C·E·P·S Journal

Center for Educational Policy Studies Journal
Revija Centra za študij edukacijskih strategij

Vol.3 | No3 | Year 2013

Revija Centra za študij edukacijskih strategij
Center for Educational Policy Studies Journal
issn 2232-2647 (online edition)
issn 1855-9719 (printed edition)
Publication frequency: 4 issues per year
Subject: Teacher Education, Educational Science
Publisher: Faculty of Education, University of Ljubljana, Slovenia
Managing editors: Mira Metljak / **English language editing:** Terry Troj Jackson / **Slovene language editing:** Tomaž Petek / **Cover and layout design:** Roman Ražman / **Typeset:** Igor Cerar / **Print:** Tiskarna Uradni list RS, d.o.o. Ljubljana

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The CEPS Journal is an open-access, peer-reviewed journal devoted to publishing research papers in different fields of education, including scientific.

Aims & Scope

The CEPS Journal is an international peer-reviewed journal with an international board. It publishes original empirical and theoretical studies from a wide variety of academic disciplines related to the field of Teacher Education and Educational Sciences; in particular, it will support comparative studies in the field. Regional context is stressed but the journal remains open to researchers and contributors across all European countries and worldwide. There are four issues per year. Issues are focused on specific areas but there is also space for non-focused articles and book reviews.

About the Publisher

The University of Ljubljana is one of the largest universities in the region (see www.uni-lj.si) and its Faculty of Education (see www.pef.uni-lj.si), established in 1947, has the leading role in teacher education and education sciences in Slovenia. It is well positioned in regional and European cooperation programmes in teaching and research. A publishing unit oversees the dissemination of research results and informs the interested public about new trends in the broad area of teacher education and education sciences; to date, numerous monographs and publications have been published, not just in Slovenian but also in English.

In 2001, the Centre for Educational Policy Studies (CEPS; see http://ceps.pef.uni-lj.si) was established within the Faculty of Education to build upon experience acquired in the broad reform of the national educational system during the period of social transition in the 1990s, to upgrade expertise and to strengthen international cooperation. CEPS has established a number of fruitful contacts, both in the region – particularly with similar institutions in the countries of the Western Balkans – and with interested partners in EU member states and worldwide.

Revija Centra za študij edukacijskih strategij je mednarodno recenzirana revija, z mednarodnim uredniškim odborom in s prostim dostopom. Namenjena je objavljanju člankov s področja izobraževanja učiteljev in edukacijskih ved.

Cilji in namen

Revija je namenjena obravnavanju naslednjih področij: poučevanje, učenje, vzgoja in izobraževanje, socialna pedagogika, specialna in rehabilitacijska pedagogika, predšolska pedagogika, edukacijske politike, supervizija, poučevanje slovenskega jezika in književnosti, poučevanje matematike, računalništva, naravoslovja in tehnike, poučevanje družboslovja in humanistike, poučevanje na področju umetnosti, visokošolsko izobraževanje in izobraževanje odraslih. Poseben poudarek bo namenjen izobraževanju učiteljev in spodbujanju njihovega profesionalnega razvoja.

V reviji so objavljeni znanstveni prispevki, in sicer teoretični prispevki in prispevki, v katerih so predstavljeni rezultati kvantitavnih in kvalitativnih empiričnih raziskav. Še posebej poudarjen je pomen komparativnih raziskav.

Revija izide štirikrat letno. Številke so tematsko opredeljene, v njih pa je prostor tudi za netematske prispevke in predstavitve ter recenzije novih publikacij.

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Dear Reader

This issue of CEPS that you hold in your hand, or that you follow on the webpage, consists of two parts. The first comprises three papers about physics education research. These were developed from contributions presented at the 1st Eastern European Meeting on Physics Education, which was held in September 2012 in Ljubljana. The second part gives three contributions on different topics. As usual, a book report is also presented at the end of this issue.

Let us introduce the research field that the first part is focused on. Physics education research (PER) is a relatively new field in physics. It started to develop from the personal interests of researchers such as Karplus, who became interested in education after personal experiences in a classroom of their children. Most of the better known researchers entered physics education as a second career, after already being successful in other fields of physics. For a long time, PER was not recognized as an independent physics discipline by the physics community. It was understood that the teaching and learning of physics depended on lecturers' and students' gifts, and that physics was reserved for the most talented people. However, these perceptions have changed in recent decades, and studies of physics education and the teaching and learning of physics-related concepts have become increasingly appreciated.

In 2005, the most significant journal in physics, *Physical Review*, introduced a special issue, *Physical Review Special Topics – Physics Education Research* (*PRST*), which has two open-access issues per year and 2.132 as its five-year impact factor. As a consequence, PER was accepted as an independent discipline in physics by several departments of physics throughout the world, which finally allowed researchers to follow that academic path, occupying themselves with problems related to physics education within departments of physics.

Nevertheless, the discipline remains relatively small, only three international journals having impact factors publish papers from this field: *European Journal of Physics*, *American Journal of Physics* and *PRST*. Moreover, two journals discuss high school-oriented problems: *Physics Education* and *The Physics Teacher*. And that is practically the whole of the field. There have been some recent attempts to introduce new journals related to this discipline to the market, but the future will decide their quality and importance PER is obviously a part of a wider research discipline (i.e. science education research) and physicists are also highly active in this wider field. Researchers in physics education, educators and teachers discuss the problems related to physics education within the annually

organized conferences and seminars of GIREP (Groupe International de Recherche sur l'Enseignement de la Physique), ICPE (International Commission of Physics Education), or AAPT (American Association of Physics Teachers) meetings. The community is rather large and well organized, and new results within this field increasingly influence the teaching and learning of physics.

PER consists of several subfields; let us describe the most important ones. Within existing and new topics in curriculum development, the depth of the knowledge, the sequences and similar are discussed. As physics is an experimental science, the development of experiments, accessible to teachers and students as demonstrations and in laboratories, is an essential contribution to the field. Although experiments are mostly straightforward for teachers and their messages seem clear, the research on students' comprehension related to the experiments, how they are included in teaching interventions and at which points and why they can lead to correct or incorrect conceptions is a complementary part of the development of experiments. Studies of various approaches in teaching physics, general and tailored to the specifics of various topics, are another valuable sub-discipline. More general is the impact of studies on how conceptual understanding develops in various fields of physics, on which robust concepts is built and how these robust concepts can be transformed, if they are not correct. These studies also receive reflections outside of physics and are beneficial for science education as well as for education in general. There are several other problems scientists in this field focus on in their studies. The reader can begin to comprehend what PER is about from three contributions in the focus part in this issue of CEPS; they come from three specific areas on which this research field has focused in recent years.

The first paper focuses partly on the findings by Gojkošek, Sliško, and Planinšič regarding the role of the learning sequence on the construction of explanatory models for an experiment that is entirely new to students, called the foil test. This test asks students to explain a microscopic structure of a specific foil that is found when an LCD screen is dismounted. They are allowed to perform various experiments using a foil. The authors compare three different learning approaches, called traditional, prediction and laboratory approach, using the results of explanatory model for a foil test. They show that the prediction group seems the most successful and that the time spent on the problems has little or no effect on construction of the model. The authors discuss various possible reasons for the results obtained.

The next paper, by Hadžibegović and Sliško, discusses the role of active learning in large classes of students, which is generally believed to be impossible. The authors have chosen the topic of optics to design a module that helps

students to learn from interactive lecture experiments, guiding them to justified explanation of the phenomenon observed and predict new related phenomena, which leads to developing a conceptual understanding that is tested by writing and drawing. They report a significant increase of conceptual understanding and a substantial change from the passive to active role of students after a single active lesson.

The last contribution, by Leopold Mathelitsch, discusses competencies related to science education. The author presents three models regarding competencies in science from German-speaking countries: Germany, Switzerland and Austria. More details are given in a special program 'Competencies in Mathematics and Science Teaching', introduced in Austria. The discussion is focused on teachers' views on the idea of competencies, and those that support teachers find welcome at the introduction of the competency approach into teaching. The evaluation of the program and the role of problems and exercises is discussed in detail.

As the first part of papers was contributed by physicists working in physics education research, their papers reflect that field's standard for papers to be as short as possible for the results reported. Therefore, the part devoted to general contributions had space for three articles.

The first article of the second part, by Ceciliani and Bortolotti, discusses the physical activities of younger children, focusing on outdoor activities that are declining throughout the developed world. The authors emphasise that in our rapidly changing contemporary society, it has become apparent that children spend significantly less time playing outdoors than their parents did. Therefore, considerable attention must be paid by professionals to engage this challenge, especially within early educational contexts. The goal of their study was to first explore the continual drive of play in educational growth and, second, the ways in which children play outdoors at school, in order to reap the developmental benefits of outdoor play in a supportive context, where such fundamental activity is not only allowed, but also supported. The results of this study highlight the findings regarding children's physical play behaviour and its frequency. The authors also discuss teachers' attitudes toward outdoors activities. They suggest several options for early childhood professionals to foster children's enjoyment of outdoor play and active spontaneous play.

The next article, by Giannikas, comes from language education research. The author discusses primary language learning in the Greek region of Cyprus, specifically, the positive effects of classroom management and organisation on a student-centred approach of teaching. The focus of the article is the student-centred approach and the difficulties that teachers accustomed to

teacher-centred ways of language teaching encounter due to the lack of guidance and support when introducing the student-centred approach.

The final paper of the second part, by Stamelos and Kavasakalis, reports the results of semi-structured interviews and an analysis of the policy papers on the production of policy-oriented learning during the establishment and implementation of a specific policy program in the policy sub-system of the Greek university as well as an interpretation of the existence of policy-oriented learning. The theoretical tools were drawn mainly from the theoretical work of Sabatier and Jenkins-Smith, termed the 'advocacy coalition framework (ACF)'. The Greek university is therefore considered to be a policy subsystem in which actors form coalition networks that share policy core beliefs and values, and engage in coordinated action in order to translate these beliefs and values into public policy.

At the end a book review of the translated monograph of Warburton – The Art Question – with afterword study by Marjan Šimenc is presented.

The new issue of the CEPS journal brings a variety of papers from various education research fields, reporting and discussing several open research questions. I hope that information available in this issue will provide alternative insights into readers' research problems and foster new research ideas.

Mojca Čepič

Do Learning Activities Improve Students' Ability to Construct Explanatory Models with a Prism Foil Problem?[1]

Mihael Gojkošek*[2], Josip Sliško[3], and Gorazd Planinšič[4]

The transfer of knowledge is considered to be a fundamental goal of education; therefore, knowing and understanding the conditions that influence the efficiency of the transfer from learning activity to problem solving play a decisive role in the improvement of science education. In this article, the results of a study of 196 highschool students' ability to transfer knowledge in explanatory model construction are present. Three test groups were formed, traditional, prediction and lab groups, in which students were involved in three different learning activities. A week after instruction, students were tested with a foil test and Lawson's Classroom Test of Scientific Reasoning. According to the results, little knowledge transfer from learning activities to the foil test occurred. Among the three tested learning methods, the one asking for prediction seems to best improve the transfer of knowledge. Time spent on activities had little or no effect on the transfer of knowledge. Some possible reasons for the observed results are presented, and the importance of correct scientific explanation during the learning process is considered.

Keywords: Knowledge transfer; Prism foil problem; Learning activities; Explanatory model; Prediction; laboratory activity

1 Findings of the research were presented on The World Conference on Physics Education in July 2012 in Istanbul, Turkey.

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Ali različne aktivnosti pri učenju lahko izboljšajo sposobnost dijakov pri konstruiranju razlagalnega modela pri problemu prizmatične folije?

Mihael Gojkošek*, Josip Sliško in Gorazd Planinšič

Transfer znanja se pojmuje kot temeljni cilj poučevanja. Za izboljšanje poučevanja naravoslovja je pomembno poznati in razumeti pogoje, ki vplivajo na učinkovitost transferja z učne aktivnosti na reševanje problema. V prispevku bomo predstavili izsledke raziskave o sposobnosti transferja znanja 196 srednješolcev pri oblikovanju razlagalnega modela. Oblikovali smo tri testne skupine – tradicionalno, napovedovalno in laboratorijsko, v katerih so dijaki izvajali tri različne učne aktivnosti. En teden po izvedeni učni aktivnosti so dijaki rešili test o prizmatični foliji in Lawsonov test znanstvenega sklepanja (Lawson's Classroom Test of Scientific Reasoning). Izsledki so pokazali, da je bil transfer znanja z učnih aktivnosti na test o foliji majhen. Med tremi eksperimentalnimi skupinami je bil povečan transfer še največji pri napovedovalni skupini. Trajanje učne aktivnosti je imelo majhen oz. ničen vpliv na transfer znanja. Predstavili bomo nekaj mogočih razlag za pridobljene izsledke in razpravljali o pomenu pravilne znanstvene razlage med učnim procesom.

Ključne besede: transfer znanja, problem prizmatične folije, učne dejavnosti, razlagalni model, napovedovanje, laboratorijska aktivnost

Introduction

Knowledge transfer is widely considered to be a fundamental goal of education (Marini & Genereux, 2004). Usually, this transfer is seen as the ability to apply knowledge and skills to new contexts and problems that differ from the initial learning situation (Barnett & Ceci, 2002; Eraut, 2004). Constructivist belief, according to which any process of building new knowledge starts with a foundation of everything that is already known by the learner (Michael & Modell, 2003), emphasises the importance of prior knowledge and, in particular, students' ability to transfer that knowledge into new situations. Considering the similarity between learning activity and the task in which one should apply knowledge, transfers can be near or far (Marini & Genereux, 2004). Additionally, some knowledge and skills, when acquired, are content specific while other knowledge and skills may be more readily transferred to a new domain (Michael & Modell, 2003). One of important elements involved in knowledge transfer is instructional context, which also includes instruction and support provided by the teacher (Marini & Genereux, 2004).

The aim of this study was to compare three instructional practices and their influence on the success of knowledge transfer in the case of a prism foil problem.

The development of effective teaching and learning strategies, which offer potential for improving outcomes of science and physics courses, has been a focus of science education research in recent decades (Meltzer & Thornton, 2012). One of the first researchers to emphasise the importance of students' active participation in the learning process was Robert Karplus, who (in collaboration with Myron Atkin) presented instructional model of guided discovery (Atkin & Karplus, 1962). The three phases of Karplus's cycle for science teaching are: *Exploration, Concept introduction, and Concept application* (Karplus, 1977). A newer approach based on work of Karplus, which extended learning cycle by two phases, is the so-called 5E cycle, consisting of five phases: *Engagement, Exploration, Explanation, Elaboration, and Evaluation* (Bybee et al., 2006). In physics education research, White and Gunstone (1992) presented activities based on a three-phase cycle known as *Predict, Observe, Explain*. Two learning cycles were presented by Lillian McDermott in order to help physics students to overcome resistant difficulties. The first cycle consists of phases called *Observe, Recognize, Apply*, while the second consists of three phases called *Elicit, Confront, Resolve* (McDermott, 1991). These two cycles are not distinct strategies, but are part of much broader learning approach called *Physics by Inquiry* (McDermott, 1996). Another active learning educational framework that overcame boundaries of

basic learning cycles, and includes a number of strategies to involve students in authentic scientific tasks is the I*nvestigative Science Learning Environment* (Etkina & Heuvelen, 2001). Several studies showed that understanding is improved by students' engagement in the learning activity. Crouch, Fagen, Callan and Mazur (2004), for example, found that learning can be enhanced by asking students to predict the outcome of the demonstration before seeing it but after showing the introductory experiment. In this study, we have attempted to upgrade this finding by addressing students' ability to construct explanatory models.

