From the formal curriculum to the lesson planning: the didactic transposition kindergarten teachers' carry out as they plan to teach dissolution

Angeliki Vellopoulou, Konstantinos Ravanis

Department of Educational Sciences and Early Childhood Education, University of Patras, Greece
avellopoulou@gmail.com, ravanis@upatras.gr

Abstract

The present paper focuses on the study of scientific knowledge Didactic Transposition phenomena in kindergarten school. Aiming to examine the relationship between the formal curriculum and teachers' didactic choices, we analysed the official curriculum texts and transcripts of 40 personal semi-structured interviews with kindergarten school teachers, regarding contents related to the Dissolution phenomenon. Data analysis and interpretation reveals that the role of the teacher is critical, at least regarding scientific knowledge transposition in the context of kindergarten education. Teachers' content choices may differ greatly from those officially proposed, in ways that do not ensure the compatibility of the teaching subject to a transposed scientific model. Issues are raised as to the conditions under which open and flexible curriculum frameworks can be effective for young children's initiation into the natural sciences.

Key words

Didactic transposition - Kindergarten curriculum - Science teaching - Qualitative text analysis

Introduction

Teaching in general poses questions concerning the choice of the appropriate contents to be taught, their adaptation and recontextualisation so as to meet the teaching objectives, children's developmental needs and interests. As far as the teaching of scientific knowledge contents is concerned, the above-mentioned questions refer mainly to the educational version of the scientific knowledge, to the processes of reorganization and reconstruction of the scientific discourse into educational discourse. Curriculum frameworks and textbooks addressed to the student and the teacher are the official texts of the curriculum adopted by the state. Those texts are the result of a process that aims to specify and interpret the contents of the official curriculum in order to facilitate teaching and learning. Our research studies the role of the official texts and that of kindergarten school teachers on the process of scientific knowledge transposition into teaching knowledge.

Theoretical Framework

Adopting the perspective of the Didactic Transposition theory described by Chevallard (1991), our research considers scientific school knowledge not as a simplification but as the result of a series of transformations that presuppose the decontextualisation of academic knowledge from the conditions within which it was created and its recontextualisation according to the terms and restrictions imposed by the educational context (Chevallard, 1991; Johsua & Dupin, 1993; Bernstein, 1996; Koulaidis & Tsatsaroni, 1996; Koliopoulos & Ravanis, 2000). Taking into account different educational factors involved in the process of knowledge transformation, Chevallard (1991) distinguished between two phases of didactic transposition: during the first phase scientific knowledge is transformed into knowledge to be taught (or school knowledge) as it is expressed in the formal curriculum, while during the second phase the teacher effects new transformations of school knowledge aiming at adapting it to the particular educational context, thus changing the school knowledge contained in the curriculum into taught knowledge.

Defining the role and importance of curriculum frameworks for young children's education, Duffy notes that "it is not possible to 'practitioner proof' the curriculum […] each child and setting is unique, and the curriculum offered needs to reflect this" (Duffy, 2010, p. 105). The educational practice in kindergarten school differs from that of the other grades because there is no textbook to mediate between the curriculum and the student, while the responsibility for the curriculum implementation is exclusively assigned to kindergarten school teachers.
The need for constant adjustment of the curriculum frameworks according to the socio-cultural environment of the young children, and accordingly the need for "open" and "flexible" curriculum frameworks, is stressed in

recent pedagogical research literature (OECD, 2006; Eurydice Network, 2009). In this perspective, kindergarten school teachers are not only responsible for the "appropriation" of the educational activities but they rather operate on the borderline of the first and the second phase of the Didactic Transposition. Depending on the circumstances, they can either adopt the official curriculum frameworks' recommendations regarding the appropriate knowledge to be taught or even specify different teaching subject or discipline specific contents from those officially proposed, provided that those choices are in line with the general principles and objectives set by the official curriculum framework. But the general principles and objectives of a curriculum, as well as the appropriateness of the one or the other teaching subject and content, are all products of teachers' interpretations.

According to the theory of the Didactic Transposition the whole process of scientific knowledge decontextualisation and recontextualisation results in a distance between the initial scientific and the school knowledge. However, the two kinds of knowledge should maintain a compatible reference relationship, from which the school knowledge will draw its value as a teaching option, or at least their relationship should not raise issues of contradictions (Chevallard, 1991).

