized not only as a theory-of-transition towards constructivism but also as a “hinge-theory.”

Some studies have investigated the consistency levels of theories across different educational scenarios. One of these studies was conducted by Klatter, Lodewijks, and Aarnoutse (2001) with 27 sixth-grade primary students. Different dimensions were evaluated such as the purpose of school, self-regulation, and learning strategies. Three consistent clusters of interrelated beliefs were found, based on which the authors inferred three different learning theories: 1) restricted, 2) functional, and 3) developmental. In the study conducted by Peterson and Irving (2008), consistent relationships between conceptions of assessment and feedback were found in 41 secondary students. Additionally, Kember (2001) have supported the contention that university students’ conceptions of teaching, learning, and knowledge (epistemological beliefs) should be viewed as interrelated sets of theoretically logical relationships. Finally, Martín et al. (2011) have studied the conceptions held by 1,716 primary and secondary teachers about five educational scenarios: teaching of concepts, procedural skills, attitudes, motivational strategies, evaluation. Cluster analysis revealed the existence of three theoretical profiles: direct-interpretative, interpretative-constructive, and constructive. This finding was
interpreted as empirical support for the postulates of the implicit theories approach because of three reasons: 1) because a direct-constructive profile was not identified, which would have shown the highest degree of theoretical inconsistency; 2) because the interpretative theory was found to act like both “theory-of-transition” and “hinge-theory;” and 3) because a “pure” constructive profile was identified, which demonstrated the consistency of explicit knowledge.

Learning and teaching to play a musical instrument: Context for the research

Within the field of music performance, many research studies have investigated how musicians change their approaches to instrumental practice as expertise develops (for a review, see Hallam & Bautista, in press). Expert instrumentalists are not only characterized by the quantity of their practice but especially by its quality. During practice sessions, they display a wide repertoire of learning strategies over which they have a high degree of metacognitive control. In addition, most professional musicians tend to hold sophisticated epistemological views regarding interpretation, grounded in pluralism, although obviously each tries to define his or her own musical “identity” (Hallam, 1995). Evidence suggests that experts tend to display a general three-step pattern in their learning of musical scores, described by several authors as “macro-micro-macro” (Lane, 2006). The first step (“macro”) involves developing an artistic image of the score, based on aspects such as its style, aesthetic, and structure. This “big picture” (Chaffin, Imreh, Lemieux, & Chen, 2003) has a pervasive effect on the second step of the processing pattern (“micro”), since it influences the strategies employed to acquire the score's basic elements (i.e., graphic notations), as well as to solve the technical difficulties that these elements entail (e.g., motor skills, relaxation, etc.). Once all these aspects are mastered, the artistic dimensions of the scores (“macro”) become the main focus of attention once again during the third step (dimensions involving interpretation, communication of emotions, stylistic and aesthetic cues, etc.).

In contrast, research indicates that students do not approach their learning in such a complex way (e.g., Marín, Pérez Echeverría, & Hallam, in press; McPherson, 2005). Music learners tend to be mostly focused on the “micro” pattern previously described, among other possible reasons, because they do not seem to develop an internal “big picture” of the scores they play (Bautista, Pérez Echeverría, Pozo, & Brizuela, 2009). Students tend to concentrate first on playing the correct notes (at the correct pitch in the case of non-temperate instruments). Attention is then addressed to rhythm and technical aspects of playing. Finally, they become focused on the reproduction of dynamics and agogic notations. As recent research suggests (e.g., Marín et al., in press), students at intermediate and advance levels are generally able to conceptualize and display considerably more sophisticated learning approaches.

This study was carried out in Spain with students at official music conservatories. In Spain, conservatories are the only educational institutions where students can obtain officially valid music qualifications (i.e., recognized diplomas). The national curriculum for music education establishes that instrumental instruction (including its lowest levels) is specialized and professional in nature (see Ley Orgánica de Educación [LOE], 2006 – which stands for General Law of Education). Thus, we might define Spanish music conservatories as specialized and professional music schools. Conservatories do not form part of the compulsory education system. Music students in Spain are
required to pursue their compulsory education in parallel, as any other student in the country.

The Spanish curriculum for instrumental education is divided into three levels: Elementary (four years), Intermediate (six years), and Tertiary (four/five years, depending on the programme chosen). Students usually begin their instrumental training when they are between 8 and 9 years old. A very small proportion of them (about 5%) finish the Tertiary level. Students usually graduate (i.e., obtain their Undergraduate Degree) when they are between 22 and 23 years old. Elementary and Intermediate levels are generally taught by the same staff of instrumental teachers (with certified teacher status), whereas Tertiary level is taught by teachers with higher professional status (professors). Instrumental teachers across the whole country are required to implement similar contents and pedagogies at all educational levels. The curriculum suggests that both contents and pedagogies need to draw on constructivist models of learning and instruction.

Instrumental education is developed both individually (one-to-one private lessons) and collectively (classes of about 4 or 5 students) throughout all three levels. Besides of studying their main instrument, students are required to attend a considerable number of theoretical and practical courses (e.g., Musical Language, Choir, Harmony, History of Music, etc.). These courses are established by the national curriculum for music education (LOE, 2006). Tertiary level students are required to choose one of the two following majors: “Music Performance” or “Music Pedagogy.” Despite the differences between these two majors, all the students must take at least a one-year course called “Music didactics,” which covers issues such as psychological learning processes, constructivist teaching models, and curricular design. Elementary and Intermediate levels do not include any similar course.

**Aims**

We decided to investigate music students’ conceptions about three specific scenarios: learning, teaching, and assessment/evaluation. Our target students were Spanish piano students at three developmental/instructional levels, ranging from the early courses of the Intermediate level (12-13 years old, approx.) to the last courses of the Tertiary level (23-24 years old, approx.). We chose to limit the research to students from one instrumental speciality (piano) for two major reasons: a) because we wanted to prevent the possible variation in students’ conceptions due to the specific instrument played; and b) because the first author of this piece is a trained pianist, and therefore a good knower of the jargon and the most common challenges with which piano students oftentimes deal. Based on the taxonomy of learning and instruction theories previously described (direct, interpretative, and constructive), our hypothesis was that piano students’ conceptions would be progressively more sophisticated as both their age and level of education increased. The highest level of sophistication was expected to be found among Tertiary students, not only because they are older and have a higher degree of expertise, but also because of the courses they have taken in didactics and pedagogy as part of their formal education. We also aimed at analyzing whether piano students’ conceptions of learning, teaching, and assessment/evaluation formed theoretically consistent profiles, similar to those profiles identified in Martín et al.’s (2011) project. If so, our purpose was to analyze the distribution of participants depending on their developmental-instructional group, in order to infer their conceptual change processes.
METHOD

Participants

The participants were 215 piano students at 22 music conservatories (12 Intermediate and 10 Tertiary conservatories) from 10 autonomous regions in Spain. Students were selected according to three pre-determined levels of the combined variable “Age / Level of Instruction.”