Explanation and the nature of it have played a central role in the history of science. For a long time, studies in philosophy, anthropology and sociology have been focused on how scientists generate and evaluate scientific explanations (Duschl, Schweingruber, & Shouse, 2007). Since science education is inspired by authentic scientific research, several researchers investigated students' ability to construct explanations for physics phenomena (e.g. McNeill, Lizotte, Krajcik, & Marx, 2006; Redfors & Ryder, 2001; Ruiz-Primo, Li, Tsai, & Schneider, 2010). However, few studies have directly addressed a possible connection between this ability and the nature of prior instruction about the phenomenon. Therefore, we focused our study on effects that learning activities may have on the success of knowledge transfer to physics-phenomenon related problem solving.

Our research question was:

How do different learning activities influence the transfer of knowledge in the construction of explanatory models for prism foils?

We decided to compare three kinds of instruction: teacher's explanation without students' engagement, teacher's explanation accompanied by a request for a prediction, and independent laboratory activity. Students' ability to construct explanatory models for prism foil has already been investigated (Gojkošek, Planinšič, & Sliško, 2012), but, without any prior learning activity, the problem seemed to be too demanding for highschool students. We hypothesized that learning activities about the optical properties of rectangular prisms will increase the number of correct explanatory models.

Prism foil

A prism foil is a thin transparent film that is flat on one side and with microscopic prismatic ridges on the other side; a cross-section is shown in Figure 1. A prism foil is a part of a backlight system in common LCD monitors and can be obtained by disassembling a broken monitor. Its advantage is that one can perform

similar experiments as with macroscopic prism without revealing its structure. More information about the optical properties of prism foil and its pedagogical applications can be found in the article of Planinšič and Gojkošek (2011).

For the purpose of the research, we used two simple demonstration experiments involving prism foil. When the light beam from a torch is incident perpendicularly to the prism side of the foil, the beam undergoes two refractions and emerges at angles ±α, depending on which side of the prism the beam strikes (Figure 2a). When light is incident perpendicularly to the flat side of the foil, it undergoes double total internal reflection and returns back into the original direction (Figure 2b). The sequence of these two experiments, after which students are encouraged to explain the structure of the foil on the basis of observed results, is called the *prism foil problem*.

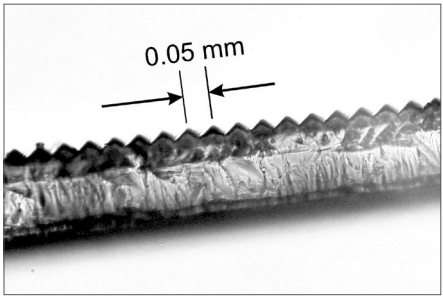


Figure 1. Cross-section of prism foil observed under the laboratory microscope.

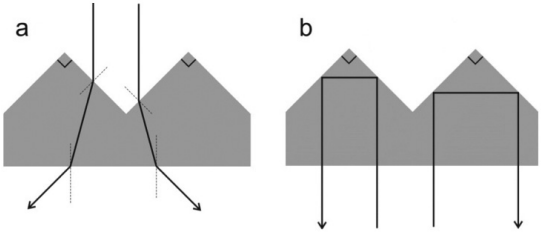


Figure 2. a) Light beam incident perpendicularly to the prism side of the foil undergoes double refraction and emerges at angles ±α. b) Light beam incident perpendicularly to the flat side of the foil undergoes double total internal reflection and returns in the original direction.

Research design

A total of 196 students aged between 17 and 19 from three Slovenian secondary schools were included in our research; 113 of them were females and 80 were males. Gender was determined from students' names written on their tests. All three schools were located in urban districts. Physics was a compulsory subject and lessons followed prescribed curriculum. Before they were tested, the students took lessons on reflection, refraction, total internal reflection, image formation, diffraction and interference of light. Our study was implemented in three steps: the first students were involved in the learning activity with the prism that was followed by two tests: the foil test and Lawson's Classroom Test of Scientific Reasoning.

Learning activities

Students were involved in three kinds of learning activities with a laser ray-box and a three-sided prism made of Plexiglas with isosceles rectangular triangle as a base surface. Three test groups, called the traditional, prediction and lab groups, were formed for the purpose of the research.

In the traditional group, a physics teacher showed students three demonstration experiments. The first experiment showed a double refraction of the laser beam that occurs when light is incident at the angle of 45 degrees to the prism (see Figure 3a). The second experiment showed the internal reflection of the beam when light was incident perpendicularly to one of prism's shorter sides (see Figure 3b). In the third experiment, the teacher presented double total internal reflection when light was incident perpendicularly to the prism's longer side (see Figure 3c). The teacher performed the experiments and explained observed results using Snell's law in a qualitative way with minimum engagement of students. The whole activity took about five minutes.

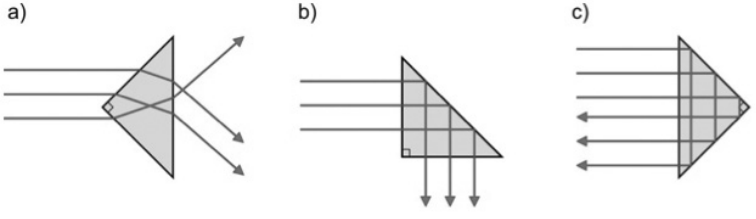


Figure 3. Sketches of demonstration experiments performed with rectangular prism and laser ray-box.

In the prediction group, the teacher showed students first and second demonstration experiments (double refraction and single total internal reflection) in the same way as previously described. Then he showed the setup of the laser ray-box and the prism for the third experiment and asked students to predict the outcome without showing the experiment. Students illustrated their predictions in their notebooks. After that, the teacher performed the experiment whereupon one of the students was encouraged to explain the observed result aloud and then the whole class discussed it. This activity took between 5 and 10 minutes.

In the lab group, students were divided into groups of 4 or 5. We gave them written instructions for the laboratory activity, which included sketches of the experimental set ups like those in Figure 4. Their task was to perform each experiment, to draw a ray diagram of the observed result and to explain the result by using the laws of involved optical phenomena. The students wrote their answers in the lab reports. The whole activity took 45 minutes.

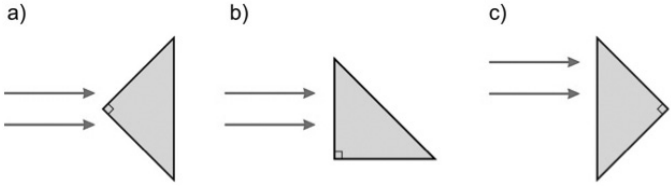


Figure 4. Sketches of experimental setups for laboratory activity in lab test group.

Foil test

Approximately one week after the learning activities took place students were tested with foil test, which was based on the prism foil problem and was developed by our research group. We assumed that prism foil is an unknown element to students. Instead of the term 'prism foil' we used 'a special foil' in order not to suggest its structure. Part of the foil test consisted of two demonstration experiments in which students observed the split of the light beam when the light was incident perpendicularly to one side of the foil, and the reflection of the beam when it was incident perpendicularly to the other side.

In the first question, we asked the students to sketch and describe the observed outcomes of the experiments. In second question, the students' task was to draw and to verbally describe their explanatory model for the foil's structure. Additionally, they had to name an optical phenomenon that might be the

reason for the observed results. At the end of the task, they were encouraged to express, on the scale from 1 to 5, their confidence in the correctness of their explanatory model. In the last question, we asked them if they were surprised by the outcomes of the experiments and, if they were, what surprised them most. It took students approximately 30 minutes to finish the test.

Lawson's Classroom Test of Scientific Reasoning

As a reference test, we used Lawson's Classroom Test of Scientific Reasoning (CTSR). The test was developed by Anton E. Lawson as an instrument for measurement of formal-level reasoning (Lawson, 1978). The reliability of the test has been confirmed in several studies (e.g. Ates & Cataloglu, 2007; Coletta & Phillips, 2005; Lawson et al., 2000). A revised version of the test with 24 multiple-choice questions was translated into the Slovenian language and used in this study.

Questions were combined in 12 pairs of form question-argumentation. Each pair was coded with one point when both answers were correct and with none otherwise; the total number of points was 12. Students who scored between 0 and 4 points were classified as concrete-logical thinkers, students with scores between 5 and 8 were classified as transitional, and students with 9 points or more were classified as formal-level thinkers. The reliability analysis gave a value of 0.724 for Cronbach's alpha coefficient, which is comparable to results reported by other researchers (e.g. She & Lee, 2008).

Analysis

In the analysis of the foil test, we coded the optical element (or physics concept) that was proposed as the basis of foil's structure by students. Similar to our previous research (Gojkošek, Planinšič, & Sliško, 2012) we formed nine groups named after key elements included in the explanation: prism, lens, diffraction grating, mirror, channel, layer, other, incomplete, and no model.

We also coded the quality or sophistication of explanatory models and their consistency with common physics knowledge on a scale from 1 to 5.

Models that give no explanations were coded with 1. Models that merely describe the observed result but do not provide any explanation for the foil's structure or are incomprehensible were coded with 2. In this group were also classified those explanatory models that include only a sketch without verbal description or verbal description without a sketch of the foil. (Note that students were explicitly asked to use both representations in the explanatory model construction task.)

We split Code 3 into three subcategories. When a student described the structure of the foil, which by his/her opinion was crucial for observed results, but did not connect this structure with specific optical phenomenon, we coded this with Code 3.1. Code 3.2 was assigned when a student explicitly stated some physics (optical) phenomenon that in his/her opinion played a crucial role for the observed outcomes of the experiments, but the structure of the foil that would employ this phenomenon was not addressed. Code 3.3 was assigned to explanatory models that consist of optical phenomenon and a description of the foil's structure, but these two did not form a consistent whole (e.g. student states non-existent optical phenomenon or uses optical elements and phenomena contradictorily, like 'the lens reflects the light').

Explanatory models that described the structure of the foil and employed corresponding physical concept in the explanation, but contained one or more physics mistakes, or inconsistent use of the concept were coded with 4. Usually in such models the use of physics concept differed from generally accepted physics knowledge in a way that the outcomes matched the observed experimental results. A typical example is diffraction grating that produces interference maxima only in two symmetrical directions (without central reinforcement) or a diverging lens that splits the parallel beam of light into two separate beams.

Models that included descriptions of the foil's structure, employing corresponding physical concept in the explanation in a consistent way, and contained no mistakes were coded with 5. Table 1 includes examples of typical explanatory models proposed by students for every quality code.

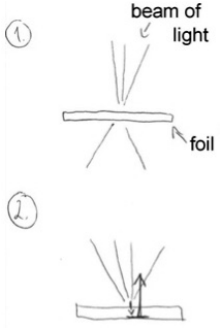
Results

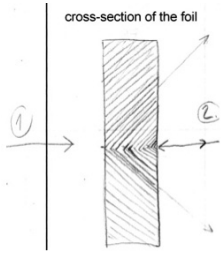
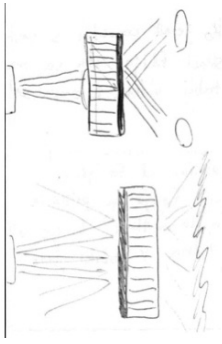
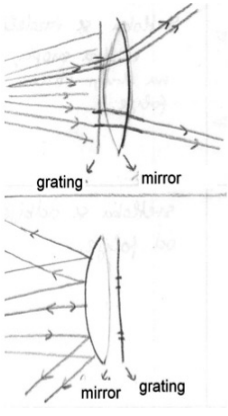
The average score measured by Lawson's Classroom Test of Scientific Reasoning was 7.6 (63.5%); 30 students (15.3%) were classified as concrete-logical thinkers; 90 students (45.9%) were classified as transitional thinkers and 76 students (38.8%) were classified as formal-logical thinkers. These results are similar to reports of students' reasoning levels in other studies (e.g. Ates & Cataloglu, 2007; Marušić & Sliško, 2012). The reasoning abilities of students in three test groups were comparable. The average scores of students in the traditional, prediction, and lab groups on CTSR were 7.3 (61%), 7.6 (64%) and 7.1 (59%), respectively. The percentages of concrete-logical, transitional, and formal-logical thinkers in each group are presented in Figure 5. Differences in students' scores on CTSR between test groups were analysed using a one-way ANOVA test. The differences have been proven not to be statistically significant

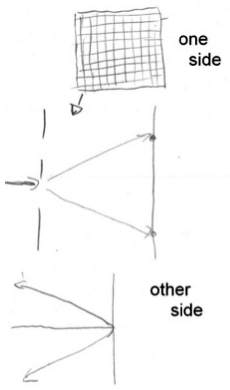
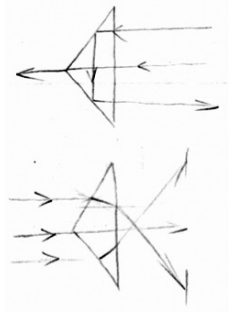
(p=0.544, F=0.610). However, we found a significant difference between Lawson's scores of males and females (70% vs. 55%, respectively). An unpaired t-test showed that difference is statistically highly significant (p<0.001, t=5.518, df=186.776). Unequal variances of gender groups were assumed in the analysis. No other gender-related analysis has been made.

Only five students out of 196 successfully constructed an entirely correct explanatory model; four of them were tested in the prediction group and one in the lab group. Their average score on CTSR was 82%; four of them were classified as formal-level thinkers, while one was classified as a concrete-level thinker (she scored 33%). There was also one student in the lab group who constructed a partially correct explanatory model: instead of double total internal reflection, he explained reflection of the light beam on one side of the foil through the total reflection on its flat surface. The total number of explanatory models that involved prism(s) in some way was three in the traditional group, five in the prediction group and three in the lab group.

Table 1. *Examples for typical explanatory models proposed by students for quality codes 1-5.*

quality code	student's code	student's sketch	student's verbal description	our notes
1	AE25	(no sketch)	(no description)	
2	AD18		In the first experiment, the beam of light goes through the foil and is split into two beams (we can see two circles). In the second experiment, the beam of light cannot go through the foil; therefore, it is reflected into the opposite direction.	Student AD18 only described the observed result and did not address the structure of the foil or involved optical phenomena.

3.1	AC22		The foil consists of several fibres. Whether the foil transmits the light or not depends on the fibres' layout.	Student AC22 constructed her explanation of the structure of the foil (fibres), but did not explain which optical phenomenon affects the beam of light.
3.2	AD14		When the light beam is incident on the first side of the foil, the rays are bent, and two beams are formed (due to different refractive indexes of air and foil). When the light beam is incident on the other side of the foil, rays are reflected; the foil works like a mirror.	Student AD14 built an explanatory model on the optical phenomena (refraction and reflection), but did not suggest suitable structure for such explanation.
3.3	AK16		Light can pass only through slots; it is refracted in mirrors and then falls on the screen in two beams. Light is mostly reflected on the convex mirror and therefore no light can be seen on the other side.	Note that Student AK16 explicitly stated construction elements of the foil (slots, mirror) and optical phenomena involved (refraction, reflection), but their use is confusing (light is 'refracted in mirrors').