During the past 20 years, kindergartens in Greece have worked based on two curricula: from 1989 to 2002 the Greek Ministry of Education (G.M.E.) and the Greek Pedagogical Institute (G.P.I.) proposed a structured curriculum based on Piaget's theoretical framework; from 2003 to the present, the curriculum implemented is inspired by interdisciplinary pedagogy (see Eurybase – Descriptions of National Education Systems and Policies http://eacea.ec.europa.eu/education/eurydice/eurybase_en). It was deemed important to analyse both curricula texts, since for over ten years the Piagetian Curriculum has been the curriculum of reference for Greek kindergarten teachers and, as such, it might also exert influence on teachers' didactic choices through established perceptions and practices.

In both the Piagetian Curriculum (P.C.) of 1989 (G.M.E. – G.P.I., 1991) and the Interdisciplinary Curriculum (I.C.) (G.M.E. – G.P.I., 2002), clear aims are set, in regard to familiarising the children with the concepts and phenomena of Sciences, and different units are proposed related to the "States and Properties of Matter". Among the proposed units, the one concerning "Dissolution", is common to both curricula and includes several teaching suggestions (Vellopoulou & Ravanis, 2010).

We chose the phenomenon of dissolution as a representative teaching object from the world of Sciences, in order to study didactic phenomena of the second phase of the Didactic Transposition in Greek kindergarten schools, and we posed the following questions: *1. Is there a distance between the officially proposed –by the curriculum texts– teaching object concerning dissolution and the relevant object kindergarten teachers plan to teach in their classrooms? If so, what is the nature of that distance, are the two teaching objects compatible between each other as well as with a transposed scientific model appropriate for young children? 2. What are the possible factors influencing the relation between the scientific and the relevant teaching object concerning dissolution, in other words what factors influence kindergarten school teachers' didactic choices as their proceed in reframing the officially proposed teaching object during lesson planning?*

Methodological Approach

Our research objective, the study of conditions, processes, influences and their possible relationships regarding didactic phenomena of knowledge transposition, lead us on the one hand to choose a qualitative data analysis perspective as the most appropriate for in-depth and detailed approach of the above mentioned questions, and on the other hand to analyse empirical data from two sources: a) the official Greek kindergarten curriculum, and b) kindergarten school teachers planning educational activities.

Thus the research developed in two distinct phases, according to the data source and their analysis succession. In the fist phase we approached the curriculum texts and teacher's guide, aiming to identify and analyse the official definition of the concepts involved regarding the teaching of "Dissolution". In the second phase we studied interview transcripts conducted with 40 kindergarten school teachers, who, after reading and commenting the relevance and clarity of the selected curriculum texts excerpts, they planned in writing teaching interventions on the phenomenon of "Dissolution" and discussed them with the researcher. The kind of interview used in our research can be described as personal (Gilham, 2000) semi-structured interview (Bogdan & Biklen, 2003) with the use of an interview guide (Nils & Rimé, 2003; Patton, 2002).

We analysed official documents that predated the study, as well as documents produced for the research purposes (Bogdan & Biklen, 2003; Smith, 2000), focusing on the literal meaning of the texts (Mason, 2002), that is, the meanings expressed directly through the texts. Using the context unit as our data coding unit, i.e. the part

of the text (word, phrase, sentence or sentences) that contribute more completely to making the meaning understood and thus to making more valid coding decisions, (Smith, 2000), we set up categories which characterise the research material. We use the term reference to present and describe those context units identified and analysed.

The initial thematic categories concerning the conceptual definition of the phenomenon of "Dissolution" were treated as resources for further retrievals, in order to derive additional information on teachers' teaching choices (Mason, 2002). At different stages of data analysis, "open", "axial", or "selective" coding processes were used, in order to respectively identify the initial categories, correlate them and reveal more general categories or relevant sub-categories, and finally cross-check and enrich the established categories (Strauss & Corbin, 1998; Flick, von Kardoff, & Steinke, 2004), while a combination of both manual and computer assisted techniques (QSR Nvivo 2.0 qualitative data analysis software) where used, depending on the research scope, time investment and the need to organise, store, reproduce and retrieve coded data (Welsh, 2002; Roberts & Wilson, 2002).