- Group I: between 12 and 14 years old / 1st or 2nd course of Intermediate level.
- Group II: between 17 and 20 years old / 5th or 6th course of Intermediate level.
- Group III: more than 22 years old / 3rd or 4th course of Tertiary level.

The features of these groups of students regarding their gender and age are shown in Table II. Focusing on Group III, 44 students (92.66%) were enrolled in the “Music performance” major, whereas four students (8.33%) were enrolled in “Music Pedagogy.”

| TABLE II |
| Features of the three groups of students |

<table>
<thead>
<tr>
<th>GROUP I</th>
<th>GROUP II</th>
<th>GROUP III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>Male</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>TOTAL</td>
<td>87</td>
<td>80</td>
</tr>
</tbody>
</table>

| Age: | | | |
|------|------|----------------|
| Range (years) | 12.04 - 13.96 | 17.10 - 19.85 | 22.10 - 29.30 |
| M (years) | 13.34 | 18.19 | 24.35 |
| SD | 0.73 | 1.20 | 2.18 |

Twenty five conservatories were invited to participate in the project (percentage of participation was 88%). Four of these conservatories were chosen due to a criterion of easy accessibility (the first author had been a former student and maintained personal relations with some members of their boards of directors). The rest (21 conservatories) were randomly selected from the entire pool of conservatories in Spain.

Materials

A multiple-choice questionnaire composed of 16 items was designed and implemented (see Appendix). The items posed problematic situations related to music learning (4 items), music teaching (7 items), and assessment/evaluation of musical knowledge (5 items). The difference in the number of items was a matter of content validity (as explained below, only those items in which 100% of agreement among judges was achieved were included in the final version of the questionnaire). Students were asked to suggest a solution for these problematic situations and/or give their opinion about them by choosing between three response choices, which were based
on the epistemological, ontological, and/or causal assumptions of the three above-described theories (direct, interpretative, and constructive). Social desirability bias was avoided in all response choices by means of two different strategies: a) either by making explicit the strengths and weaknesses that each theory might entail, i.e. using both positive and negative arguments in all cases; or b) by exclusively mentioning the most prototypical/salient argument of each theory and hiding/avoiding other aspects, so that all possible solutions seemed somewhat “incomplete.” We made sure that the length of the three response choices was similar in each item (note that this feature might not be present in the English translation presented in Appendix). Students were asked to select the response choice with which they agreed the most, as well as the response choice with which they least agreed. They received the instruction of answering all the items even if they did not completely agree or disagree with the three response choices provided. Besides the random ordering of the response choices within each item, the distribution of the 16 items was counterbalanced in three different versions in order to control for order effects.

The questionnaire was designed in three phases:

I. Drawing on an in-depth review of educational literature and many years of experience within settings for musical learning, the first author produced a broad set of tentative items. These items were assessed in a focus group formed by specialists in the implicit theories framework, who discussed aspects such as the relevance, pertinence, and content of the items, as well as their wording. This focus group had three meetings. In between these meetings, the provisional items were pilot-tested with music students specialized in instruments other than the piano, with the aim of checking correct understanding and discriminative validity of these items. The outcome of this first phase (Version I) was a questionnaire composed of 18 items.

II. Content validity of Version I was assessed by eight independent judges. They all were experts in the implicit theories framework. Four of them were trained musicians as well. Their task was to identify which theory (direct, interpretative, or constructive) matched each of the three response choices. Two items for which 100% agreement was not achieved were eliminated. Some interesting suggestions made by two judges regarding subtle details of wording were taken into account in the production of the final version (Version II). These changes did not entail any variations in the content of these items.

III. Finally, content validity of Version II was evaluated. Judges were 33 university psychology students enrolled in a specialized seminar on music learning and instruction. First, they were provided with operational definitions of the three theories (direct, interpretative, and constructive). After reading and analyzing these definitions (first individually and then jointly), the psychology students were given the questionnaire. Their task was to assess the correspondence between each response choice and each conception, by answering YES (Match), NO (Don’t match), or DOUBT (Not sure whether they match or not). On the basis of their answers, Hambleton-Rovinelli’s index of item-objective congruence was calculated for every response choice. All the scores were higher than .81, which indicated that our final questionnaire had a very high degree of content validity.

Considering that the questionnaire we designed may be useful for other researchers in the field of music performance, as well as for music educators and teachers, in Appendix we provide a translated version into the English language. The original version in Spanish can be found in Bautista (2009).
Procedure

Once the permissions of the conservatories’ boards of directors were granted, all the piano teachers were informed about the project and the procedure to administer and collect the following documents:

1) Parental Consent, which had to be signed in advance either by the father or mother of all minor students (< 18 years old);
2) Personal Background Form (Anonymous), in which the students were asked about issues such as gender, age, and major (only applicable to Tertiary level students);
3) Two consecutive research tasks. The first task was focused on the production of learning outcomes (see Bautista et al., 2009). The second task was the questionnaire on which this article is based. Students solved both tasks individually in their classrooms under the supervision of their piano teachers. All necessary instructions were explained in writing so that teachers did not interfere with students’ answers. Both teachers’ and students’ participation was voluntary. No material reward was given.

Design and methods of analysis

The design used was «Ex post facto» simple, prospective, and cross-sectional. Our variable of comparison was “Age / Level of Instruction,” with the three levels described above. The dependent variable (that is, piano students’ conceptions of learning, teaching, and assessment/evaluation) was conceptualized on the basis of the three theories presented in the Introduction: direct, interpretative, and constructive.

In order to offer an overview of the results obtained, descriptive statistical analysis (frequencies and percentages) were conducted. The three scenarios were considered both together and separately. These analyses were undertaken for the two response contexts, that is, “Most agreement” (+) and “Least agreement” (−). Then, Chi-square tests of independence and Simple Correspondence Factorial Analysis (SCFA) were carried out to explore the relations of association/opposition between the three groups of participants (I, II, III) and the three theories (direct, interpretative, constructive). The purpose of conducting the SCFA was to infer the conceptual change process of piano students’ learning and instruction theories. A brief rationale about this analytic technique is provided below. Finally, in order to group the participants (N = 215 students) according to the similarities in their response choices and identify the existing profiles, an Ascending Hierarchical Classification (AHC, or cluster analysis) was performed. This analysis was intended to explore the levels of theoretical consistency in students’ conceptions of learning, teaching, and assessment/evaluation. SPAD.N version 5.0 data analysis software (manufacturer: Décisia) was used to conduct SCFA and AHC. The rest of statistical analyses were completed using SPSS (version 14.0).