4	AE17		On one side, this foil is like a diffraction grating that causes interference, i.e. maxima and minima due to diffraction of light. On the other side, the foil works like a mirror and therefore rays are reflected; total reflection occurs.	Student AE17 used optical elements (diffraction grating, mirror) and corresponding phenomena (diffraction, interference, reflection), in a consistent way. However, central interference maximum was ignored in order to provide the observed result.
5	AC4		When a light ray is incident on one side of the foil, it undergoes double total reflection. Only a small part goes through. A light ray incident on one side is refracted downwards, while a ray on the other side is refracted upwards. Only a little falls in the middle.	Student AC4 consistently connected the structure of the foil (prism) with the corresponding optical phenomenon (refraction and total internal reflection).

No major difference between the frequencies of quality codes for explanatory models in three test groups was found. Mostly students constructed explanatory models that were coded with Codes 2, 3 (which includes Codes 3.1, 3.2 and 3.3), and 4. Only a few students constructed explanatory models of the highest quality, and also only a few constructed no model at all. Percentages of explanatory models of different qualities in the traditional, prediction and lab groups can be seen in Figure 6. Since the frequency of quality codes in test groups were similar, we combined all results in one group and analysed them.

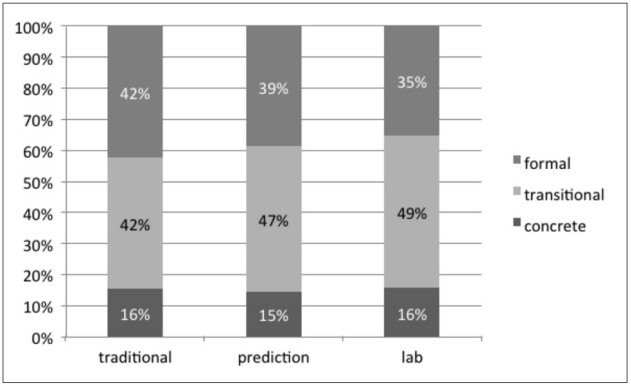


Figure 5. Comparison of students' cognitive abilities in traditional, prediction and lab groups. Percentages of concrete-logical, transitional and formal-logical thinkers in each group are very much alike. The difference between groups was shown not to be statistically significant.

We found a strong connection between the quality of explanatory model and the score on Lawson's CTSR. Almost 60% of concrete-logical thinkers constructed explanatory models that were coded with quality Code 2, while this percentage drops to approximately 40% in transitional and less than 15% in formal-reasoning groups. Quality Code 3, which includes Codes 3.1, 3.2, and 3.3, was assigned to approximately 25% of concrete-level thinkers, while these percentages in transitional and formal-level groups are about 45%. Among quality Codes 3, Code 3.1, which was assigned to explanatory models based on descriptions of the structure, was the most frequent in all reasoning groups. This was followed by Code 3.3, while Code 3.2 (explanatory models based on optical phenomenon) was assigned less frequently. Additionally, we found that no Code 3.2 was assigned in the concrete-level group, while it was assigned to approximately 10% of explanatory models in other reasoning groups. We found significant increase of explanatory models of Quality Code 4: while there is only 10% of such models in concrete-level and 15% in transitional reasoning groups, 35% of such explanatory models constructed by formal-level thinkers can be found. The results are shown in Figure 7.

Discussion

Since only five students out of 196 (2.6%) were able to construct an entirely correct explanatory model, we believe that little transfer of knowledge from the learning activity to the prism foil problem occurred. Comparing the

results to our previous research (Gojkošek, Planinšič, & Sliško, 2012), we can see that active learning methods may improve transfer of knowledge, but the complexity of the testing problem still results in a strong floor effect. Several possible reasons for such poor achievements can be considered.

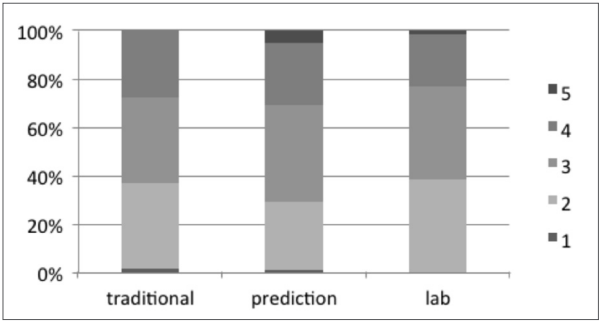


Figure 6. The graph shows the frequency of occurrence of explanatory models coded with quality codes 1-5 in traditional, prediction and lab group.

First, the transfer of knowledge from the learning activity to the prism foil problem is a far transfer. It seems that both problems do not appear similar to students, and probably the most difficult task for them is to transfer knowledge from the macroscopic (prism in the learning activity) to the microscopic scale (prism foil). Another factor that influences the distance of transfer is the time elapsed between the learning activity and the testing problem. We believe that students would be more successful if the foil test would be administrated immediately after the learning activity.

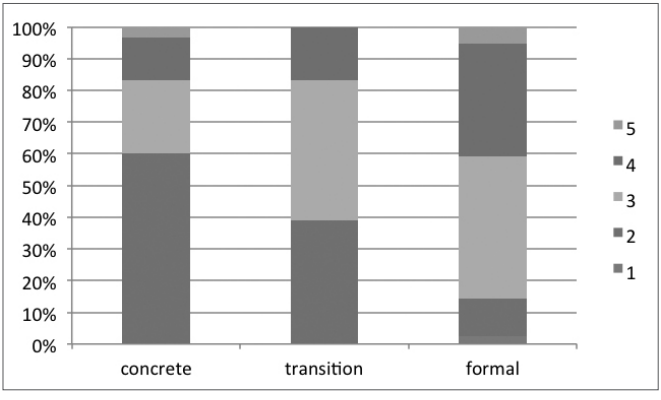


Figure 7. Graph shows occurrence of explanatory models coded with quality codes 1 to 5 in groups of concrete-logical, transitional and formal-logical thinkers according to their scores on CTSR.

Secondly, the question of what was learned by students in the learning activities should be explicitly addressed. People must achieve a threshold of initial learning that is sufficient to support knowledge transfer (Bransford et al., 2000). We believe that, at least in the traditional group, this criterion was not satisfied. The length of the learning activity and poor engagement of students might have resulted in little (or no) knowledge, which was not sufficient for successful transfer.

Thirdly, the complexity of the prism foil problem may require that the problem be addressed in several steps. In our previous research (Gojkošek, Planinšič, & Sliško, 2012), two different task sequences were applied during the problem solving. We showed that students were more successful when they observed the surprising result at the beginning, which was followed by observation of a second experiment that provided additional (less or not surprising) data. Breaking a larger problem into smaller sub-problems that are easier to comprehend is an effective strategy in problem solving (Catrambone, 1998; Gick, 1986). In this study, both experiments were presented simultaneously. Consequently, students had to operate with a greater quantity of the information, upon which a consistent explanatory model should be built. Especially for concrete-logical thinkers, this is a challenging task.

Our results suggest that students in the prediction group were the most successful ones (4 entirely correct explanatory models; 5.3%), followed by the lab group (1 entirely and 1 partially correct explanatory model; 1.8%), while students in the traditional group did not construct any correct explanatory models. Moreover, the number of explanatory models that involve prisms in any way suggests that prediction group was the most successful one. Those results provide further support to the belief that learning with students' active engagement in the form of prediction of experimental outcomes provides more knowledge in comparison to traditional methods (Crouch, Fagen, Callan, & Mazur, 2004). We believe that the students' participation resulted in deeper knowledge, which was observed through more cases of successful knowledge transfer in the prism foil problem solving.

We hypothesized that hands-on laboratory activity might provide even deeper understanding; however, our results do not suggest this. One possible explanation for that may be found in the method of students' investigation. They obtained precise instructions for the laboratory activity, and their task was to explain the observed results, using knowledge of corresponding physics phenomena. However, at the end of their activity, the teacher did not provide them any explanation model that would support (or disprove) their assumptions and explanatory schemes. The authors believe that the lack of teacher's explanation

may result in less learning, as students' explanations without the support of authority (teacher) remain mere speculations and their understanding of the observed process remains unevaluated and questionable. Our results suggest that lab exploration alone, without any reflection on previous knowledge, may not be enough for meaningful learning and consequently successful transfer of knowledge. These results are in resonance with the findings of other researchers, who reported the greater effectiveness of guided (enhanced) discovery when compared to unassisted (unguided) or minimally guided instructional approaches (Alfieri, Brooks, Aldrich, & Tenenbaum, 2011; Mayer, 2004).

Another important observation is that time spent on the activity is not the most influential factor for successful transfer. Learning activity in the lab group lasted 45 minutes, while in the prediction group it took less than 15 minutes. Despite the much shorter time spent on the instruction, students from the prediction group seem to be more successful in the transfer of knowledge. On the basis of this result, we conclude that more important than the duration of the learning activity is its nature. In other words: it is more important *how we* teach students instead of *how long* we teach them.

The fact that most of the students who constructed correct explanatory models are formal-level thinkers supports the finding from our previous study: formal reasoning skills are a key factor in the construction of explanatory models for prism foil. However, there was one student that managed to find the solution of the problem with concrete-level reasoning skills. This may suggest that asking for predictions during demonstration experiments may help non-formal thinkers to transfer knowledge.

The nature of the instruction methods does not seem to influence the quality of students' explanatory models. This is not a surprising result. Short learning activities may increase knowledge, but have a much smaller impact on the development of competences needed for the construction of sophisticated and consistent explanatory models. In contrast, a connection between quality of models and students' cognitive level was expected. Higher cognitive abilities, such as hypothetico-deductive reasoning, are essential in the construction of complex explanations based on the observation of surprising data.

We believe that frequency of Code 3.2 also indicates differences in students' reasoning abilities. Note that no concrete-logical thinker constructed the model coded with quality Code 3.2. This code was assigned to explanatory models based on knowledge of optical phenomenon involved in the experiment, which, on the other hand, contained no or too little information about the structure of the foil. It would be contradictory if a concrete-level thinker would base his/her explanation on abstract concepts like those composing the

transferable knowledge of optical phenomenon in question. Such models, however, were found in transitional and formal-level reasoning groups.

Conclusions

In our study, we investigated the ability of 196 highschool students aged 17 to 19 to transfer knowledge from a learning activity to problem solving with prism foil. Three different instructional methods were used: teacher's demonstration and explanation of observed results without students' engagement was performed in the *traditional* group. In the *prediction* group, the teacher showed and explained two experiments, while the third one was performed after the students' prediction of its outcome. In the *lab* group, students were involved in unguided laboratory activity, in which they performed all three experiments by themselves. Students were later tested with Lawson's Classroom Test of Scientific Reasoning and Foil test.

Our results show that little knowledge transfer from the learning activity to the prism foil problem occurred. It seems that students in the prediction group benefited the most from the instructional method, while transfer was poorer in the lab group and was not observed in the traditional group. We recognized the distance of transfer, the low effect of learning methods and single-step problem solving strategy as possible reasons that little transfer occurred. Additionally, we found that asking for prediction during demonstration experiments may help non-formal thinkers to transfer knowledge. However, inquiry-based laboratory explorations without explicit reflection on previously acquired knowledge may not be enough for successful knowledge transfer.

Acknowledgements

The authors are thankful for the kind cooperation of the following highschool teachers: Ruben Belina, Marjana Benedik, Rok Capuder, Timotej Maroševič, and Florjana Žigon.

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Biographical note

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Changing University Students' Alternative Conceptions of Optics by Active Learning

Zalkida Hadžibegović*[1] and Josip Sliško[2]

Active learning is individual and group participation in effective activities such as in-class observing, writing, experimenting, discussion, solving problems, and talking about to-be-learned topics. Some instructors believe that active learning is impossible, or at least extremely difficult to achieve in large lecture sessions. Nevertheless, the truly impressive implementation results of the SCALE-UP learning environment suggest that such beliefs are false (Beichner et al., 2000). In this study, we present a design of an active learning environment with positive effect on students. The design is based on the following elements: (1) helping students to learn from interactive lecture experiment; (2) guiding students to use justified explanation and prediction after observing and exploring a phenomenon; (3) developing a conceptual question sequence designed for use in an interactive lecture with students answering questions in worksheets by writing and drawing; (4) evaluating students' conceptual change and gains by questions related to light reflection, refraction, and image formation in an exam held a week after the active learning session. Data were collected from 95 science freshmen with different secondary school backgrounds. They participated in geometrical optics classes organized for collecting research results during and after only one active learning session. The results have showed that around 60% of the students changed their initial alternative conceptions of vision and of image formation. It was also found that a large group of university students is likely to be engaged in active learning, shifting from a passive role they usually play during teacher's lectures.

Keywords: Active learning; Alternative conceptions; Geometrical optics; Large-enrolment; University students

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Spreminjanje alternativnih pojmovanj v optiki z aktivnim učenjem pri študentih

Zalkida Hadžibegović* in Josip Sliško

Aktivno učenje je individualno in skupinsko sodelovanje pri aktivnostih, kot so: opazovanje v razredu, pisanje, eksperimentiranje, diskutiranje, reševanje problemov in pogovarjanje o temah, ki naj bi se jih naučili. Nekateri predavatelji menijo, da je aktivno učenje pri predavanjih z veliko udeležbo nemogoče ali pa vsaj zelo težavno. Vendar pa izsledki vpeljave učnega okolja SCALE-UP govorijo proti takim prepričanjem (Beichner et al., 2000). V študiji bova predstavila model okolja za aktivno učenje s pozitivnim učinkom na študente. Model temelji na naslednjih postavkah: 1) učenje študentov s pomočjo eksperimentiranja v sklopu predavanj; 2) usmerjanje študentov pri pravilnih razlagah in napovedih po opazovanju in raziskovanju pojava; 3) priprava niza konceptualnih vprašanj za uporabo v sklopu interaktivnega predavanja, pri katerem študentje pisno in s skiciranjem odgovarjajo na vprašanja na delovnem listu; 4) evalvacija konceptualnih sprememb in nadgradenj pri izpitnih vprašanjih o odboju in lomu svetlobe ter o nastanku slike, ki so bile izvedene en teden po koncu učnega posega. Vzorec je zajemal 95 študentov prvega letnika naravoslovnih študijskih smeri z različno predhodno srednješolsko izobrazbo. Študentje so sodelovali pri urah aktivnega učenja o geometrijski optiki, ki so bile izvedene enkrat – samo za namen študije. Izsledki kažejo, da je svojo prvotno predstavo o vidu in oblikovanju slike spremenilo okoli 60 odstotkov študentov. Ugotovitve kažejo tudi, da je aktivno učenje povsem mogoče vpeljati v veliko skupino študentov in spremeniti običajno pasivno vlogo študentov med tradicionalnimi oblikami predavanj.