Data Presentation and Analysis

The conceptual analysis of the two curricula and teachers' manuals texts regarding the phenomenon of Dissolution revealed in the P.C. texts 11 relevant thematic units that formed three categories: a. "Dissolution", a category of 5 units that instruct teachers to focus on the Dissolution phenomenon, b. "Soluble / insoluble substances", a category of 5 units that instruct teachers to focus on the distinction of substances and the formation of two groups, those dissolving and those not dissolving (in water), c. "Solutions", a category of only one unit that proposed the teaching of the concept of solution (see Table 1). In the texts of the I.C. 18 relevant thematic units were identified, which were grouped into four categories: a. "Dissolution", a category of 10 units instructing teachers to focus on the Dissolution phenomenon, b. "Solvent", a category of 3 units focusing on the teaching of the concept of the solvent (water), c. "Solutions", a category of 4 units focusing on the teaching of the concept of solutions, and d. "Other", a category of only one unit that proposed the simultaneous teaching of contents concerning language and writing (see Table 1).

According to the above mentioned analysis the P.C. highlights both the approach of the Dissolution phenomenon and the distinction between substances that can or can not be dissolved, where as the I.C. puts mainly an emphasis on the phenomenon and does not propose the teaching of the relevant substances distinction.

Category title	**Number of thematic units identified**	
	By the analysis of the P.C. texts	**By the analysis of the I.C. texts**
Dissolution	5	10
Soluble / insoluble substances	5	-
Solvent	-	3
Solutions	1	4
Other	-	1
Total number of the thematic units	**11**	**18**

Table 1 *Categories revealed by the conceptual analysis of curriculum texts and the teachers' guides*

The subsequent conceptual analysis of the interview transcripts revealed considerable differences between the teaching contents that seemed to concern kindergarten teachers while studying and commenting on the official texts (1st part of the interview), and those they actually plan to teach (2nd part of the interview).

More specifically, during commenting on the official texts, kindergarten teachers refer to contents relevant to those highlighted by the texts, rather to the same extent (see Table 2), with one exception. Although the I.C. texts do not refer to the distinction between soluble and insoluble substances kindergarten school teachers who commented upon the I.C. texts, seemed to be preoccupied by such a distinction. However, while planning teaching interventions, both kindergarten school teachers, those who commented on the P.C. texts and those who commented on the I.C. texts, seemed to be greatly preoccupied by the distinction between soluble and insoluble substances, as well as with "Other" issues (see Table 2).

Analysing further the references grouped in the category "Other" revealed that kindergarten teachers' comments concerned issues regarding teaching methodology or broader teaching concerns, as it is expected when the discussion focuses on teaching planning and everyday practice.

Kindergarten school teachers grouped according to the following characteristics:	Thematic units in the 1st and 2nd part of the interview in each category										Total number of the thematic units in the 1st and 2nd part of the interview		Total number of the thematic units	Total number of kindergarten school teachers
	Dissolution		Soluble / insoluble		Solvent		*Solutions*		Other					
	1st part	2nd part	1st part	2nd part	1st part	2nd part	1st part	2nd part	1st part	2nd part	1st part	2nd part		
a. Curriculum they chose to comment:														
Piagetian inspiration Curriculum	55	14	65	120	1	4	8	4	6	63	135	205	340	12
total	69		185		5		12		69					
Interdisciplinary Curriculum	278	139	55	130	57	11	66	1	54	177	510	458	968	28
total	417		185		68		67		231					
b. Education on Science Didactics														
1 to 4 relevant courses	196	110	44	101	37	9	41	0	32	126	350	346	696	20
total	306		145		46		41		158					
No relevant courses	137	43	76	149	21	6	33	5	28	114	295	317	612	20
total	180		225		27		38		142					
c. Years of teaching experience														
2 to 4	101	51	18	71	21	0	18	1	15	53	173	176	349	10
total	152		89		21		19		68					
5 to 9	76	43	40	60	12	9	18	0	17	77	163	189	352	10
total	119		100		21		18		94					
10 to 19	100	43	47	86	14	3	22	3	14	65	197	200	397	13
total	143		133		17		25		79					
More than 20	56	16	15	33	11	3	16	1	14	45	112	98	210	7
total	72		48		14		17		59					
The transposed teaching content they choose to teach:														
is compatible with a transposed scientific model of the Dissolution phenomenon	54	27	17	33	10	0	11	0	9	44	101	104	205	6
total	81		50		10		11		53					
is not compatible with a transposed scientific model of the Dissolution phenomenon	25	8	5	15	4	3	9	4	6	17	49	47	96	3
total	33		20		7		13		23					
involves inconsistencies in relation to a transposed scientific model of the Dissolution phenomenon	254	118	98	202	44	12	54	1	45	179	495	512	1.007	31
total	372		300		56		55		224					
Total number of the thematic units in each part of the interview	**333**	**153**	**120**	**250**	**58**	**15**	**74**	**5**	**60**	**240**	**645**	**663**	**1.308**	**40**
Total number of the thematic units	**486**		**370**		**73**		**79**		**300**					