RESULTS

General descriptive analysis

Table III shows the total frequencies and percentages obtained by the three groups of students in each response category (direct, interpretative, constructive), distinguishing between the contexts “Most agreement” (+) and “Least agreement” (−). In order to analyze the associations between the variables “Group” and “Theory,” two Chi-square tests of independence were conducted. The hypothesis of independence (or null hypothesis) was rejected in both cases,
showing the existence of statistically significant associations (for the “Most agreement” context: $X^2 = 227,806$, $d = 4$, $p < .001$; for the “Least agreement” context: $X^2 = 272,495$, $d = 4$, $p < .001$). On the basis of the resulting Adjusted Residuals, one asterisk (*) indicates the frequencies of students that were statistically lower than expected in each cell, and two asterisks (**) those frequencies that were statistically higher than expected.

### Table III

**General descriptive statistics: frequencies, percentages, and chi-square**

<table>
<thead>
<tr>
<th></th>
<th>GROUP I</th>
<th>GROUP II</th>
<th>GROUP III</th>
</tr>
</thead>
<tbody>
<tr>
<td>(+)</td>
<td>Direct</td>
<td>504</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>(*)</td>
<td>36,42%</td>
<td>17,18%</td>
</tr>
<tr>
<td></td>
<td>Interpretative</td>
<td>585</td>
<td>556</td>
</tr>
<tr>
<td></td>
<td>(*)</td>
<td>41,81%</td>
<td>43,43%</td>
</tr>
<tr>
<td></td>
<td>Constructive</td>
<td>303</td>
<td>504</td>
</tr>
<tr>
<td></td>
<td>(*)</td>
<td>21,76%</td>
<td>39,37%</td>
</tr>
<tr>
<td>(-)</td>
<td>Direct</td>
<td>582</td>
<td>748</td>
</tr>
<tr>
<td></td>
<td>(*)</td>
<td>41,81%</td>
<td>58,43%</td>
</tr>
<tr>
<td></td>
<td>Interpretative</td>
<td>108</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>(*)</td>
<td>7,75%</td>
<td>14,84%</td>
</tr>
<tr>
<td></td>
<td>Constructive</td>
<td>702</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>(***)</td>
<td>51,72%</td>
<td>26,71%</td>
</tr>
</tbody>
</table>

(*) Frequency lower than statistically expected (i.e., Adjusted Residual > -1.96)
(**) Frequency higher than statistically expected (i.e., Adjusted Residuals < 1.96)

Focusing just on the asterisks, it is interesting to notice how Group II and Group III obtained the same relations of dependence with the three theories. For example, in the “Most agreement” context, these two groups obtained response rates significantly higher than expected in *constructive* options, and lower than expected in *direct* options. Similarly, in the “Least agreement” context, these groups obtained response rates significantly higher than expected in both *direct* and *interpretative* options, and lower than expected in *constructive* options. Despite these similarities, if we focus on the percentages instead, we can observe for example that within the “Most agreement” context, Group II students showed a higher preference for *interpretative* response choices, whereas Group III showed the highest preference for *constructive* ones. Focusing now on the “Least agreement” context, we can see that *direct* response choices were more frequently selected by Group III than by Group II, unlike *constructive* options. On the basis of these qualitative comparisons, we could state that Group III showed a slightly higher level of sophistication than Group II. On other hand, Group I showed exactly the opposite relations of dependence described for Groups II and III. Although *interpretative* options were the most preferred within the “Most agreement” context, as they were for Group II, students from Group I obtained response rates significantly higher than expected in *direct* options, whereas *constructive* choices were significantly lower than expected. The most outstanding result concerning the “Least agreement” context in this group was the high frequency of *constructive* options (more than 50% of response choices), which was significantly higher than expected.

**Descriptive analysis for each scenario**

Table IV shows the descriptive statistics (total frequencies and relative percentages) obtained by Groups I, II, and III in each of the three scenarios considered in this study: learning (Le), teaching (Te), and assessment/evaluation (As). Notice that codes included in the fourth column of Table IV (e.g., LeD+, LeI+, LeC+) will be used to report the subsequent results.

A Simple Correspondence Factorial Analysis (SCFA) was carried out on the basis of the frequencies shown in Table IV. SCFA is a technique of multivariate
analysis –specifically a variant of principal component analysis– that relates two categorical variables by projecting their relations of proximity and opposition on a factorial plane (for a complete overview, see Lebart, Morineau, & Warwick, 1984). In our case, these two categorical variables were “Group” –with three modalities: I, II, III– and “Type of answers” –with 18 modalities, that is, three theories (direct, interpretative, constructive) x three scenarios (learning, teaching, assessment/evaluation) x two contexts (“Most agreement,” “Least agreement”). Codes for these 18 modalities are shown in the fourth column of Table IV. The two axes resulting from this SCFA explained 97.71% and 2.29% of the Total Inertia² of the contingency table, whose value was 0.08456. Eigen-values of these axes were 0.0826 and 0.0019, respectively. According to customary criteria, the interpretation of the factorial plane is based only on those modalities whose contribution to one or both axes is higher than the average value (i.e., 100 / number of modalities). In this case, all the modalities of the variable “Group” exceeded 33.3 (100/3), but only 11 modalities of “Type of answers” exceeded 5.55 (100/18). The codes of these 11 modalities have been underlined in Figure 1.

As can be observed, Axis 1 graphically ordered the three modalities of the variable “Group” (I → II → III) from the left to the right hand side of the plane, by suggesting the existence of a developmental/instructional pattern of conceptual change in students’ conceptions. Three sets of statistically significant associated modalities were identified along this continuum (notice that the asterisk * indicates that the modality is associated with two different sets):

– The first set, which resulted associated with Group I, was composed of the following modalities:
  • Learning: most agreement with direct options (LeD+), and least agreement with constructive options (LeC-).
The relations of association reported above indicated that, broadly speaking, the older the students and higher their level of education, the higher was the level of theoretical sophistication identified in their answers.