Ključne besede: aktivno učenje, alternativni koncepti, geometrična optika, množični vpis, univerzitetni študentje

Introduction

During their education, science students are expected to develop critical thinking and learning skills to address novel problem-solving and team-work-based issues that will be essential in their future careers and lives. Teachers have a crucial role in leading students to achieve such high level of work competencies in a knowledge-based economy and society. The main aim of this paper is to describe an in-class learning sequence for the active learning of physics designed for a large group of science students. Based on experience and education research in general, science students finishing the first cycle of the Bologna model of study do not have enough knowledge to cope with problem solving in real life. It is well known that students' 'inert knowledge' is a key problem in modern education (Whitehead, 1959). Both students and teachers should learn techniques for the practical use of their knowledge in order to understand the underlying concepts in a particular field of study. This teaching paradigm shift should be accepted by both students' and teachers, and not only at a level of accepting declarations and documents in the Bologna Process as a main process in higher education in Europe. Grabiner and Dunlap (1995) propose a definition of learning as 'cognitive, involving processes of critical information assessment and the constant creation and evolution of knowledge structures' for helping educators and students to reach their learning new goals. There are many possibilities for introducing active learning environments, such as inquiry learning around realistic problems, learning through practice and application, interactive-learning environments, information-rich learning environments, etc. Active learning in science means a shift in the traditional teaching methodology to enable students to take an active role as investigators, problem solvers and to change a role of teachers to be students' guides and facilitators instead of knowledge presenters (Adams et al., 1988).

Meltzer and Thornton (2012, p. 478), when discussing the active learning of physics as 'instruction involving students in their own learning more deeply and more intensely than does traditional instruction, particularly during class time', described in their 'Resource Letter' the instructional methods of many research-based active-learning instructional modules in physics originating after the 1970s. Most science education researchers consider active learning methods to be an important opportunity to give students a basic conceptual understanding and problem-solving abilities developing in an active learning environment (different in-class activities, observational experiments, hands-on activities, computer simulations, mathematical modelling, etc.). Michael Prince (2004) gave a simple definition of active learning as any instructional method

that engages students to shift from a passive to an active role in the learning environment (classroom or other place where students learn). Unquestionably, the active learning of physics means to change traditional lectures or lab work and the level of passively receiving information from teachers or cook-book-style lab manuals.

In traditional lectures, students are not encouraged to move beyond the memorization of the information delivered by instructors, and communication of information and concepts are not student-centred. In the student-centred teaching-learning process, instructors are supposed to help students to analyse, synthesize, and evaluate information by being engaged in activities that prepare them to reflect upon ideas and upon how they are using those ideas.

In this study, a design of an active learning sequence in the traditional teaching-learning environment (the amphitheatre) is presented. It is based on the following elements:

1) having students engaged in classroom activities;
2) urging students to think about the presented information;
3) helping students to evaluate the information transfer through Prediction-Observation-Explanation activities (White & Gunstone, 1991);
4) engaging students to discuss the topics with classmates and instructor or through the worksheet writings;
5) helping students to change their alternative conceptions by their active engagement.

Two research questions (RQ) are:

RQ1: What are the students' possibilities and challenges in an active learning environment?

RQ2: What are students' conceptual changes after an active learning sequence of a geometrical optics phenomenon?

To obtain answers to the research questions, it was necessary to evaluate students' understanding of geometrical optics processes (light reflection, light refraction and image formation) by examining collected student responses received during an in-class experiment, through worksheet writings and drawings, as well as through exam evaluation of active learning sequence content.

Method

The data presented here are part of a pilot study of an implementation of active learning methods and materials with science students at Sarajevo

University in Bosnia and Herzegovina. Since there is no empirical investigation of the students' conceptual understanding of the optical phenomena in existing physics courses at the University of Sarajevo, the main aim was to find out how a group of science students understood basic concepts of geometrical optics before, during and after a 90-minute active learning sequence (ALS).

Participants

Data were collected from 95 students (88% of female freshmen) who were enrolled in the first year of a science programme. They started university education with different secondary school backgrounds in physics. Around half of enrolled freshmen (52%) had previously finished a four-year high school (a so-called gymnasium) where they learned physics during only in the first and second years. Other students have studied physics in different high schools (mostly secondary medical school, and classic high school) for four years (41%), for only one year (5%), and there was also a group of students who never studied secondary school physics (2%). The research was carried out in the spring semester of 2011.

Every academic year, a large group of students (around 130–150 freshmen) take the course *General Physics II* in the spring semester (90 minutes per week). Around 100 of them attend each meeting with their instructor. Before the ALS implementation, students were taught the basic topics of geometrical optics within four school hours (each 45 minutes). Firstly, the instructor (Z. H.) attempted to refresh their basic knowledge in geometrical optics delivered to them four years ago (in the last grade of elementary school) or two years ago (during their secondary schooling). Secondly, through their regular physics course, science freshmen were taught the themes of geometrical optics as calculus-based course content. The students showed weakness in applying their mathematical knowledge to derive the geometrical optics laws at a higher mathematical level compared with those who studied the topic in the secondary schools. According to the instructor's experience, the students did not have sufficiently developed conceptual understanding of geometrical optics content. They mainly attended their physics classes as passive listeners. The university physics course usually is a learning environment in an amphitheatre as a classroom for a large group of students (between 100 and 150 students). These reasons motivated this physics course instructor (Z. H.) to explore opportunities to increase not only the students' active engagement and interest for deeper learning of geometrical optics but also to achieve a greater number of students passing exams. To meet such goals, an ALS was chosen to make a

lecture change in the amphitheatre as a learning environment in the university physics course (Figure 1).

Figure 1. An ALS organized in the amphitheatre as students' learning environment.

ALS context

An ALS of geometrical optics was implemented to achieve two main learning goals:

1) to enable students to learn geometrical optics actively by predicting-observing-explaining different aspects of an experiment with a metal sphere (MS) placed in a plastic bowl (without and with water);
2) to evaluate students' gained knowledge after ALS implementation within a regular midterm physics course examination.

Experiment setting and ALS protocol

A heavy metal sphere (MS), illuminated by daylight, was placed at the bottom of an opaque plastic bowl (Figure 2). The same idea for an optics demonstration experiment can be seen in many physics textbooks with a coin in the bowl, with and without water (Mandell, 1968). For this research, a big MS was more suitable than a small coin.

In the first part of the ALS experiment, the MS was at the bottom of the empty bowl and students had the task of describing the image formation of the MS verbally and by drawing it. In the second part of the experiment, the Predict-Observe-Explain (POE, White & Gunstone, 1991) teaching technique

was implemented. Students were required to present their responses in both parts of the experiment via in-class worksheet writings.

Figure 2. A plastic bowl, bottled water and a metal sphere as a set of experimental material used in the ALS experiment.

A worksheet (WS) was created and applied in the ALS of geometrical optics, according to the POE protocol. The worksheet questions were addressing students' conceptual understanding of light source role, the role of observer's eye, light reflecting from the metal sphere, light refracting in the air-water and water-air systems, image formation and image nature.

Students' responses about the vision model (VM) were considered according to the created coding scheme, recognizing three kinds of students' responses:

1) SVM: scientific vision model;
2) AVM: alternative vision model;
3) NCVM: without the concept of vision.

SVM states that light rays travel from a light source to the MS as a subject of vision, its reflection on the MS (Figure 3a) or its refraction-reflection-refraction in the air-water-MS-water-air system (Figure 3b) and after which light rays travel into the observer's eyes. In this model, at least two close rays have to appear in the students' drawings using the light-ray model. Without water, the apparent position of the MS coincides with its real position in the bowl. With water added, the apparent position of the MS does not coincide with its real position, but appears higher (Figure 3).

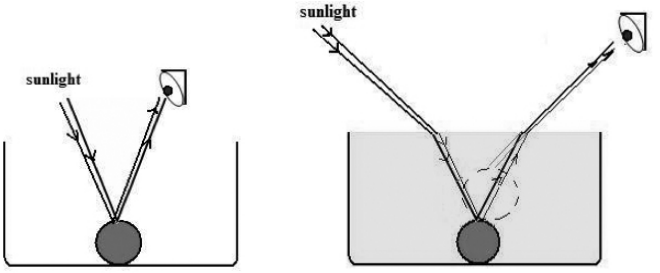


Figure 3. Examples of drawings that represent concepts of the SVM: (a) for an MS placed in the empty bowl, and (b) an MS placed in a bowl with water.

It is important to stress that incorrect drawings of the apparent depth of an object in water are frequently found in physics textbooks (Nassar, 1994). For example, even Nobel Prize Winner Sheldon L. Glashow has presented a completely erroneous drawing and calculation of the image position of a diamond ring resting at the bottom of a swimming pool. Based on them, he says: 'The ring appears to be much further from the edge than it really is' (Glashow, 1994).

Thanks to superficial treatment of image formation in physics textbooks (and, very likely, in classroom teaching), it is not surprising that students reveal poor understanding of how the image of an underwater object should be found using ray model of light propagation (Kaewkhong et al., 2010).

AVM is an alternative vision model with two bodies included along travelling paths of light rays (light source–MS; eye–MS; MS–eye or MS–water, or combining some of these noted pairs as a light travel path).

NCVM consists of some nonphysical solving approaches or art works without any vision model used.

Both qualitative and quantitative data analyses are carried out. In the focus of qualitative data analysis were the students' drawings by which they indirectly presented their vision models. The quantitative analysis of students' worksheet responses was implemented using a scoring system related to the first and second parts of worksheet activities, presented in Appendix 1 and Appendix 2. The third part of the worksheet consists of an open-ended question about students' emotions and opinions related to their ALS experiences. The total number of worksheet grading points is six (6) points. Statistical data based on the results of the 95 students who responded to the worksheet questions in both the first and second parts of the worksheet activities were analysed.

In the regular *General Physics II* course midterm exam, organized a week after ALS implementation, students were asked to solve a task (question) that covered the ALS content. It was a way to evaluate students' conceptual

knowledge of geometrical optics after the ALS. Here, it is necessary to note that the exam question was given after a 45-minute in-class explanation by the instructor about all correct answering in the ALS parts, held a week before their midterm exam. The exam question was given in the following form:

Based on the ALS of geometrical optics, your tasks are:

1) in the provided box you are supposed to attach your drawing presenting the image formation of the MS situated at the bottom of the empty bowl for a given observers' eye position to see the MS;
2) in the provided box you are supposed to attach your drawing presenting the image formation of the MS situated at the bottom of the water-filled bowl for a given observers' eye position to see the MS.

Correct answers to the exam question provide the maximum six points.

Results and data analysis

The presence of Vision Models in students' responses

Qualitative data analysis of student responses was carried out on a selection of students' drawings as visual representations of students' conceptual understanding of observed phenomenon and nature of the MS image formation.

There were 2.1% of students who gave no response at all. Among the remaining 97.9% of the students, there were a dominant number who showed their AVM (75.3%), and only 7.2% of the students had vision models that were compatible with the SVM. Among 95 students, 8% used the NCVM. Students showed mostly the AVM option of the light rays travelling from the observer's eyes to the MS (61.8%). The light rays' trajectory from the MS into the observer's eyes was found in 5.2% of the students' drawings. Here, it is necessary to emphasise that before the ALS was implemented in the Physics II lecture, many students studied geometrical optics at three levels of physics education (elementary school, secondary school and university).

Among 95 students, only two of them showed proper understanding of image formation when light reflects at the MS touching the bottom of empty bowl. However, there were no drawings showing students' understanding of the MS image nature if the MS was situated in the bowl with water. In an elementary school textbook previously used by students, there are correct figures showing two rays of light as a minimum number of rays entering an eye needed for image formation (Kulenović, 2006).

Since the distribution of points related to the coding scheme presented in Appendix 1 and Appendix 2 was not normal, scores were expressed by

median value (2 points). Students' scores were divided into seven groups as presented in Table 1.

As shown in Table 1, there are 11 students without any points, whereas only four students who achieved five points, which is the maximum number of points. Especially pertinent is the fact that only a few students (<20%) gave their explanations for each of WS task parts.

Table 1. *The students' point distribution related to the scoring scheme.*

Category	Number of students N, (%)	Median
6 points	0	2
5 points	4 (5)	
4 points	0	
3 points	25 (26)	
2 points	27 (28)	
1 point	28 (29)	
0 points	11 (12)	

The situation is relatively better in the case of distribution of responses related to the prediction parts. In this case, more than 60% of the students had correct predictions in both types of the ALS prediction phases (Table 2). But students' difficulties remain the same when they need to provide an accurate justification for their predictions and to demonstrate that they understand what the nature of the formed image is.

Table 2. *Students' rates of correct predictions, explanations and image formation.*

Item	Rate of correct predictions (%)	Rate of correct explanations (%)	Correct image formation (%)
Prediction 1	62	18	2
Prediction 2	63	11	0

Vision Model application in ALS based exam answers

Students showed marked improvement when solving an exam task based on the implemented ALS. They showed vision models that were not quite the SVM, but which were much closer to it. However, they still revealed weakness in the presentation of image formation if the MS was at the bottom of the bowl with water.

Most of the students, among the 95 who were ALS participants, illustrated their responses using the SVM. Still, some students had their alternative conceptions revealed, and there were around 10% of students without any vision model (Table 3). Around seventy percent of students successfully solved the tasks, presenting their drawings of image formation. Table 3 shows that among such a significant number of students, there were three SVM categories presented for both phenomena reflection and refraction of light rays. Three SVM usages are found:

SVM1: VM as the SVM described above;

SVM2: VM in the frame of the SVM but with one light ray presented in each travelling path;

SVM3: VM in the frame of SVM but with one light ray presented only after its reflection on the MS and travelling to the observer's eye.

The number of students with the alternative conceptions of vision and image formation markedly decreased. A total of 16% of the students continued to show their alternative models (Table 3). Two such alternative models without any information about light source are:

AVM1: light rays travel from the observer's eyes to the MS;

AVM2: light rays travel from the MS into the observer's eyes.

A significant number of students (11.6%) was without SVM/AVM or their task responses. A possible reason for such student's passive learning role could be explained by a possible relation toward self-irresponsibility to the study physics course content leaving it for their next (i.e. repeated) physics course.

Table 3. *Students' responses of Vision Models used.*

Vision Model	Rate of students' responses for ray reflection (%)	Rate of students' responses for ray refraction (%)
SVM1	45	42
SVM2	26	24
SVM3	3	5
AVM1	12	8
AVM2	3	2
NCVM	9	16
NR	2	3

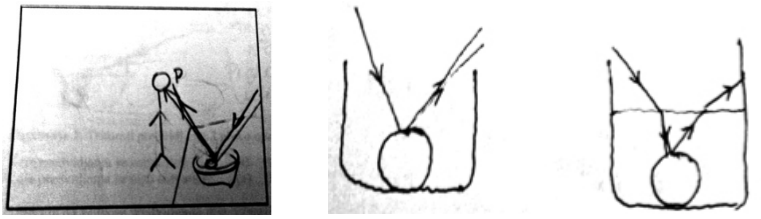
Note: NCVM = non-scientific vision model; NR = no response

Students' conceptual change

Students' responses were also analysed in order to determine specific alternative conceptions or difficulties based on pre-exam (ALS activities) and exam evaluation of their conceptual understanding of geometrical optic phenomena and image formation. The results (Table 3), compared with results presented above, show that positive conceptual changes occurred in students' minds regarding understanding of how a light ray travels and its image formation. However, a weak change occurred related to the nature of image as a real image (case of reflected light by the MS) or a virtual image (case of refracted/reflected light by air-water-MS-water-air system). Around 30% of the students correctly presented image formation and its nature by the reflection of light at the MS. Only 6% of students showed a virtual image of the MS after its formation in the observer's eye looking at the MS in water. Additionally, according to the drawings of the MS seen in water, it was possible to see whether conceptual change was retained or not.