Table 2 *Number of the thematic units detected on the 1st and the 2nd part of the interview in each conceptual category, kindergarten school teacher's characteristics, and the relationship between the transposed teaching content they choose to teach and a transposed scientific model of Dissolution.*

It seems that, as far as the Dissolution phenomenon is concerned, Greek kindergarten school teachers define teaching contents on the basis of categorical concepts (soluble / insoluble substances), a practice deeply influenced by the Piagetian perspective on cognitive development and the distinction between natural and logico-mathematical knowledge (von Glaserfeld, 1991; Leimeignan & Weil-Barais, 1993). However, considering the objective of children approaching an appropriately transposed scientific model of the Dissolution phenomenon, able to provide grounds for relevant reasoning, the significance of such a practice is questionable, as well as kindergarten teachers' ability to support children in grouping a variety of every day materials in soluble and insoluble ones.

To sum up, during commenting upon the relevance and clarity of the official texts excerpts regarding the phenomenon of Dissolution, the issues discussed by the teachers of the research sample are in general

compatible with the issues highlighted by the texts, whereas when the context changes to teaching planning circumstances, considerable differences are observed. In some cases those differences relate to an additional preoccupation of kindergarten teachers with methodological questions, while in other cases they reveal differences in teaching content choices.

Conclusions

The analytical processes carried out on the official Greek kindergarten curriculum texts and the transcripts of the interviews with 40 Greek kindergarten teachers, revealed that the role of the teacher is of central importance, at least on this level of the scientific knowledge transposition. The official texts seem to influence scientific content definition by teachers, as long as the context is restricted in studying and commenting on the curriculum and teachers' guide texts. When it comes to planning educational interventions kindergarten teachers operate on the borderline of the two levels of the Didactic Transposition, making content choices that may different considerably from those proposed by the official school texts. The influence of practices that draw their value from their extensive and long-term use by the community of kindergarten school teachers seems to prevail against the official instructions.

The need for central guidance of the education for children younger than 6 years, seems to be generally accepted and stressed, on the grounds of promoting a similar level of quality of the educational services provided by the state for all children, of supporting teachers every day work, of facilitating communication between teachers, parents and the community (OECD, 2001; Bennett, 2005). In addition, the importance of a flexible central guidance is recognised, in order to enable teachers to make the necessary adjustments and take appropriate teaching decisions depending on different contextual factors and circumstances, considering each child's needs and interests (OECD, 2001; OECD, 2006). Thus the view of 'open' and 'flexible' curriculum frameworks seems to be dominant, a perspective, which suggests official texts that can be considered rather as guides of teaching practice and not as extensive descriptions of proposed teaching contents. The Interdisciplinary Curriculum currently being implemented in Greek kindergarten school is in line with this view, and consequently the official texts addressed to kindergarten teachers present quite briefly suggestions regarding the appropriate scientific contents that can be approached by young children (G.M.E. – G.P.I., 2002), as well as selective examples of good practice (Dafermou, Koulouri & Mpasagianni, 2006). The texts of the former Piagetian Curriculum, influenced by the curricula theory, adopted a more uniform teaching practice and included more specific teaching suggestions on possible teaching contents (G.M.E. – G.P.I., 1991).

It seems that the dominant perspective for 'open' and 'flexible' curriculum frameworks can only be effective if teachers have extensive professional knowledge (Hedges, 2007; Banks, Leach & Moon, 1999) and in-depth understanding of the scientific knowledge they intend to teach, in order to be able to make appropriate content choices, i.e. to proceed in reframing scientific school knowledge into taught knowledge by taking into account children's' socio-cultural environment, their needs and interests, but at the same time ensure the compatibility of the teaching subject with an appropriately transposed scientific model.

References

Banks, F., Leach, J., & Moon, B. (1999). New understandings of teachers' pedagogic knowledge. In J. Leach & B. Moon (Eds.), *Learners and pedagogy*, (pp. 89-110). London: Paul Chapman.

Bennett, J. (2005). Curriculum Issues in National Policy-Making. *European Early Childhood Education Research Journal*, *13*(2), 5-23.

Bernstein, B. (1996). *Pedagogy, symbolic control and identity: Theory, research, critique*. London: Taylor & Francis.

Bogdan, R., & Biklen, S. K. (2003) *Qualitative research for education: an introduction to theory and methods*. Boston: Pearson Education.