As ascending hierarchical classification (AHC) analysis, and qualitative descriptions of the resulting classes

To identify the profiles of conceptions of learning, teaching, and assessment/evaluation existing among the students, and analyze the distribution of the students among these profiles, an Ascending Hierarchical Classification analysis (AHC) was conducted. More specifically, we used Ward’s clustering method (Lebart et al., 1984), which allows the grouping of participants according to the similarities in their answers. The first step was to identify those items in which no significantly statistical differences were found among groups of students I, II, and III, in order to exclude those items from the AHC. This
identification process focused on both response contexts (i.e., “Most agreement” and “Least agreement”). Thus, Chi-square test of independence was applied 32 times (that is, 16 items x 2 response contexts). On the basis of the resulting \( \chi^2 \) values (with \( p < .001 \)), differences were not found in seven cases, specifically in one case related to learning (4Le+, which stands for “4th Item, Learning scenario, Most agreement”), in one other case related to teaching (1Te-, which stands for “1st Item, Teaching scenario, Least Agreement”), and interestingly in five cases related to assessment/evaluation (1As+, 1As-, 3As+, 3As-, and 4As-). The latter finding indicated the existence of remarkable similarities among the conceptions of the three groups of students concerning the settings for knowledge assessment and evaluation. Once these items were eliminated, the AHC was applied.

Considering both the resulting hierarchical classification tree and the dendrogram of Euclidean distances, which are not presented here due to their large size, we decided to split the sample into three classes (iteration 436, index 0.08610). Thereby it was possible to obtain three classes with relatively similar sizes, ranging from 52 to 83 participants. Splitting the sample in a higher number of classes (such as 4, 5, or 6) would have resulted in classifications composed of some very small classes (composed of less than 8-12 participants). The composition of the three resulting classes in terms of frequency and percentage of students is reported in Table V. A Chi-square test allowed us to reject the hypothesis of independence between the variables “Group” and “Class” (\( \chi^2 = 87.023, d=4, p < .001 \)). Based on the Adjusted Residuals highlighted in Table V, we can observe that the frequency of Group I students was higher than statistically expected in Class 1, and lower than statistically expected in Class 2 and Class 3. Students from Group III showed the opposite associations, whereas Group II students did not significantly associate with any of the three classes.

To name and characterize the three resulting classes, we decided to focus on the “Most agreement” response context. We established the criterion that, to give the name of a theory to the resulting profiles, at least one third (33.3%) of the significantly over-represented options should reflect that specific theory (in any of the three scenarios). The profiles obtained are summarized in Table VI. It is important to notice that:

| Table V
Composition of the classes in terms of frequencies and percentages of students (*) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 1</td>
<td>Class 2</td>
<td>Class 3</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Group I</strong> Students</td>
<td>60</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>%</td>
<td>68.96%</td>
<td>24.13%</td>
<td>6.89%</td>
</tr>
<tr>
<td>A.R.</td>
<td>-7.9</td>
<td>-0</td>
<td>-7.9</td>
</tr>
<tr>
<td><strong>Group II</strong> Students</td>
<td>18</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>%</td>
<td>22.50%</td>
<td>27.50%</td>
<td>50.00%</td>
</tr>
<tr>
<td>A.R.</td>
<td>-3.4</td>
<td>-0</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Group III</strong> Students</td>
<td>2</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>%</td>
<td>4.16%</td>
<td>18.75%</td>
<td>77.08%</td>
</tr>
<tr>
<td>A.R.</td>
<td>-5.4</td>
<td>-1.0</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>80</td>
<td>52</td>
<td>83</td>
</tr>
</tbody>
</table>

(*) Adjusted Residuals higher than +1.96 are highlighted in dark grey, and those lower than -1.96 in light grey.
a) In the column called “Group % (composition)”, we report in decreasing order the percentage of students (Groups I, II, III) classified in each profile;  
b) The most predominant theory/ies in each scenario has/have been highlighted in grey colour.  
c) The number of over-represented items of each theory is reported (ranging from 1 to 6).

Table VI
Theoretical profiles identified among piano students

<table>
<thead>
<tr>
<th>Profiles</th>
<th>Group % (composition)</th>
<th>Learning</th>
<th>Teaching</th>
<th>Assessment &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct-Interpretative</td>
<td>I &gt; II &gt; III</td>
<td>2 Direct</td>
<td>3 Direct</td>
<td>2 Direct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Interpretative</td>
<td>1 Interpretative</td>
<td>3 Interpretative</td>
</tr>
<tr>
<td>Interpretative-Constructive</td>
<td>II &gt; I &gt; III</td>
<td>-</td>
<td>2 Direct</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Interpretative</td>
<td>2 Interpretative</td>
<td>1 Interpretative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Constructive</td>
<td>1 Constructive</td>
<td>1 Constructive</td>
</tr>
<tr>
<td>Constructive</td>
<td>III &gt; II &gt; I</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2 Interpretative</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 Constructive</td>
<td>6 Constructive</td>
<td>3 Constructive</td>
</tr>
</tbody>
</table>

If we analyze Table VI broadly, the first thing that catches our attention is the fact that more than one theory co-exists in all three profiles. This finding is consistent with the idea of “representational multiplicity” referred to in the Introduction. The qualitative descriptions of the profiles are presented below according to a criterion of increasing sophistication. Descriptions are based on the “Most agreement” response choices that were significantly over-represented in each profile (i.e., those whose eigen-values were higher than +1.96, with \( p < .001 \)). Codes of these options will be presented in brackets (e.g., 1LeD+, which stands for: 1st Item, Learning scenario, Direct option, “Most agreement” context) (see Appendix).

Class 1: Direct-Interpretative profile

This profile is composed of direct and interpretative conceptions. More specifically, direct conceptions predominate in learning and teaching scenarios, whereas interpretative conceptions predominate in situations for assessment/evaluation. As reported in Table V, this class was statistically over-represented by Group I students, and under-represented by students from Group II and Group III.

• Learning: Class 1 members consider that rote learning procedures, focused on both the automatic reproduction of musical scores and technical skills’ training, are the most suitable for the learning of musical pieces (3LeD+). Related to this idea, both the scarce time for practice and the lack of persistence (i.e., learning conditions) are understood as the most important causes for the emerge of learning “difficulties” (1LeD+). In addition, these students understand that collaborative peer-learning is positive and effective only when the student who teaches has a higher level of expertise than the student who learns (2LeI+).

• Teaching: These students agreed the most with response choices in which the teacher attributes a passive and reproductive role to the learner. For instance, they think that providing students with the “correct” fingerings of musical pieces, from the very beginning of the learning process, is the best procedure to
teach students how to choose the fingerings (2TeD+). In their viewpoint, teaching must be focused on the final learning outcomes instead of learning processes. Imitation and modelling are thought to be the best teaching strategies to help students solve their technical and interpretative difficulties (7TeD+). Members of Class 1 also think that teachers need to be in charge of selecting the tasks to be completed by students, and that the most important thing to be done when assigning these tasks is to “show” students the expected final outcome (3TeD+). Finally, these students think that teachers are to focus on correcting learners’ mistakes and errors. In their view, providing direct explanations and/or external instructions is the best didactic procedure to correct students’ errors and mistakes (4TeI+).