By comparing students' alternative conceptions in exam responses, progress toward SVM was found, but still with a low improvement of understanding the MS image formation. Differences between the exam point scores and ALS scores were also significantly changed in a positive direction. A new dominant group of students was a group who has achieved the exam points between four and six points.

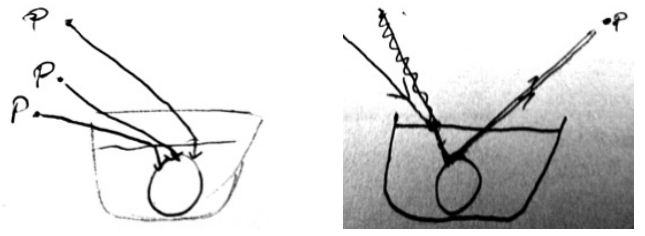
An example of student's drawings with a progress of understanding is presented in Figure 4, showing the light ray paths. Here, there is evidence of how this student changed his AVM (Figure 4a) to a vision model closer to the SVM (Figure 4b), but his understanding is not on the conceptual change path. The left sketch in Figure 4b shows a student's answer about MS image formation if it is placed in the empty bowl. He used only one light ray as an incoming ray, but two light rays are presented as its reflected rays without a strict eye position. The right sketch is a student's answer about light travelling if the MS is placed in the bowl with water. It is presented as an impossible situation for image formation in the eye of the observer. One light ray after its first refraction and its reflection on the MS has a correct light path, but after second refraction it is presented as a refracted light ray that is stopped by the bowl's wall that is not seen by an observer.



a) b)

Figure 4. An example of conceptual understanding progress achieved after the ALS. (a) Student #1 AVM scheme in the ALS worksheet. There are two light rays as incoming and reflecting rays, but only one reflecting ray enters in the eye of the observer. Other pair of rays is incorrectly presented. (b) Student #1 exam responses.

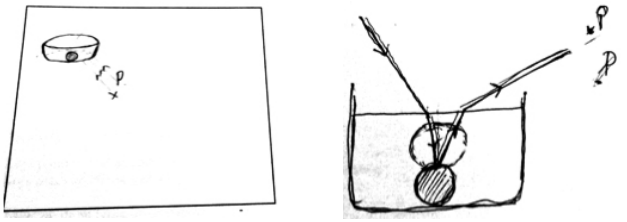
Student #2 achieved a small change of his AVM, shown in Figure 5a, to a new vision model presented with a better understanding of the correct light path as shown in Figure 5b.



a) b)

Figure 5. An example of a conceptual change for understanding two optics phenomena (light reflection and light refraction) after the ALS. (a)Student #2 used an AVM in the ALS worksheet without any evidence about a light source and image formation of the MS placed in the bowl with water. An observer's eye is marked as several P positions. (b) Student #2 achieved a change, but his understanding is not still correct understanding of geometrical optics and geometry of this problem.

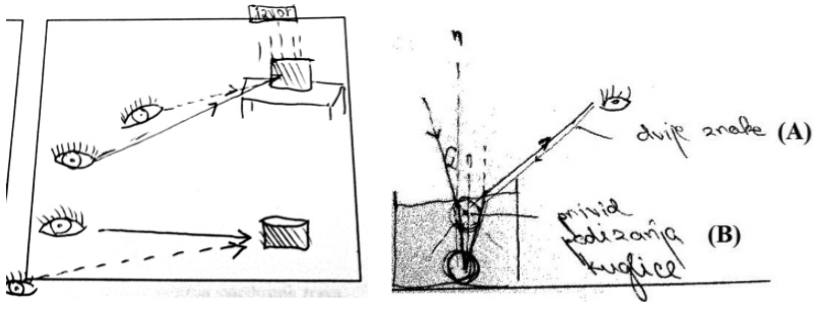
A few selected students' drawings included in Figure 6 show how only one ASL can contribute to be occurred conceptual change by student, especially for those students who did not understand how observer can see a metal sphere.



a) b)

Figure 6. Student #3 showed an improved understanding of image formation and how light travels: (a) is an example of sketch without any implementation of geometrical optics knowledge, but (b) is an example showing her much improved sketch which shows the SVM understanding with all correct light travel and image formation presented almost closed as one in Figure 1b.

In Figure 7, Student #4 showed also her improved understanding of image formation. She used two near rays only after light reflection at the MS point and highlighted this with the attached text (text B, Figure 7b). Looking for the completed and correct responses, there were found only six (6) of them or only six exam answers for full grading points (six).



a) b)

Figure 7. Drawing samples by Student #4 show the student's conceptual change from her ALS incorrect response (sketch a) to the exam solution graded as satisfactory (sketch b).

Student #4 included (Figure 7a) a light source in her sketch (written word a source at the top of the sketch), but she presented her AVM with light rays travel from the observer's eye to the bowl and the MS as an invisible object. The same student gave her exam solution in Figure 7b, which almost correctly presented all elements of the SVM. In this example, it is evident that the Student #4 has progressed. Namely, there is no longer an AVM, but she showed a better

understanding of the SVM. There is also a textual confirmation that she has taught the necessity of drawing at least two close light rays for entering into the observer's eye. A proof of this is her text marked with the letter 'A' (Figure 7b), which, translated into English, says 'two light rays'. Student # 4 showed that she understood the character of the MS image, if the MS was observed in the bowl with water. It is indicated in Figure 7b by her text marked as letter 'B' which, translated into English, says 'illusion of lifted sphere'.

Student responses to the open ended questions about ALS

The students had the opportunity to describe their feelings and thoughts about ALS realized in the amphitheatre as their usual learning environment. Their comments were collected and analysed. Almost all students (98%) expressed their satisfaction with these learning experiences. Only two students did not declare anything about their feelings. A selection of highest positive students' response frequencies follows:

- The sequence of active learning about geometrical optics, in the way it was realized, is interesting, and I like this way of teaching and learning (69% of students).
- Active learning is useful, interesting and helps me to better understand and learn about the phenomena of the light reflection and light refraction (63% of students).
- I really enjoyed this class (65% of students).
- I am definitely more interested in this method of learning than in traditional teaching (5% of students).
- I was effectively able to piece together the difficult problem of image formation through our active learning (2% of students).

Around 65% of students who were actively involved in the ALS successfully solved the exam problem at the passing level. The research results, gained after only one 90-minute active learning session, showed that around 60% of students have changed their initial alternative conceptions of vision and of image formation understanding that could be accepted as passing exam points. Some of the students repeated wrong answers, showing an insufficient understanding of what nature of the image is and how it is formed if light reflects or refracts passing through two different optical media. An important evidence of the benefit of the ALS participation is the fact that 90% of 35 the students who were not taking part in all of the ALS activities before the examination did not earn a single point for answering exam question based on the ALS.

Concluding remarks

During the spring 2011 semester, a group of 130 science freshmen answered an exam question that covers the content of an ALS of geometrical optics carried out previously with a group of 95 students. The students showed their improved knowledge through an ALS, which possibly enabled them to achieve much better exam results. A possible additional reason for better exam results could be a 45-minute in-class presentation of correct ALS answers organized by their instructor (Z. H.) after received scores in the ALS held a week before their midterm exam. Among the 130 students who were taking the course exam, around 65% of them earned between 4 and 6 exam points for their solution based on the realized ALS geometrical optics content. Students who participated in the ALS showed better conceptual understanding of the light reflection by an opaque body (a metal sphere), light refraction passing through different optical materials, and image formation if the MS was placed in an empty bowl or in a bowl with water.

This pilot study shows prevailing positive results in the case of only one 90-minute ALS implemented in the course *General Physics II*. It was a way of involving a group of science freshmen in the active learning of physics, especially those who were with weak prior geometrical optics knowledge and without practice in active physics learning engagement. At the same time, it was a challenge for both students and instructor to move students from memorization to productive thinking and application of gained knowledge.

An answer to RQ1 (*What were the students' possibilities and challenges in an active learning environment?*) is an affirmation that there are many possibilities for introducing active physics learning at the university level, even in a large group of students (around 130–150 of students) who learn physics in an amphitheatre, which is an inadequate environment for active learning sessions. Better exam results achieved by the group of 95 ALS practitioners are found as strong students' benefits compared with exam results of previous generations of science freshmen who had also to complete the same task without any ALS in geometrical optics.

An answer to the RQ2 (*What are students' conceptual changes after active learning of a geometrical optics sequence?*) is the fact that students achieved a better understanding phenomena of geometrical optics, which is shown throughout their exam results. The confirmatory findings of better conceptual knowledge developed after only one ALS are based on the evidence that around 65% of the students answered the exam question for passing grades.

Some selected results described in this paper, concerning student responses after an active learning geometrical optics sequence implemented in a large class can be used as evidence of a successful change in lecture organization by the physics instructor (Z. H). Such a change enabled obtaining initial evidence of a greater effectiveness of active learning environments when compared with traditional one. An active role of students is a better way for stronger stimulation of students' skills for productive thinking, which are needed in the application, analysis, evaluation and creation of knowledge, as the most fundamental objectives of physics teaching along cognitive process dimension.

Physics education research results indicate that physics should be taught using more interactive instructional methods. These ways of teaching require significant changes in the way faculty think about teaching and learning and corresponding changes in their teaching behaviour (Henderson, 2008, p. 179). Changing lecture design and learning environment require significant work on the part of faculty members teaching science courses or work with pre-service and in-service science teachers to be highly trained and experienced in a proper ALS.

Acknowledgement

The writing of this article was a part of Josip Sliško's sabbatical research project 'Active physics learning on line', supported by CONACyT Mexico, for the period August 2012–July 2013.

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Appendix 1

ALS Worksheet I part content and grading score.

ALS – part I		
Activity	**Accepted answer**	**Grading point**
Prediction 1: Based on the Ray Model of Light, predict the positions that you can see the metal sphere located at the bottom of an opaque bowl, filled with air. Mark the position of the eye of an observer in a point P (or sketch the eye in a proper position).	Scientific vision model used: Drawing 1 is a set of at least two light rays that travel from a light source to the metal sphere, reflect off it and reach the observer's eye or position P.	1
Observing 1: Student observes the metal sphere in the bowl and tries to evaluate his/her own prediction. Student is asked to confirm her/his prediction with observing results.	Student confirms the own prediction and own result of observing in the experiment.	1
Explanation 1: If there is a difference between the predicted and observed position of observer's eye, you need to make a better distribution of eye position that MS is visible. Use the Ray Model of Light.	Using the scientific vision model of explanation for a new and correct drawing.	1

Appendix 2

ALS Worksheet II part content and grading score.

ALS – part II		
Activity	**Accepted answer**	**Grading point**
Prediction 2: Metal sphere (MS) is at the same place in the bowl. If the bowl is filled with water, predict what will happen if you observe the MS from the previous place of the invisible MS for you: (a) The MS will be invisible. (b) The MS visible part will be lower than in the empty bowl. (c) The MS visible part will be the same as in the empty bowl. (d) The MS visible part will be higher than in the empty bowl. (e) It is not possible to predict the effect for MS visibility placed in the bowl with water.	Correct answer is (d).	1
Drawing 2 and Explanation 2	Scientific vision model used: Drawing 2 is presented by at least of two light rays that travel from the light source to the water surface and refracts in water changing the path. After reaching the MS, the light rays are reflected on the metal sphere point and then refracted again leaving water, and travel to the observer's eye in position P. A seen MS is not its real image (new image is a case of the MS lifted in comparison of its previous positions in the bowl).	1
Observing 2: Perform the experiment. Question 1: If your prediction 2 was correct you need to mark which one: (a) (b) (c) (d) (e) Question 2: If your prediction 2 was wrong you need to mark which one: (a) (b) (c) (d) (e)	Accurate prediction.	1

Biographical note

Zalkida Hadžibegović (BSc in Physics, MSc in History and Philosophy of Science, PhD in Physics) teaches courses on General Physics, Astronomy, and Philosophy and History of Science at University of Sarajevo, Bosnia and Herzegovina. She established in 2009 the first science education research group (Sarajevo Chemistry and Physics Education Research Group), which conducts research on integrated Chemistry, Physics, Mathematics, History and Philosophy of Science knowledge, and has focused on active learning approach. Her research interests include the applications of history and philosophy of science in science education, students' scientific literacy, science knowledge integration, and creativity at university and high school level especially for talented students.

Josip Sliško (BSc in physics, MSc in philosophy of physics, PhD in philosophical sciences) teaches courses on physics and mathematics education at Facultad de Ciencias Físico Matemáticas of the Benemérita Universidad Autónoma de Puebla. His research interests include students' explanatory and predictive models of physical phenomena, students' strategies for solving untraditional physics and mathematics problems, presentation of knowledge in textbooks and the design of active learning sequences that promote cognitive, metacognitive and emotional development of students. Josip Sliško is the author or co-author of 80 journal articles and 12 physics textbooks. Since 1993, every last week in May, he is the president of the committee that organizes an international workshop called New Trends in Physics Teaching.

Competencies in Science Teaching

Leopold Mathelitsch[1]

The role of competencies is discussed with respect to science teaching. In particular, competence models from Germany, Switzerland and Austria are presented and compared. A special topical program, 'Competencies in Mathematics and Science Teaching', was started in Austria three years ago. Initial experiences with this program are reported, specifically with regard to how the teachers adopt this new idea of competencies and which kind of support is appreciated. Two aspects of the program are explained in detail: the evaluation of the program and the role of exercises and problems.

Keywords: Competencies; Science teaching; Competence models; Evaluation; Exercises and problems

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Kompetence v poučevanju naravoslovja

Leopold Mathelitsch

Prispevek obravnava vlogo kompetenc v okviru poučevanja naravoslovja. Predstavljeni in primerjani so predvsem nemški, švicarski in avstrijski modeli kompetenc. V Avstriji je bil pred tremi leti vpeljan poseben tematski program Kompetence v poučevanju matematike in naravoslovja. V prispevku so predstavljene prve izkušnje programa, in sicer o tem, kako učitelji sprejemajo nov koncept kompetenc in kakšno podporo pri izvajanju programa potrebujejo. Podrobneje sta predstavljena dva vidika programa: evalvacija programa ter vloga vaj in problemskih nalog.

Ključne besede: kompetence, poučevanje naravoslovja, model kompetenc, vaje in problemske naloge

Introduction

'Competencies', 'competence models', and 'standards' have become immensely popular terms, but also relevant issues, at least in the educational systems in German-speaking countries. This may be an outcome of international comparative studies, such as TIMSS and PIRLS (Timss, 2011) or PISA (Pisa, 2009), where the results of the students in these countries were below high expectations, and in some cases even below average. In order to counteract and to overcome this undesired situation, several programs have been initiated: in Germany SINUS (Sinus, 2007) and Science in Context (Parchmann et al., 2006), in Switzerland HarmoS (Harmos, 2009), in Austria IMST (Imst, 2013).

The international studies assess and compare the knowledge, but also the attitudes of students in different fields and at different stages of their education. The result of a certain period of education is thereby measured. This had some influence on the focus of researchers in education as well as that of policy makers. Previously, the curriculum was the main educational directive given to the teacher, stating what had to be taught, and also in some cases, by what means. This was an input-oriented and a teacher-centred approach. Now, the attention turned to the output, i.e. what students should have learnt within a certain period. This is an output-oriented and student-centred construction, very often formulated in terms of competencies and standards.