Chevallard, Y. (1991). *La Transposition Didactique*. Paris: La Pensée Sauvage Éditions.

Dafermou, C., Koulouri, P., & Mpasagianni, E. (2006). *Guide for Kindergarten teacher. Educational planning – creative learning environments*. Athens: OEDB.

Duffy, B. (2010). The early years curriculum. In G. Pugh & B. Duffy (Eds.), *Contemporary issues in the early years*, (pp. 95-108). Los Angeles: Sage.

Eurydice Network (2009). *Early Childhood Education and Care in Europe: Tackling Social and Cultural Inequalities*, http://eacea.ec.europa.eu/about/eurydice/documents/098EN.pdf.

Flick, U., von Kardoff, E., & Steinke, I. (2004). What is Qualitative Research? An Introduction to the Field. In U. Flick, E. von Kardoff & I. Steinke (Eds.), *A Companion to Qualitative Research*, (pp. 3-11). London: Sage.

Gilham, B. (2000). *The research interview*. London: Continuum.

Greek Ministry of Education – Greek Pedagogical Institute, (1991). *Activities manual for the Kindergarten – teachers' guide*. Athens: OEDB.

Greek Ministry of Education – Greek Pedagogical Institute, (2002). *Cross-thematic curriculum framework for the Kindergarten and curriculum for activities' development*. Athens: OEDB.

Hedges, H. D. (2007). *Funds of Knowledge in Early Childhood Communities of Inquiry*. Unpublished Doctoral Thesis, Palmerston North: Massey University.

Johsua, S., & Dupin, J.-J. (1993). *Introduction à la didactique des sciences et des mathématiques*. Paris: P.U.F.

Koliopoulos, D., & Ravanis, K. (2000). Élaboration et évaluation du contenu conceptuel d'un curriculum constructiviste concernant l'approche énergétique des phénomènes mécaniques. *Didaskalia*, 16, 33-56.

Koulaidis, V., & Tsatsaroni, A. (1996). A Pedagogical Analysis of Science Textbooks: How can we proceed? *Research in Science Education*, *26*(1), 55-71.

Lemeignan, G., & Weil-Barais, A. (1993). *Construire des concepts en physique*. Paris: Hachette.

Mason, J. (2002). *Qualitative Researching*. London: Sage Publications.

Nils, F., & Rimé, B. (2003). L'interview. In S. Moscovici & F. Buschini (Eds.), *Les Méthodes des Sciences Humaines* (pp. 165-185). Paris: PUF.

OECD (2001). *Starting strong: Early childhood education and care*. Paris: Organisation for Economic Co-operation and Development, http://www.oecd.org/dataoecd/53/12/2535215.pdf.

OECD (2006). *Starting Strong II: Early Childhood Education and Care*. Paris: Organisation for Economic Co-operation and Development, http://www.oecd-ilibrary.org/education/starting-strong-ii_9789264035461-en.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks: Sage Publications.

Roberts, K. A., & Wilson, R. W. (2002). ICT and the Research Process: Issues around the Compatibility of Technology with Qualitative Data Analysis [52 paragraphs]. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 3(2), Art. 23, http://nbn-resolving.de/urn:nbn:de:0114-fqs0202234.

Smith, M. K. (2000). Curriculum theory and practice. *The encyclopaedia of informal education*, www.infed.org/biblio/b-curric.htm.

Strauss, A., & Corbin, J. (1998). *Basics of Qualitative Research*. Thousand Oaks: Sage Publications.

Vellopoulou, A. & Ravanis, K. (2010). A methodological tool for approaching the didactic transposition of the natural sciences in kindergarten school: the case of the "states and properties of matter" in two Greek curricula. *Review of Science, Mathematics and ICT Education*, *4*(2), 29-42.

von Glasersfeld, E. (1991). Abstraction, Re-Presentation, and Reflection: An Interpretation of Experience and of Piaget's Approach. In L. P. Steffe (Ed.), *Epistemological foundations of mathematical experience* (pp. 45-67). New York: Springer, http://www.vonglasersfeld.com/130.

Welsh, E. (2002). Dealing with Data: Using NVivo in the Qualitative Data Analysis Process [12 paragraphs]. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 3(2), Art. 26, http://nbn-resolving.de/urn:nbn:de:0114-fqs0202260.

IUFM de l'université d'Aix-Marseille

Institut Universitaire de
Formation des Maîtres
Aix*Marseille Université

SKHOLÊ

Cahiers de la Recherche et du Développement

Volume 17

SKHOLÊ 2012

Volume 17 - 2012