- **Assessment and Evaluation**: The epistemological assumptions demonstrated by Class 1 members seem to be grounded in both radical realism (dualism) (4AsD+) and interpretative realism (4AsI+). For them, the main function of “evaluation” is giving grades to students, as well as finding out their struggles so that the teacher can externally correct them (2AsI+). Concerning the object to be assessed, evaluated, and graded, these students think that teachers should exclusively focus on final learning outcomes (5AsD+), or eventually give little importance to learning processes, cognitive abilities, and other general competences (5AsI+).

**Class 2: Interpretative-Constructive profile**

The second profile is mostly composed of interpretative and constructive conceptions, except for the teaching scenario where some direct conceptions were also identified. This class was similarly composed by students from all three groups (Table V).

- **Learning**: Unlike members of the previous class, Class 2 members consider that musical learning needs to focus on both technical and interpretative aspects. Rather than processing musical scores linearly (i.e., from the first bar to the end), they think that the best way to learn how to play a new musical piece is to select and practice their most difficult sections from the beginning, so that those sections are practiced more than the easiest ones (3LeI+). In addition, their attitude regarding collaborative peer learning is positive even if the learners have different levels of musical expertise. From their perspective, the very act of trying to teach and/or help a peer fosters processes of reflection and knowledge explicitation, which are very positive for student’s learning (2LeC+).

- **Teaching**: Interestingly, Class 2 members’ conceptions about teaching are based on the three theories considered in this study. They hold the same conception as Class 1 students regarding the best pedagogic procedure to assign the weekly tasks (3TeD+). In their opinion, teachers must focus on externally correcting students’ mistakes either by means of verbal explanations and instructions (4TeI+), or simply by imitation and modelling (4TeD+). Concerning how to teach musical fingering, they think that teachers must first encourage students to do the work by themselves, and then correct their errors by providing them with the most suitable solutions (2TeI+). Finally, although it might seem paradoxical or even incoherent with the ideas previously referred to, Class 2 members conceive that the “best piano teacher” is neither the best pianist nor the best at giving verbal explanations and/or instructions, but the most engaged in promoting students’ self-reflection and understanding (1TeC+).

- **Assessment and Evaluation**: Like in Class 1, members of this class also hold a quantitative and corrective conception about the main functions of assessment
However, they conceive that aspects such as learning processes and meta-cognitive abilities need to be considered as further “objects” of assessment within final examinations, having the same degree of importance as final learning outcomes (5AsC+).

Class 3: Constructive profile

The third profile is composed of constructive conceptions, except for the teaching scenario where some interpretative conceptions were identified as well. Group II and III students were statistically over-represented in this class, whereas Group I students were under-represented (Table V).

• Learning: Class 3 members have the same positive attitude regarding collaborative peer learning as do Class 2 members (2LeC+). However, students from Class 3 hold a more sophisticated view concerning the best learning approaches. In their opinion, interpreters need to focus on developing a holistic understanding of the music they perform, paying special attention to its artistic meaning and sense (3LeC+). Connected with this idea, the lack of personal communicative and expressive goals—in other words, the lack of personal agency—is conceived of as the most important cause for students’ learning difficulties (1LeC+).

• Teaching: Class 3 members chose constructive conceptions in most of the items on teaching presented in the questionnaire, and interpretative conceptions in two specific items. In their opinion, teachers should ideally: a) involve students in the selection of their own weekly tasks, by asking them to reflect on why, what for, and how these activities need to be undertaken (3TeC+); b) make use of students’ “successes” to foster their meta-cognitive processes (5TeC+), in such a way that these processes help them deal with their learning weaknesses (4TeC+); c) use pedagogic strategies such as debates, reflective questioning, etc. to foster students’ reflection upon their “mistakes” and how to overcome them (7TeC+). Consistently, Class 3 members have positive attitudes concerning students’ self-assessment, as critical thinking abilities are conceived to be essential (6TeC+). Regarding how to teach the fingerings, these students seem to agree the most with interpretative conceptions (2TeI+), like Class 2 members, and also with constructive ones (2TeC+). According to the latter, the main focus of teaching should be placed on fostering deep learning processes rather than on final outcomes. Finally, the “best piano teacher” for Class 3 members is not always the best pianist. Besides playing the piano very well, teachers need to be able to explain clearly what students have to do at every moment, and correct their mistakes efficiently (1TeI+).

• Assessment and Evaluation: Unlike the former classes, Class 3 members conceive that the main function of evaluation is to improve students’ learning processes by promoting their self-reflection on their strengths and weaknesses (2AsC+). Regarding contexts for musical knowledge assessment, their answers tend to be grounded in constructivist assumptions (4AsC+). Finally, regarding the “objects” to be assessed and evaluated within final examinations settings, these students hold the same sophisticated conception as Class 2 members (5AsC+).

CONCLUSIONS AND DISCUSSION

The first general conclusion of this study is that, with the progress of both age and educational level, piano students’ conceptions of learning and instruction tend to be increasingly more sophisticated. Looking at the
frequencies statistically lower and higher than expected presented in Table III, we can observe that Group I students tend to agree the most with direct and interpretative theories, and the least with the constructive theory. As far as Group II is concerned, interpretative and constructive response choices are the most preferred, whereas direct options are the least preferred. Group III students show a similar tendency, although they have even a higher preference for the constructive theory, and most importantly, a higher disagreement with the direct theory. This tendency towards increasing sophistication is coherent with the conceptual change patterns identified in other epistemic and academic domains, both in studies carried out from the implicit theories framework (Scheuer et al., 2001, 2006) and other approaches (for a recent review of scientific subject-matters, see Murphy & Alexander, 2008).

Analyses for scenarios have allowed us to describe the relations of association-opposition between the three groups of students and the different conceptions of learning, teaching, and assessment/evaluation (Table IV and Figure 1). Because the sets of associated modalities were described in detail in the previous section, here we are going to focus on the discussion of further issues. In our viewpoint, the distribution of modalities within the SCFA plane is quite consistent with previous studies on intuitive conceptions and conceptual change in others domains (Pérez Echeverría et al., 2001; Vosniadou, 1994, 2007). The plane suggests the existence of the following continuum:

- In the least theoretically sophisticated pole (left hand side of the plane), relatively close to the area where Group I is located, we find a conception (AsD+) according to which evaluation should be focused on final learning outcomes, and carried out from a realistic epistemological perspective. We also find another conception (LeC-) that explicitly rejects the learner’s active and constructive role in the learning process. These two modalities –notice that both are contributive ones– are based on epistemological, ontological, and/or causal assumptions that clearly reflect the most extreme version of the direct theory (Wellman, 1990). It might be for that reason that both modalities were located in such peripheral locations, even far from the location of Group I.