An overview of this approach and of competence models is given in the next chapter, with a special focus on the science subjects of biology, chemistry and physics. The most important factor in implementing a new idea in an educational system is the teacher. How do teachers adopt this new concept and how do they apply it in their classroom? A thematic program was started in Austria three years ago in order to support teachers in the implementation of competencies, and the third chapter reports on this process. School projects lasting for one year constitute the centre of the thematic program. The projects are proposed and executed by teachers or teams of teachers, and they are supposed to be focused on specific aspects of competencies. Two important components of these projects will be emphasised in Chapters Four and Five: One is on the evaluation of the projects, which is done by the teachers themselves using methods of action research (Altrichter, Posch, & Somekh, 1993), but also executed by experts in educational research performing comparative studies. The second point concerns the role of problems and exercises, which has become more influential within the context of standards and competencies. Conclusions will round up the paper.

Competencies, competence models and standards in teaching science

There are many different definitions of the term 'competence', varying mainly in the broadness of the conception. Traditionally, competencies have been seen in a very general way, like social competencies or learning to learn, sometimes termed 'key competencies'. However, competencies have very often been narrowed down to knowledge and skills in a specific field or subject.

In German-speaking countries, the following definition has found general consensus (Weinert, 2001): 'Competencies are cognitive abilities and skills to solve specific problems, associated with motivational, volitional and social dispositions for using these skills and abilities in variable situations'. Former definitions often stopped at the first comma, but there is now common agreement that competencies are more than content knowledge and skills, i.e. they should include the awareness and willingness to use them, and this also in a new context.

Nevertheless, such a definition is decidedly abstract and far from practical application. Therefore, competence models have been constructed: They should concretize the structure of competencies, apply them in different situations (e.g. school subjects), and describe details of the different aspects associated with competencies. With regard to educational purposes, competence models should form a basis for standards and, in this sense, should act also as a link between the abstract definition and concrete problems for students.

It is interesting that the competence models of Germany, Switzerland and Austria for science subjects are rather similar to each other. In particular, they span three dimensions: one is connected to contents; the second one to levels and the third one to skills (see Fig. 1). The discussion of the three dimensions will begin with the parameter 'contents'. It could be argued that the least differences between the three countries would concern this dimension, but this is not the case. In physics, for example, Austria has chosen the traditional way, and the content dimension reflects more or less the syllabus and lists mechanics, electromagnetism, thermodynamics, optics and matter. Germany and Switzerland have defined concepts applying to all three science subjects: In Germany, these are energy, matter, interaction, system, and in Switzerland matter, planet earth, energy, the human body, plants and animals, ecosystems, society and technology.

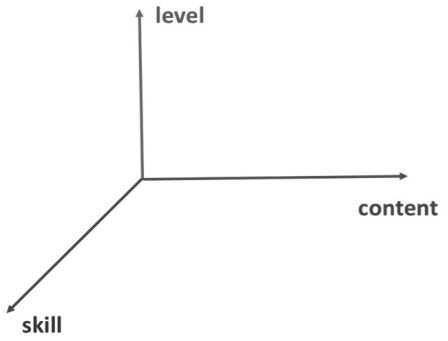

Figure 1. Three-dimensional competence model.

However, the dimension 'level' is the most uniform one: three levels of understanding are defined: reproduction, understanding and application, transfer. There are some differences in the details and the description, but in general the following concepts guide the three levels: reproduction means guided learning and actions, description of phenomena; application should allow for a correct use of the terminology (it should already include some independent work of the students); transfer indicates the ability to connect scientific concepts with real situations in a more-or-less independent way.

The dimension of 'skills' has different subdivisions in the various countries. Austria subsumes different skills and actions in three categories: knowledge organization (collection, presentation, communication of data), gaining cognition (questions, investigations, interpretations), and conclusions (judgment, decision, action) (Bifie, 2011). Germany has four divisions: content knowledge, science methods, communication, and judgment. In Switzerland, several more categories divide this dimension: ask questions and investigate, exploit information sources, organize structure and model, assess and judge, develop and realize, communicate and exchange views (Labudde, Nidegger, Adamina, & Gingins, 2012).

In principle, one should differentiate between normative versus descriptive competence models. A normative model is a detailed description of aspects of competencies that students should have gained and should have available. A descriptive model, however, is a detailed description of patterns of competencies that the students actually exhibit. Of course, the two models do not coincide in most cases: the first one is an aim, the second one reality. However, the two models should not be too far apart, and therefore an interaction should take place. A descriptive model is based on empirical investigations, and this empirical data must have influence and should be some directive for the normative model. The aim should be ambitious; it should step out from the present

situation, but it should not be unrealistic. The interaction between normative and empirical models should be a cyclic one.

Standards are indicators for the quality of education in specific situations, i.e. in a given subject, after some period of instruction. They can be related to content (curriculum) or to the performance of the students. Usually they are based on a normative competence model, but they are more specified, tailored to a specific setting. Large-scale assessments take advantage of standards; sometimes standards are established for this purpose. In this sense, the definition of standards should allow for a (more) objective comparison of different groups (classes, schools, countries). Standards are often exemplified by exercises and problems. Because of the importance of this topic, it will be discussed in greater detail in the final chapter.

Standards can be expressed as minimal, regular or even maximal standards. Minimal standards define the least requirements that have to be met by the students. If they score below this level, they usually have to bear consequences. It might be easier to achieve and to agree upon minimal standards than on regular standards, but there is the danger that it could encourage students (and teachers) to be satisfied when this minimal goal is reached. Switzerland has adopted minimal standards (Labudde, 2007).

Regular standards are part of the educational systems in Germany and Austria. They should indicate what the average student should exhibit in content and performance. However, the definition of an average student is exceedingly vague. Regular standards would need empirical studies as a basis. At the present stage, the regular standards in Germany as well as Austria are born out of the common experience of teachers and educators.

Maximal or excellent standards are achievements that only the best students can reach. Usually, they are not implemented in an educational system.

Finally, it should be mentioned that some warning signs and critical remarks on competencies and competence models have already been stated. Schecker (2012) points out that the present way of defining competencies does not provide for a solid basis for describing and measuring learning outcomes. If Weinert's definition as stated above is applied, problems will arise with assessments, since competencies in the above sense can only be measured in a complex setting, including actions and performances of the students.

'Competencies in Mathematics and Science Teaching'

IMST (Innovations in Mathematics and Science Teaching, Imst, 2013) is an initiative of the Austrian Ministry of Education, a response to the unsatisfying

performance of Austrian students in the international comparative studies. It started in 1998, and several measures have been initiated and executed in the meantime. For instance, centres for didactics have been founded, nationwide and on a regional basis; networks of teachers also have been installed.

One initiative was the so-called MNI Funds. Teachers were invited to apply for a one-year school-project. The project-proposals underwent a reviewing process, and finally about 100 projects were supported each year. These were new ideas in the Austrian school system: there was a transparent reviewing process; the teachers received a certain amount of money, not only for material but also for their extra work including a final report; teams of supervisors were responsible for different topical groups of projects; the teachers had to attend workshops about evaluations or how to write a report. This program was in action until 2009, which means that in total about 1000 projects were supported.

This program was organized by IMST itself, and the teachers essentially had freedom in their choice of the topic of their proposed project. Three years ago, the structure of this fund was changed: it has been decentralized and also channelled to few specific topics. Institutions within Austria could propose and apply for a so-called thematic or topical program. Out of the 16 applications, five were selected; in the meantime one has been cancelled. The current programs:

- Competencies in Mathematics and Science Teaching
- Competencies in Practical Work
- E-learning and E-teaching
- Reading and Writing

The selection of the topics by the ministry shows the importance that is given to the concept of competencies. The transition from a curriculum-directed to a competence-guided educational system is a declared aim of the ministry. To initiate and support this process, a special institute (Bifie, 2013) was given the assignment and responsibility to develop competence models and standards and to perform nationwide assessments. The thematic programs are another way of supporting and communicating this process. Teachers work for one year on a project related to special aspects of competencies, thereby learning and knowing the topic in depth. At the same time, they are supposed to communicate the outcomes of the project within their school and by a report made public by IMST (IMSTWiki, 2013).

The Regional Centre for Didactics of Physics in Styria applied for the program 'Competencies in Mathematics and Science Teaching'. This centre (pdg, 2013) was founded in 2006 in order to support physics education from pre-school to university. All institutions responsible for physics teacher

education and in-service training in Styria contribute to this centre: university and technical university, two pedagogical universities and an institution for administration. The centre was awarded the execution of this topical program: the contract includes some financial support, but also the obligation to coach about 20 projects each year, and to combine this process with didactic research. Since the title of the program is 'Competencies in Mathematics and Science Teaching', in order to cover all the topics strong cooperation with the didactic centres of biology, chemistry and mathematics has been established. Since a not negligible number of projects are related with the role of language in science teaching, the centre for didactics on German language has also been asked for support.

Our main purpose was to assist teachers on their way to competence-oriented teaching. Therefore, our research questions are also very much connected to actual school work:

- To which extent do teachers adopt ideas of competence (models)?
- How do they apply these ideas in their teaching?
- How can one support this process?

In 2010/2011, 22 school-projects were allocated to our program; in the following year, 21 were. In summer 2012, 25 projects were approved. The fact that the number of applications went up steadily (42 this year) shows that the topic is accepted by the teachers. The next chapter will summarize some results and also document how the program developed in a certain direction.

Evaluation

The evaluation of the topical program has been executed on two different levels, the first one by the teachers evaluating their own project, the second by researchers in didactics performing cross-case studies. Furthermore, students at the university were involved by choosing some special aspect of the thematic program as a topic of their university thesis.

The evaluation of the projects by the teachers is usually performed by applying methods of action research (Altrichter, Posch, & Somekh, 1993). Action research is a broad field, but with respect to education one could define it as follows: action research is the study of a special situation in school, performed by teachers, with the aim of improving the quality of the situation. I do not want to discuss here whether action research is research in the traditional way (Herbert Altrichter (1990) entitled a book 'Is this still science?'), but I will compare some characteristics of traditional and action research. This should serve primarily to define action research in greater detail.

Traditional research is usually a three-step process of data-taking, evaluation and interpretation, whereas action research is often an iterative process of action, evaluation, and action once again. In traditional research, there is a subject-object relation between the researcher and researched person, whereas in action research a subject-subject relation is taking place. Traditional research consists of a description and explanation of reality. One aim in action research is to change reality, to start a development process. The methods in traditional research are well defined, and should, for example, guarantee reproducibility. Action research allows for a variety of methods with which individual interpretation is essential. The outcome of traditional research is for the scientific community; action research very often should provide feedback only for a single person.

In this sense, action research aims at the personal development of a teacher and/or the improvement of a situation. However, the methods of action research are also a helpful tool for evaluating a project: interviews, questionnaires, analysis of audio- and video-recordings, protocols of observations, evaluation of students' work (tests, home works, portfolios), reflective teaching, and critical friends.

The teachers were supposed to include an evaluation plan in the proposal of their project; a chapter on evaluation also had to be part of the final report. Practice in this respect has shown that evaluation is not a popular part of the project for teachers. Much more effort is invested in the actual work of the project, not in the evaluation. Teachers are not used to such tasks. They also do not see the value of it. Very often they overestimate the results of their evaluation in that they draw general conclusions that are simply not possible because of the small samples. Nevertheless, the constraint to perform such an evaluation opens the awareness of the individual teacher for it, and also generates data for a comparative research.

Cross-case studies were performed for the first two years of the topical program (Knechtl, Rath, & Rechberger, 2013); the third year is still in process. In particular, we wanted to find answers to the research questions stated in Chapter 3. The basis for the studies consists of questionnaires at the start-up and the following two workshops, the final reports, and phone-interviews with at least one person of each project. Two diploma theses were finished dealing with the program work of the first year, one on the general acceptance of the concept 'competence' by the teachers (Sormann, 2011), the second one on experimental competencies (Lugitsch, 2011). Four more are under way for the second year, but they have not yet been finished.

In the first year, the projects were divided into four groups according to the level of education: science teaching in primary school (7 projects),

mathematics (5), science subjects in Secondary 1 (6), and science subjects in Secondary 2, including the theme of language and science teaching (4). In total, 59 classes were involved.

The outcome of the first year was, to some extent, uncertain, at least in our opinion. Out of the 22 projects which started at the beginning, 21 were finished, and the teachers executed their projects close to their project plans. Thus, one could say that they fulfilled their tasks. They were also satisfied with their performance and with the support given by the mentors.

The survey at the beginning has shown that the awareness of the conception 'competencies' was unusually low, despite the fact that the teachers have chosen this particular topical program. Final reports and interviews revealed an improvement of their knowledge about competencies and competence models, but the transfer to the classroom took place on only a few occasions. For instance, exercises were still formulated in the traditional way (see the next chapter). Another problem became evident: the topics and methods of the projects were so diverse that it was extremely difficult to compare particular aspects. Therefore, we have chosen a different strategy for the next year.

First, we ordered the 21 projects not according to the age of the students, but with regard to the competence which was most visible in the project plans. The final decision was made in discussion and agreement with the teachers. The new groups were:

- pupils' skills of observation (mainly primary school projects)
- experimental skills
- issues of language in mathematics and science
- students' ability to discuss and judge conflicting issues on a topic.

In addition, we gave the teachers specific tasks: they should attempt to put emphasis on the chosen competence. In particular, one chapter of the final report should be dedicated to one specific example. This example, some exercise, some short school unit, should be connected to this competence, and it should be designed and presented in such a way that other teachers could implement it extremely easily.

The cross-case analysis has been finished; four diploma theses (each one on one of the above mentioned topics) are still under preparation. Teachers again finished their projects successfully, they also appreciated that they had to concentrate on one specific competence. This strengthened their understanding of competences, and they could see an added value to their teaching. Competences were much more visible in the final reports, and about half of the projects included examples in such a quality that they can be used immediately in school.

This is an encouraging result. We will proceed in this direction, and it could give also a guideline for similar activities, either by policy makers or school authorities: Projects can be a viable way of transferring the idea of competencies to the teacher and, consequently, to the actual school work, but the projects should be centred and concentrated around a few items. The acceptance is much better when the teachers work on a detailed problem in-depth than trying to handle the general topic in a way that is as satisfying as possible.

Problems and exercises

Analyses of Austrian textbooks have shown that exercises and problems are highly uniform: usually they contain a small calculation imbedded in a context, which is sometimes extremely artificial and unrealistic. Regarding competencies and the three-dimensional span of them (Figure 1), in most cases only a small subspace of the two dimensions 'level' and 'skills' is addressed. For example, the skill 'judgment' is not required in any of the problems. This can be seen also in the results of the PISA tests: those tasks that include elements of judgment had extremely low scores by Austrian students.

The situation may change because of several reasons. The first one is obvious: each country wants to improve in the international tests. Therefore, the previously published examples (some remain unpublished to allow for a comparative study) and similar ones will be used as prototypes for training purposes.