- The second set of associated modalities (top right side), of which Group II forms part, shows an “intermediate” level of theoretical sophistication. Drawing on the location of its three contributive modalities, this set might be characterized by means of three adjectives: 1) “scattered,” because of the location of these modalities; 2) “eclectic,” as two of these modalities (TeI+ and AsD-) are shared with other sets; and 3) “inconsistent,” since these two modalities are based on very different assumptions:
  - According to TeI+ conceptions, teaching is aimed at externally managing and/or controlling students’ actions and processes, in order to help learners reproduce “reality” in the most correct and faithful way (Pecharromán & Pozo, 2008). Due to its location, this modality might be interpreted as a “conception-of-transition” from the first to the second profile.
  - According to AsD- conceptions, assessing/evaluating should not be limited to externally determining whether students’ final knowledge is “right or wrong.” The location of this modality, halfway between the second and third profiles, might be suggesting that the first step towards constructivism involves a process of “rupture” with epistemological realism and with ontological views of knowledge in terms of states and final products.

- Focusing on the most sophisticated set (bottom right side), of which Group III forms part, it is important to notice the proximity among its contributives modalities, which might be interpreted as a reflection of the higher degree of consistency and coherence of constructive theory.
The AHC analysis has allowed us to identify three well-differentiated clusters of conceptions of learning, teaching, and assessment/evaluation, which—using Martín et al.’s (2011) terminology—have been called profiles. When looking at Table VI and reading the descriptions presented above, it becomes salient that more than one theory co-exists in all three profiles. Consistent with Entwistle (2007) and Rodrigo et al. (1993), this finding shows that depending on the particular demands of each situation, students tend to activate their epistemological, ontological, and causal assumptions in slightly different ways. This result, which is consistent with the idea of representational multiplicity (Karmiloff-Smith, 1992; Pozo, 2003), is indicating that piano students’ conceptions are not completely consistent. However, their conceptions are not “random” either. Piano students’ conceptions, as Table 6 shows, are seemingly organized in the form of relatively consistent profiles (Kember, 2001; Klatter et al., 2001; Martín et al., 2011; Peterson & Irving, 2008). This is the second general conclusion of this article.

Interestingly, the three resulting profiles are composed of conceptions of teaching slightly less sophisticated than the conceptions of learning and assessment/evaluation. In this regard, it seems that students might be quite resistant to accept the idea of a teacher that, instead of modelling learners’ behaviour and/or providing them with instructions and verbal explanations, tries to foster students’ learning by means of reflective and proactive pedagogies. Conversely, conceptions of assessment/evaluation resulted to be comparatively the most sophisticated in all three profiles. As our analysis of the factorial plane pointed out, it might be the case that conceptual shifts from one profile to the next one are triggered by changes in those specific conceptions, which are mostly based on epistemological and ontological assumptions. These ideas beg further investigation.

Moving to our third purpose, the distribution of participants among the resulting three profiles allows us to postulate a possible path of conceptual change in piano students’ conceptions:

- **Direct-interpretative.** This is the most simplistic profile. Since it is exclusively composed of direct and interpretative conceptions, we assume its cognitive nature to be mostly implicit and unconscious. In this regard, the fact that it is mostly held by the youngest students (almost 70% of Group I students) seems very logical to us, as well as consistent with existing research (Marín et al., in press).

- **Interpretative-constructive.** We conceive its degree of sophistication to be “intermediate.” This profile is integrated by the broad spectrum of theories, from direct to constructive. For this reason, we consider that its cognitive nature might be halfway along the implicit-explicit continuum. Moreover, the apparently inconsistent character of this profile leads us interpret it as a “profile-of-transition” towards constructivism, in which interpretative theory—the most predominant one, interestingly—might be acting as a “hinge-theory” between direct and constructive conceptions (Martín et al., 2011). None of the three groups showed statistically significant associations with this profile. However, it is interesting to notice that most of its members belong in Group II (Tables V and VI).

- **Constructive.** This is the most sophisticated profile, and hence the most theoretically consistent. Since it is mostly composed of constructive conceptions, we consider its cognitive nature to be explicit and conscious (Pozo et al., 2006). It is held by 50% of Group II students, and 77% of Group III students. This study does not allow us to identify the variables responsible for this difference between Groups II and III, which almost reaches 30%. That is, piano students’ conceptual change towards the constructive profile might be due to factors such
as their higher age, educational level, or level of expertise. Besides, we consider that the courses in didactics and pedagogy received by Tertiary students (i.e., Group III) might be another important factor. This argument has also been suggested in relation to novice piano teachers (Bautista et al., 2010, 2011), whose sophisticated constructive answers to a written open-ended questionnaire were attributed to the education they received to achieve the position of official teachers (i.e., courses in Psychopedagogy, Didactics, Curricular Design).

Once presented the main conclusions of our study, we would like to discuss some additional issues that are theoretically relevant, some of which deserve further investigation. First, it is important to notice that a "pure" direct profile has not been identified among our participants. This might be viewed as relatively expectable given their ages and educational levels. According to existing studies (Scheuer et al., 2001, 2006; Wellman, 1990), said direct profile might be present among younger piano students, especially among those who start their musical training at very early ages (around 4 years old). For obvious reasons, studying the conceptions of those young children would not be possible through the multiple-choice questionnaire designed for this study. It would involve the implementation of other instruments for data collection, such as interviews. Conducting interview studies with the youngest piano students would be very relevant, as it would enable us complete the description of their conceptual change processes.

On other hand, consistent with Schwaneflugel et al. (1996), our results suggest that it is possible to find constructive conceptions during the final years of early adolescence (12-14 years old, approximately). Certainly, as shown in Table V, almost 7% of Group I students were classified within the constructive profile. It would be necessary to conduct in-depth studies of these exceptional cases to find out which variables (personal, social, contextual, etc.) could have fostered the conceptual change at such early ages (Hofer & Pintrich, 2002).

In the opposite pole, our results also indicate that it is possible to find very simplistic conceptions among the oldest students, that is, among those explicitly instructed in didactics and pedagogy (Strauss, 2005). In fact, as Table V reveals, more than 20% of Group III students were not classified within the constructive profile. In a nutshell: although the cognitive/instructional progress tends to be parallel to the development of increasingly sophisticated conceptions, our study shows that conceptual change is not entirely "guaranteed," as it does not necessarily occur in all individuals (Scheuer et al., 2001, 2006).

This finding suggests the need for investigating the reasons for this resistance to change towards constructivism, as well as the need for implementing educational programmes focused on fostering students' conceptual change (Pozo et al., 2006; Strauss, 2005). These educational programmes should be designed and oriented not only for those adult students who are close to become teachers (remember that 23% of Tertiary students do not hold the constructive profile), but also for the other groups (notice that most of Intermediate students were not classified in the constructive profile). As argued in the Introduction, our beliefs about learning and instruction constitute extremely important mediators of our actual approaches for the acquisition and transmission of knowledge (Hofer & Pintrich, 2002; Vosniadou, 2007). Thus, if current Spanish educational law (LOE, 2006) intends for piano students to approach their learning—and their future teaching, in many cases—in more constructive ways, the conceptual change of their implicit assumptions should be addressed as a central curricular issue. In our viewpoint, this study constitutes a good starting point for the design of effective systematic interventions.

Finally, acknowledging that all methodologies have weaknesses (Duell & Schommer-Aikins, 2001), we are aware of the fact that our study has the
limitation of being exclusively restricted to the representational level, specifically to the implicit assumptions of learning and instruction. Therefore, our results should be cautiously interpreted. In addition, we consider that our project should be followed up with: a) further examinations of what these piano students actually do while learning—and eventually teaching—music; and b) intervention studies to foster the above-mentioned instruction-induced conceptual change (Hofer & Pintrich, 2002; Vosniadou, 2007).

Notes

1 Recall that all the examples provided in this section have been taken from a previous study conducted with piano teachers.

2 It is important to explain that, in the context of correspondence analysis, inertia means variance. Total inertia is the sum of eigen-values and reflects the spread of the modalities around the centroid of the plane. Its value is proportional to the Chi-square statistic, which evaluates the association between two variables (in our case, “Group” and “Type of answer”).

References


Hofer, B. K., & Pintrich, P. (Eds.) (2002). Personal epistemology: the psychology of beliefs about knowledge and knowing. Mahwah, New York: LEA.


Appendix

QUESTIONNAIRE

The questionnaire presented below is the translation into the English from the original Spanish version, which can be found in Bautista (2009). In order to simplify its presentation, items have been grouped according to the scenario addressed (i.e., “Learning,” “Teaching,” and “Assessment/Evaluation”). The response choices are always presented in the following order: Direct (Dir), Interpretative (Int), Constructive (Con).

Instructions

In the following pages, you are going to find a set of situations dealing with piano learning and teaching. After each situation, three response choices are presented. These choices reflect opinions frequently held by conservatory piano students and teachers.

– First, you must choose the response choice with which you are most in agreement.
  • You may only pick one option.

– Second, you must choose the response choice with which you are least in agreement.
  • You may only pick one option.

Please answer all the items even if you do not entirely agree or disagree with the response choices provided.

LEARNING

1.- Michael, a piano student at the same level as you, has studied for months the same repertory of pieces. However, he is still not able to play most of the pieces properly because of their technical difficulties. What do you think?

Most likely, Michael…

Dir. … is not practicing enough time. I would recommend him to practice more, because solving certain technical difficulties requires being very perseverant.

Int. … is practicing in the wrong way. I would recommend him to address his technical difficulties carefully following the directions provided by his teacher.
Con. ... is practicing without having clearly defined musical objectives. I would recommend him to practice thinking in music first, and then in technique.

2.- Piano teacher Mr. Pérez usually advises his students to practice together at least once a week, so that when one plays the other one listens, teaches, corrects, gives advice, etc. and vice versa. What do you think about that?

Dir. I think it's inappropriate because it is a waste of time. To learn how to play music good, one needs to be alone and very focused, and practice a lot of time according to the teacher's instructions.

Int. I think it's appropriate only if the student who teaches and corrects has a higher level than the other student. Otherwise, the former won't be able to teach anything useful to the latter.

Con. I think it's very appropriate even if the two students have different levels, because the act of listening to the other and trying to teach him/her something will make both students learn.

3.- There are different ways to memorize musical pieces. Which one do you think is the best?

Dir. Playing the pieces from beginning to end at least once a day, as if we were in the final recital, and then many times practicing those sections in which we've made mistakes. Our memory is more efficient when the music is rehearsed repeatedly.

Int. Practicing the pieces using different study techniques, such as playing with different speeds, with different rhythms, section by section, separate hands, etc. Our memory is more efficient when music is rehearsed step by step, and using different procedures.

Con. Analyzing the different sections of the pieces at the melodic, harmonic, formal, and structural levels, even before we start reading and practicing the score itself. Our memory is more efficient when music is learnt in a comprehensive and meaningful way.

4.- Three piano students (at the same level as you) have different opinions about how to start learning new musical pieces. What do you think?

Dir. The best is to start from the beginning always, writing down the fingerings and progressing in the reading of the score as both musical text and technical aspects become mastered. This is the most methodical and systematic way of working.

Int. The best is to start working on the most difficult sections at the technical and interpretative levels, because these sections will require being practiced the most. This is the most effective way to end up mastering the musical pieces.

Con. The best is to start analyzing the pieces at the expressive, aesthetic, and stylistic levels, as well as reading information about their composers. This is the most effective way to develop a personal understanding of the pieces.

TEACHING

1.- Three students at your same level have different opinions about who are the best piano teachers. Who do you agree the most and the least with?

The best piano teachers are...

Dir. ... generally the best pianists, because their experience as musicians enables them to show the students in a practical way how to practice and how to play; these teachers are the best models to be imitated.

Int. ... not necessarily the best pianists, because aside from playing the piano well, teachers need to be able to provide students with clear explanations about what to do in each situation, as well as effectively correct students' mistakes.

Con. ... those who have received more education as teachers, because their pedagogical knowledge and skills enable them to teach students in comprehensive and reflective ways.

2.- As you know, certain scores do not suggest the fingerings to the interpreter (e.g., baroque pieces). In your opinion, when students at your same level start to learn a score like that, what is the best thing that teachers can do?

Dir. Suggest the most suitable fingerings from the start, especially those of the most difficult sections, so that the students save time and read and memorize the piece faster. Playing the pieces correctly is the most important thing.

Int. Let the students choose their own fingerings, and then correct when there are mistakes by suggesting the most correct alternative. Learning is important, but if we want to play really well, we need to be guided by the experts.

Con. Let the students choose their own fingerings, and use their mistakes to make them think about how to improve. Although this approach takes more time and students might not play the pieces “perfect” students will learn much more.

3.- Three piano teachers argue about the best way to assign students their weekly practice. Which one do you agree the most and the least with?

What the teacher should do is...
Piano students’ conceptions of learning and instruction / A. Bautista et al.