The second reason is connected to competencies and standards. As outlined in Chapter 2, standards indicate in detail what should be known (in the meaning of competencies) at some stage of education. This goal is described in a theoretical way, but always connected with examples, tasks and problems. These exercises can, of course, be used as tests of whether the students have reached this goal, but they also fulfil the purpose of clarifying the intended goal.

A third reason may be initiated by the largest study on the quality of teaching hitherto. John Hattie has performed a synthesis of over 800 meta-analyses (over 50,000 studies) identifying and valuing performance indicators of what makes 'good learning and teaching' (Hattie, 2009, 2011). One of the most positive indicators is the proper feedback, but not only the immediate feedback of the teacher to the student: at least equally significant is the feedback of the students to the teacher. Again, tests, exercises, problems are a valuable tool in this continuing process, but thereby the role of exercises changes substantially. Traditionally, exercises were used as part of final exams or for the preparation of grading-tests. Since the feedback should be permanent and also

decoupled from grading, tests will fulfil a different purpose, i.e. that mainly students should become aware of their actual standing.

Hand in hand with this process another aspect becomes more and more important: exercises should not only be used as test-instruments or as self-checks for knowledge and understanding. They can form a valuable method of teaching. Handbooks for driving tests or language-learning very often consist only of a mixture of examples and questions/short exercises. A physics textbook starts with a long explanatory theory finishing with some exercises (end-of-chapter-problems). Changing this tradition and creating a different culture of exercises would enrich science education.

Proposals and examples for competence-oriented teaching in science have already been released. A group of experts in the German province of Hessen has published extremely extensive and elaborated examples (Kou, 2013). In all of them, exercises play a substantial role varying between learning problems, exercises for self-evaluation, partner tests, and examinations for grading.

As mentioned in the previous chapter, in the second round of the Austrian topical program the teachers had the explicit task of setting up an extensive problem, i.e. an exercise within their project. Not all of them took up this idea, but the ones who did produced exceptionally creative and interesting examples, and included new elements usually not found in exercises: additional and (for the students) new information, experimental data, promotion of actions, encouragement for discussions among the students, requirement of their opinion and reasons for it. One example is presented in the appendix, centring on judging a chemical commercial product. Collecting the best examples, ordered along the different dimensions of competences, and publishing them electronically is planned.

Conclusions

With competencies at the centre of an educational system, the focus is directed more on the student than on the teacher or the curriculum. The main question is what did the student learn and understand, and how he or she is able and willing to apply this knowledge for his/her own purposes? This provides a different theoretical framework for education, and competence models should facilitate the connection of the abstract definition with school praxis. Nevertheless, the teacher is the most important player in the educational system and therefore the question of how teachers adopt this new idea and this shift of paradigm is the most crucial one.

This article has given an example of an extensive program in which teachers perform projects dedicated to different aspects of competencies. In

addition to coaching the projects and to self-evaluation by means of action research, cross-case studies should reveal the acceptance of these new ideas by the teachers, about their way how to handle these new situations, but also how to support this process in a more efficient way.

The experience of the first two years shows that teachers prefer to concentrate on a special aspect of the full problem. Working on one task in detail gives them better insight and understanding of the entire problem. Otherwise, their knowledge of competencies and competence models remained on a theoretical level, and was not translated into actual work in the classroom. The commitment to exercises facilitates the process to a large extent: it broadens the view on different facets of competencies, it makes it easy to embed actual context, and it allows the possibility of continuous feedback between student and teacher.

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Appendix

The example is taken from Bunderlaa (2012), and Sturmberger (2013).

Beauty Lotion
Description of the product:
External factors, like unbalanced diet, negative environmental conditions, or UV-radiation, cause 80% of the aging of the skin: these factors affect the DNA, which is part of the nucleus of each skin cell.
The active components of this Beauty Lotion contain a highly effective combination of cell-active folic acid and creatine. A continuous application improves the regeneration of the cell and protects the cell-DNA from an ongoing damage by external influences. Of course, its tolerance to the skin has been checked and confirmed.

Result of repeated application:
- Noticeably tightened skin
- Verifiable smoothing effect on already existing deep crinkles
- The skin seems to become younger

Question 1:

a) What does the commercial promise?
b) What causes the aging of the skin to a large extent, according to the commercial?
c) The description refers to positive effects against 'damaging factors'. What are the damaging factors?

Questions 2:

Creatine and folic acid are the effective components according to the commercial. Judge the influence on the human body. How are these components delivered to the body and how well confirmed is their effectiveness as an admixture to cosmetic products?
The following paragraphs of a chemical encyclopaedia (Römpp, Lexikon Chemie, G. Thieme) should help you in answering these questions.

Creatine
- Component of beef and meat extract stimulating appetite
- Improvement of physical performance with regard to short, intensive activity, provided by nutrition which is enriched with creatine
- Neuroprotective effects for Parkinson and Huntington disease by supply of creatine
- Supply of creatine lowers the plasma level of homocystein and creates positive effects for arteriosclerosis

Folic acid
Folates are elements of nutrition, mainly in form of pteroylpolyglutamates. They are absorbed in the proximal part of the small intestines with an optimal PH-value of 6. The human body stores about 5–10 mg, half of it in the liver. The half-life of it is about 100 days. Folates play a central role in the metabolism of amino acids, putins and thymidin.
Demand: The folate balance of a person is maintained by an intake of 400 mg per day in order to avoid symptoms of deficit. A foetus has a higher demand of folic acid; therefore pregnant women should have an intake of 600 mg per day.

Answer the following questions:

	Creatine	Folic acid
What is the effect of this substance on the human body?		
How has this substance to be delivered to the body?		
Is there any proven effect of this substance with regard to a cosmetic treatment?		

Question 3:
Is it possible to confirm or contradict the statements in the commercial by scientific methods? If so, by which methods?

Biographical note

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Outdoor Motor Play: Analysis, Speculations, Research Paths

Andrea Ceciliani*[1] and Alessandro Bortolotti[2]

In our rapidly changing contemporary society, it has become apparent that children spend significantly less time playing outdoors than their parents did. Therefore, considerable attention must be paid by professionals to engage this challenge, especially within early educational contexts. The goal of this study was to first explore the continual drive of play in educational growth and, second, the ways in which children play outdoors at school, in order to reap the developmental benefits of outdoor play in a supportive context, where such fundamental activity is not only allowed, but also supported. The results of this study reinforce existing research in this area, highlighting the findings of children's physical play behaviour and its frequency, also in connection with the use of tools and toys; further findings highlight teacher's attitudes and suggest several options for early childhood professionals to foster children's enjoyment of outdoor play. Finally, the study results have implications for future opportunities in the planning of active spontaneous-play.

Keywords: Outdoor motor play; Development; Motor behaviour; Observation

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Gibalne igre na prostem: analiza, predvidevanja, raziskovalne poti

Andrea Ceciliani* in Alessandro Bortolotti

V spreminjajoči se sodobni družbi postaja očitno, da se otroci na prostem igrajo precej manj časa, kot so se njihovi starši. To za strokovnjake v vzgoji in izobraževanju predstavlja velik izziv, predvsem v zgodnjem obdobju šolanja. Prispevek sprva razišče pomembno vlogo igre pri učnem razvoju, raziskati pa želimo tudi oblike gibalnih iger na prostem v šoli, s katerimi lahko v spodbudnem okolju pripomoremo k razvojnemu vidiku igranja na prostem, ki je v šoli ne samo dovoljeno, ampak tudi zaželeno. Izsledki o obnašanju otrok med gibalnimi igrami in pogostostjo igranja (tudi z uporabo različnih orodij in igrač) potrjujejo že obstoječe izsledke raziskav na tem področju. Na podlagi ugotovitev je predlaganih več mogočih oblik dela, s katerim bi strokovnjaki na področju zgodnjega otroštva pri otrocih vzgajali veselje do iger na prostem. Ne nazadnje izsledki raziskave pripomorejo k načrtovanju spontanega igranja otrok v prihodnje.

Ključne besede: igre na prostem, razvoj, motorično obnašanje, opazovanje

Introduction: Classifications of Play

Our research subject concerns education through motor play; since it constitutes a wide area of study, we must limit our analysis to remain focussed. To clearly define our epistemological framework, it is useful to start by giving some fundamental references to the concept of play in general; we will then investigate motor play in particular.

From the conceptual viewpoint, it is not easy to define play – an idea shared also by other scholars (Bateson, 1956); to borrow Bateson's metaphor, it is as volatile as smoke; even though it might appear to be a contradictory statement, we could assert that it is precisely its ineffability, or its indeterminacy, that better defines our subject. Therefore, the enunciation of the idea of play cannot be too limited; on the contrary, it, in turn, implies that we play with it. In any case, the impermeability of play to its 'ultimate' understanding – its ineffability – represents both its weakness and its strength; in order to fully understand this uncanny concept, it is useful to retrieve the idea of 'paradox', that is a situation that, at the same time, can be understood as a given reality and as its opposite: a situation that Bateson (1972) clearly described. Another example suggested by Vygotskij (1979) will help us to better clarify this point: if a child plays and pretends to ride a broomstick as if it were a horse, jumping up and down (with the broomstick between his legs) so to mime the animal pace (and even its cry), his action is somehow 'real' because he 'really acts' as if he were a horse; and yet, at the same time, his action is also imaginary, because in that very moment he pretends that the broom is a horse, while all others know it is only a broom (straddled by a child who is playing with it). We could define this experience as being simultaneously real and false, depending on the viewpoint we apply to it: in other words, it is a true paradox.[3]

It is necessary to remember that our studies take into consideration real and historical activities, which are easy to be observed and also to be catalogued (even though always in a determined and partial way) as they help to answer our first question: to define play. By using Di Pietro's schematic (2003), which is based precisely on the paradoxical nature of play, we can assert that the various forms of play can be grouped into eight dimensions situated along a circular schematic (Figure 1), and diametrically opposed, which exemplify in a paradigmatic way the two-faced nature of play. In our opinion, the great value of this schematic is in the fact that,

3 We want to underline that it is because of the idea of 'paradox' that play can constantly reinvent so-called 'reality', it can modify all defined categories and help us to open new ones; it is not by chance that many innovative works in the fields of art, design or science, show many points of contact with play (Winnicott, 1971). We believe that it is mainly for these reasons that play has been seen as the human experience which that than any other has contributed to establish human culture to the point that *homo sapiens* is called also *homo ludens*, in addition to *homo faber* (Huizinga, 1949).

even though it constitutes an interpretation (i.e. an abstraction), it nevertheless has been conceived upon a tangible understanding of the reality of play on the basis of how we know it through its historically determined manifestation; therefore, it constitutes the result of a legitimate operation of classification similar to the one carried out, for instance, by Callois (1958) to which, not by chance, it is indebted.

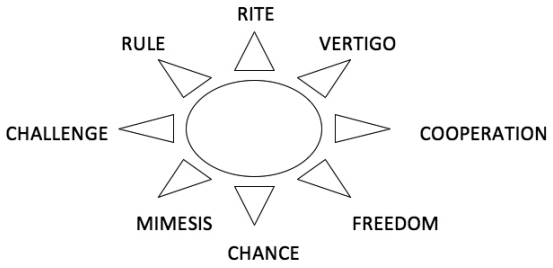

Figure 1. The Opposing Dimensions of Play.

However, a fundamental difference between the phenomenon of play in general and motor play exists, i.e. the role of motion or, as we define it, of the 'motor behaviours' (a concept that we will retrieve later on in this essay). Essentially, what defines the concept of motor play in a precise way is the fact that it depends upon the player's movements, the way in which they are performed, so much so that it is not irrelevant to evaluate both modes and efficacy of all body movements to appreciate play in itself. Rather, such an evaluation represents the element that makes a difference for the result of motor play, thereby contributing to determine the preferences people give to the various activities, as they usually choose to commit to those passages in which they perform well so to increase their sense of 'self-efficacy' (Bandura, 1977), and abandon those in which they are not successful. It is essential to observe, in fact, that in order to be successful, it is not sufficient to ideally elaborate an efficacious action plan; it is also essential to put it into practice through a series of body movements that to reach the pre-set goal in a concrete way. Context conditions and self-image also play a fundamental role on these processes (Shilder, 1935).

With the phrase 'motor behaviours', we intend to call attention to the complexity of 'motor play', considering that a player must always pay attention to the following elements while playing: the paradoxical experience of play, the context conditions, and, last but not least, the result of his own action (which depends mostly upon the subjective psycho-physical condition). It is not by chance that motor education has been defined as the 'science of the motor behaviours of decision' (Parlebas, 1997) that involves all aspects of the human being; the individual is

globally involved, even though the outlines of the involved elements can be clearly limited. Among them, we can recall the following: *biological*, because the movement develops organic functions; *cognitive*, with reference to Piaget (1945) we can easily state that logic, spatial-temporal categories, etc., develop through motor experience; *social and communicative*, as we usually play in groups, even as little children, so much so that we are somehow 'forced' to relate and communicate with others; *affective and expressive*, since the reason for movement always involve an emotion, something that literally means 'move from' and implies the adoption of postures and attitudes which are 'expressive'; *decisional*, as play always forces to take decisions, and sport and motor play strongly emphasise this condition with time constraint in a way which stimulate autonomy, assumption of responsibility, and the intuitive and inferential capability. From the perspective of pedagogical speculations, the latter theme represents the most distinct and less acknowledged contribution to the educational potentialities that can be ascribed to motor activity.

Outdoor Physical Play

Although current WHO recommendations suggest a minimum of 60 min of physical activity per day,[4] it seems that only half of preschool-aged children achieved this: i.e. nearly half of preschool-aged children do not engage in sufficient physical activity (Tucker, 2008). Therefore, effective interventions that promote and foster physical activity in children are necessary for meeting the recommended guidelines. It could be argued that among pre-primary school-aged children, active and unstructured play taking place out-of-doors during children's free times may be the foremost provider to extensive bodily activity, rather than structured activities (Bailey et al., 1994). Pellegrini and Smith (1998), analysing the developmental functions of physical play, defined it as a playful context combined with a dimension of physical vigour; they suggest that forms of physical activity play primarily serve immediate developmental functions. Furthermore, when playing outdoors, children grow emotionally and intellectually by enjoying their environment, participating in dramatic play, developing initiative, and acquiring an understanding of basic concrete concepts, such as investigating the property of objects and of how to accomplish a simple task. Such vigorous play activities can, in addition, enhance the growth of the child's expected development, for example, by helping improve appetite, strength and bodily growth (Pica, 2003) and increasing learning abilities (Clements, 2004). Therefore, a greater understanding of active free-play and the individual, social and environmental influences on these behaviours may be critical for the promotion of children's physical

4 http://www.who.int/dietphysicalactivity/factsheet_young_people/en/index.html

activity and growth at school (Burdette & Whitaker, 2005). Essentially, the spaces in which children engage in most of their active free-play, and their influences on the play activities are largely unknown and require further investigations (Veitch et al., 2006). However, our findings, based both on quantitative and qualitative data, provide insights into contextual influences on children's behaviours during scholastic outdoor spontaneous play, specifically the use of little tools and toys and teacher's attitudes towards them. We believe that our results support several suggestions to early childhood professionals in order to promote children's' enjoyment of meaningful outdoor play.

The Setting of the Empirical Work

Our work is based on two main pillars: a solid knowledge of literature and a series of observations in the field. The literature is rich with references to the educational relevance of play (Farné, 2005; Hurwitz, 2002; Smith, 1995; Tsao, 2002) considered as a support to children's potentialities for development, something that must be emphasised in relation to the dimensions of personality.