Dir. … choose the most suitable practice for the students, showing them how they have to complete it, and demonstrate the technical or interpretative outcomes they have to achieve.

Int. … choose the most suitable practice for the students, explaining and justifying why it needs to be completed, and provide students with instructions about how to practice their assignments.

Con. … involve the students in the assignment of their own practice in order to make them think and reflect about why, what for, and how they are going to complete the practice that they’ve decided by themselves.

4.- From one lesson to the next one, student Mary –at the same level as you– improves very much certain sections of the piece she is practicing. However, the way that she plays other sections is still pretty bad. What do you think?

Her teacher should start focusing on…

Dir. … those sections she doesn’t play well yet. The teacher should recommend Mary to practice specific exercises so that she can overcome these difficulties, and practically demonstrate how to do the exercises.

Int. … those sections she doesn’t play well yet. The teacher should explain Mary the reasons for her difficulties, and give her specific recommendations to overcome them as soon as possible.

Con. … those sections in which she has improved. The teachers should make Mary reflect about the reasons for her improvements, and later on compare with the difficulties that she is experiencing in the other sections.

5.- During her weekly lesson, Ana plays very well a technically difficult section of a piece. In her previous lessons, though, she was not able to play that section at all. In your opinion, what Ana’s teacher should do in this situation?

Dir. He should simply congratulate Ana on her progresses and provide her with further challenging learning opportunities. Other than that, it wouldn’t be necessary to do anything else because the student has learned and improved her technical skills.

Int. He should ask her to play the section more times and in different ways to make sure Ana didn’t play that section well by sheer chance. If she does it well again, the teacher should congratulate her and suggest her new challenges. Otherwise, he should explain her how to improve her difficulties.

Con. He should ask her to explain how she practiced that difficult section during the week so that Ana becomes aware of the reasons for her improvement. Then, the teacher should ask her about the aspects that need to be further improved, and how she’d practice those aspects.

6.- According to piano teacher Mr. Ramírez, encouraging students to self-evaluate and self-criticize their own performance during the lessons is a good teaching strategy. What do you think about that?

Dir. I don’t think that’s a good teaching strategy because that’s a waste of time. Obviously, teachers have more expertise than students, so the best is for teachers to tell us what we do right and wrong as soon as possible.

Int. I think that could be a good teaching strategy as the first approach, given that it fosters students’ active engagement. However, that strategy should always be followed up by the teachers’ evaluation on what is right and wrong.

Con. I think that’s a very good teaching strategy. It fosters the students’ reflection about our own learning process and helps us develop our personal criteria, which, in terms of our learning, are as important as teachers’ criteria.

7.- During his individual lesson, Luis (student at the same level as you) is not able to play a certain section of a piece because it’s technically very difficult. In your opinion, what should his teacher do to help him improve? The teacher should…

Dir. … play the section (slowly, separate hands) so that Luis can observe how he has to play it, and then suggest him specific exercises to practice at home.

Int. … explain Luis what his difficulties are and give him instructions to overcome them, making sure that he correctly understands how he needs to practice.

Con. … ask Luis different questions to make him reflect and think about the reasons for his struggles, as well as about what to do to overcome them.

ASSESSMENT and EVALUATION

1.- Paul, student at your same level, plays a piece in which the following indication appears: Presto (♩ = 180). However, he performs the piece using much slower tempos (around ♩ = 90). What do you think?

Dir. He’s playing the piece using an excessively slow tempo and hence incorrectly, as he’s not following the indication given by the composer. If the student is not able to reach the technical level required by this piece, he’d better leave the piece for now.
Int. He's playing the piece using an excessively slow tempo and hence incorrectly, as he's not even tried to reach the tempo that the composer indicated. If the student wants to play this piece, he should effort to increase the tempo as much as his technical possibilities allow him.

Con. He's playing the piece without following the indication given by the composer, but it doesn't necessarily mean that his performance is “incorrect.” If the student decides to play the piece that way, he should be able to justify the interpretative and expressive reasons for doing so.

2.- Within the context of piano instruction, “Evaluation” should mainly pursue…

Dir. … that teachers examine students’ musical skills and give us grades to describe how we play at the end of each term or each course.

Int. … that teachers give grades to students to describe our achievements and detect which aspects we need to correct in the next lessons or course.

Con. … that students, based on the dialogue with the teachers, reflect on our own learning process and realize our personal strength and weaknesses.

3.- David, piano student at your same level, has practiced very little over the current year. Although he is a “brilliant” pianist, he admits that this course has been really lazy. His piano teacher has been unhappy with his performance because David has improved practically nothing. However, during the last weeks of the course, David practices a lot, up to the point that he wonderfully plays all the pieces in the final recital, much better than the other students. In your opinion, what aspects should the teacher have into consideration when deciding David’s final grade?

Dir. The teacher should consider that David has played the pieces wonderfully in the final recital, and also that his performance has been much better than the other students.

Int. The teacher should mainly consider that David has played very well in the recital, although the fact that his improvement throughout the year has been scarce should be considered a little bit too.

Con. The teacher should mainly consider that David’s improvement throughout the year has been scarce, and the fact that he has played very well should be considered little because he could have improved much more.

4.- Mary, piano student at your same level, plays a piece very differently than the most prestigious pianists. What would you suggest to her?

Dir. I would suggest to listen to the CD with the interpretation of the pianist most specialized in that composer, so that she can imitate that interpretation as much as possible. In this way, the quality of her performance will be guarantied.

Int. I would suggest to listen to several CD’s with well-known interpretations, so that she can imitate the ideas she likes the most. In this way, her interpretation will be stylistically correct and, at the same time, a little personal.

Con. I don’t think that suggesting her something is necessary at all. Once the most famous and conventional interpretations are known, students need to innovate and express their musical ideas and feelings in their own way.

5.- In the final exam, Lilian –piano student as the same level as you– plays all the pieces very well, much better than the other students. When the members of the examination panel discuss what grade she should receive, however, Lilian’s teacher brings up the idea that she is still unable to learn new pieces by herself. Moreover, the teacher has tried really hard to teach Lilian how to be more self-sufficient but she hasn’t achieved any improvement at all in that regard. Do you think that these facts should negatively influence Lilian’s final grade?

Dir. No, I don’t. The important thing is that she’s played the pieces very well, even better than the other students. The fact that Lilian is not self-sufficient is not important because teachers are there to teach whatever students need.

Int. No, I don’t. The important thing is that she has played the pieces very well, but in the next year she should pay more attention to the teacher and make more efforts to improve her self-sufficiency.

Con. Yes, I do. The capacity of being self-sufficient is absolutely essential for learning. In consequence, this fact should be taken into consideration when deciding the grade Lilian deserves.