First of all, we have to ask some questions: why observe play and, in particular, motor play? Then, what do we observe of play? We can answer the first question by referring to two complementary dimensions: there are no doubts that it is in particular during the early childhood (as clearly pointed out by all schools of psychomotor tradition (Le Camus, 1980)) that to children's play represents a fundamental means for their psychophysical relation with the environment; therefore (and this is the 'other side of the coin' of the educational relation), adults, especially those who are responsible for the children's educational care, must and should be able to allow, observe and valorise play (Kern & Wakeford, 2007; Pellegrini & Smith, 1998).

	MOTOR PATTERNS CHECK-LISTS
1	HANDLING
2	RUNNING
3	JUMPING, HOPPING, JUMPING DOWN
4	THROWING
5	CLIMBING
6	SLIDING
7	SWINGING
8	KICKING
9	FIGHTING – ROUGH/TUMBLE
10	PULLING – PUSHING
11	CYCLING
12	CARRYING

Figure 2. Motor Patterns Check-List.

The second question, regarding what to observe of play, requires a more articulated answer, because the theme is much broader and, therefore, it requires additional explanations; furthermore, it relates to our research, so much so that we must introduce it in order to better understand how it connects to what we are presenting here. In fact, our investigation is part of broader research on 'Educational Cares' carried out by scholars at our Department of Educational Sciences at the University of Bologna (Contini & Manini, 2007). For us, educational care means underlining all aspects recalled this far, and, in particular, re-enhancing the healthy relevance of motor play[5] so to suggest a truly pedagogical valorisation of it. A previous survey carried out through questionnaires and interviews distributed and collected in infant schools (Bortolotti, 1997) indicated a fundamental element: the fact that we could notice a massive gap between some theoretical principles (such as 'motor activity is fundamental for learning processes') and what was, in fact, the reality of practical teaching, as the latter often privileged other more 'formalised' activities to the point that we had to face statements such as: 'we notice, though, that there is not much time to let the children play'. In other words, there was a clear contradiction between saying and doing.

Therefore, some questions emerged which we must attempt to answer: how do teachers act 'in practice' when children play motor games? Which are the considerations beyond their actions? Which are the spaces and the materials dedicated to the so called 'free play'? Also, what are children's favourite games? How and for how long do they move? In order to answer such questions, we have chosen to carry out an investigation based mostly on the observation of the way children play outdoors in infant schools.

Observing Outdoor Physical Play

For us, it proved fundamental to establish a method of direct observation that could be as systematic and as 'reasonable' as possible, i.e. very rigorous from the methodological viewpoint; a method that could answer our questions through efficacious and appropriate techniques of investigations. In brief, we decided what to observe only situations that were standard in the daily contexts, attempting to be a discrete presence and not interfere with what was happening; to focus our attention on the 'outdoor' contexts, as we can say that 'indoor, spontaneous play is suffocated', to borrow an eloquent expression used by one

5 We must acknowledge that, as former athletes and as teachers at the Faculty of Physical Education, we are not indifferent the object of study; instead, it is part of a 'world view' that involves not only educational, but also existential styles and values that make us truly passionate for our field of study. This is not a neutral element of our research to the extent that we deemed appropriate to assert it.

of the teachers involved in our research; to use video recordings, always carried out in pairs (it was extremely beneficial that both of us had a video camera so to be able to follow as many subjects as possible moving in broad areas), as they enabled performing a quantitative evaluation of motor activities in various settings; to analyse our videos through checklists, so as to further developed our study of both the strictly motor (Figure 2) and the socio-motor perspectives, the latter being approached through Rubin POS (2001); to delimitate the age limits on which we wanted to concentrate for our research.

Concerning this last point, we must distinguish between two phases of our work: in phase one, we concentrated our research on children aged either three or five years (two ages that correspond to the accomplishment of a school cycle (nursery first, and then infant school)) with the goal of pointing out relevant elements through the comparison of the different general situations. In the second phase, we took into consideration the intermediate age (i.e. we studied children aged four) in view of a longitudinal continuation of our research, mainly focused on the relationship between children play with tools and toys, and their motor behaviours. Our research involved eight schools: three infant schools and five nursery schools, about 170 children, and 22 teachers; we had 18 observational sittings and collected 24 hours of videos.

Given the above, we consider our work as heterogeneous from various view-points: quantitative and qualitative; eco-ethological. We do not consider this to be a limit, but instead it constitutes a richness. On balance, this is typical of play, as it involves all aspects of a human being, considered as a whole: we tend to make divisions in an analytical mode, by carrying out continuous abstractions and readings of 'meaning'. If the analysis succeeds in providing clear results of many factors, it cannot but be an enrichment of the research.

'Conditions' and Rhapsody of Spontaneous Outdoor Motor Play

In the research project that we have planned (Ceciliani & Bortolotti, 2007a), we have acted in a way to indicate some useful categories or plans of analysis that can be taken as points of reference for both teachers and researchers, as we think they could be used not only as tools for the evaluation of educational research, but also to improve teachers' didactic and pedagogical tasks. Essentially, it was essential to define, inside the so-called 'free play', the conditions of the action in their twofold meaning: positive, because, to some extent, they can in fact be defined as the ensemble of those elements that enable to carry out the activity, and which constitute a setting made of times, spaces, tools, and of

educational attentions; but we must also recall that the same elements restrain the activity of play, that they condition it in a negative way because they offer guidance that is strictly dependent upon rules (i.e. limitations) determined by the educators (teachers, assistants, etc.) (Farné, 2005). The overall analysis of the various situations we have observed conveys the impression that we should not talk about 'free play' inside schools, but we should use a more correct definition: *spontaneous play*; even though freedom of play is assured, at least at the level of initial impulse (so that spontaneity is assured), it nevertheless seems to be extremely limited in the choices that are conditioned by the context to the point that we could here use the concept of *probation*.

In our opinion, a good example of a mode in which spontaneous play takes place could be associated to the concept of 'rhapsody', which recalls a particular rhythm of play based on launching and retrieving some themes of play. Moving from the idea that in play there is always something that escapes, observation should monitor the impromptu aspects and the novelties, without being restrained to too clearly limited categories; by doing so, it would be possible to recognise and valorise whatever new and unexpected behaviour emerges, given the intrinsic force that these situations have, and which emerges inside such a complex phenomenon that we could consider to be chaotic. Moving from such a need, we have elaborated the concept of 'play rhapsody', a term to designate a type of phenomenon characterised by irregular rhythms, sometimes slow, other times frantic, characterised by continuous repeated movements, by constantly recurring leitmotifs with infinite variations, which combine plans and categories disrespectfully; a phenomenon which can be rendered at its best only through the 'visual' description of games (see here below the story of 'The Little She-Zombie Girl').

The Little She-Zombie Girl

There are six little girls making a circle, the 'director' of the game is placed in the middle, while a girl is in front of the others and walks keeping her arms outstretched and her legs stiff, like a zombie. The group runs to the opposite side of the garden to hide behind the bushes and play other games, the Zombie runs and tries to find them, but, once she has reached the group, the same scene is repeated. This play activity, alternated with other games, takes place during the whole period of observation, to the extent that a high percentage of running performed by the females is surveyed. At the end, the Zombie, who has not succeeded to enter the group continuously escaping from her, attempts to get closer to her mates punching and kicking. At this, the others go away and she stops running after them.

The Psychomotor Behaviour (Figures 3 and 4)

The observations on the videos gathered during our first survey enabled us to evaluate the motor behaviours most used by children aged 3 and 5 (last year of nursery school and of infant school).

Our data showed the presence of all motor behaviours in children aged 5 and the absence of some motor behaviours in children aged 3: to jump, to throw, to kick, to rough and tumble (Figures 3 and 4). Most likely, the stage of psychomotor development limits some motor behaviours that require a higher level of development: for instance, to kick, to jump and to throw are often conditioned by the process of lateralisation,[6] which is still premature at that age.

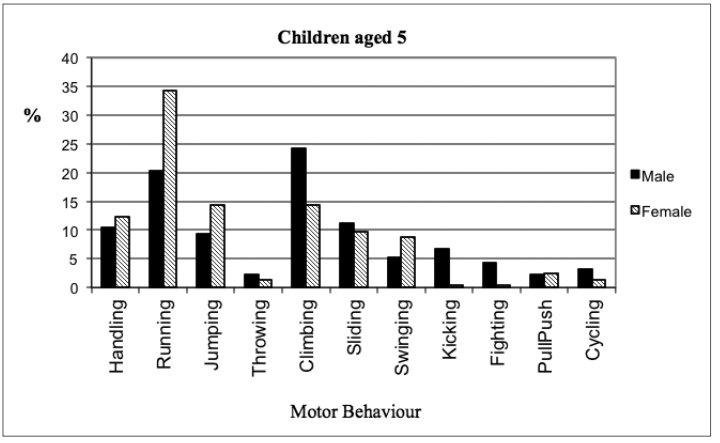

Figure 3. Motor Behaviours of 5 Years Old Children.

Instead, rough-and-tumble play presupposes a certain development of social skills (Scott & Panksepp, 2003; Smith et al., 2004): a little child does not understand why, while playing, he can be thrown down, pushed or pulled by another child. Some motor behaviours are shared by children aged both 3 and 5 (to run; to handle; to climb; to slide) and appear to be preparatory activities (basic behaviours) in comparison with more developed motor behaviours.

6 Lateralisation is the process which, moving from the dominant genetic hemisphere, leads to the distribution of different functions in various body segments. For instance, in right-handed people, the main functions are distributed as follows: support/push in the inferior left limb; leap/attack in the inferior right limb; the dominant hand is the right one; the sub-dominant hand is the left one; the dominant eye is the right one; the sub-dominant eye is the left one. The chest acquires balancing functions in relation to the correct distribution of the above stated functions, as it accompanies the coordinated actions of both upper and lower limbs with appropriate movements during the motor behaviours.

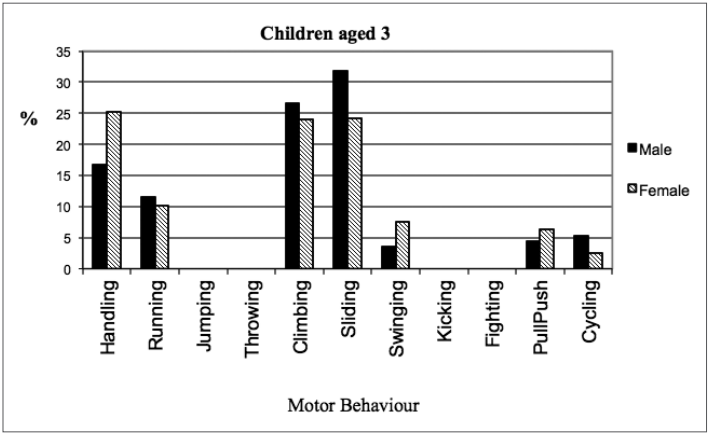

Figure 4. Motor Behaviours of 3 Years Old Children.

Climbing. In infancy school, unlike in primary school (Ceciliani, 2008), males tend to climb in a divergent way both on codified tools (castle, rope ladders, wooden ladders, slide) and on trees. During this manifestation of 'task orientation' (Spray et al., 2001) and self-efficacy perception (Bandura, 1977, 2001), they accomplished extremely difficult motor tasks: climbing along the sides of the wooden castle; climbing up the slide; upside-down rocking in popliteal hold[7] on branches and tools; climbing of large trees. In contrast, females only climbed the codified tools (castle, rope ladders, wooden ladders) and always in the appropriate mode.

In *nursery schools*, the act of climbing often relates to the 'jumping on' various elements located in their environment (big tools, fixed toys, tables, benches), rather than to the real act of climbing. Males and females showed a remarkably balanced gender percentage, whereas in the percent of climbing behaviours that we observed males showed a higher percent of accomplishment (Figure 3). No difference was detected concerning the modes of climbing, as they were all convergent with the standard use of the various tools and equipment (always and only the artificial codified ones).

Handling. Handling is an activity which children of both ages share, even though the percent is higher at the nursery school (Figures 3 and 4). The interest of little children for the fine motor activities limits their motor behaviours as it requires a higher concentration and precision connected to the technique of how to use toys, little tools and other devices. This should explain, at least

7 This is a technical term used to indicate a person suspended on an upright/support (pole, branch or other) through the hold of the inferior limbs, wrapped around the support, accomplished through the back side of the knee (*poplite*).

in part, why little children are more static than older ones. Generally speaking, in the presence of toys and little tools children prefer to concentrate on how to handle them; only after having satisfied this need do they open up to other freer and associative games (climbing, riding tricycles, climbing castles or rope dome-shaped toys). As a result, it is evident that the educational care in relation to the manifestation of spontaneous play can also be characterised by the way the teaching setting is organised: the presence or the absence of little tools conditions the modes of play in a very powerful way, as well as the quantity and quality of the related motor behaviours.

Running. In contrast, in the infant school running is by far the most liberating motor behaviour. In fact, this movement is not always linked to specific activities or games; instead, it often represents a moment of motor relief, a 'play of exercise' (Piaget, 1972). Among children aged 5, females were committed to a free interpretation (vent) or semi-structured (running-up games), whereas males ran also when playing codified games (soccer, basketball). This explains how codified games are already rooted in infancy culture, even though with rules and modes more similar to the *paidia* play than to the *ludus* play (Caillois, 1995); in contrast, females are less conditioned by this type of activity.

In the case of children at the infant school, we did not notice gender-based differences, and running was less frequent: it was produced through a sketch of the real motor scheme, which was generally used to move from one point to the other of the courtyard as a play of exercise (Piaget, 1972), or induced by teachers during some guided activities. Children aged 3 seemed to compensate the lack of motor behaviour, such as running through the use of tools such as slides, as they show greater interest in these tools than older children.

Jumping and hopping. Jumping, hopping and jumping down[8] are activities that are carried out more by males than by females. Generally speaking, females carried out these motor behaviours in performance-like activities related to individual dances, but also to little choreographies carried out in pairs or small groups (3-4 little girls). As previously stated, males used jumping as a competitive expression: jumping farther or higher. As observed in the case of climbing, males tended to challenge themselves in the continuous search for activities pushed to the limits of their possibilities.

Throwing and kicking. In comparison with males, females did not show motor behaviours related to kicking and throwing. As previously acknowledged,

8 The jump downwards is a strategy to control the flight balance and it is essentially practised by young children. It consists in reaching an elevated surface (the kerb, a bench, or similar) and jump to the ground. This behaviour enables the child to experience the emotion of flying, to hover oneself for a moment without any ties in the context of a safe descent and touch of the ground.

males have linked the first two motor behaviours to codified sport activities (soccer and basketball) and, only once, to free play (a group of three males launching a ball). Females did not show any interest for this type of activity. Rather, what is strange is the disappearing of throwing as a sort of practicing activity, i.e. as an activity used to show one's own ability by throwing all sorts of things (pebbles, sticks, cones, or other), to prove both strength (to throw far away) or precision (to throw to hit the target). These behaviours were not registered also among children aged 3, both males and females.

Rough-and-Tumble Play Fighting. Concerning rough and tumble play (Scott, 2003; Smith, 2004), this game concerned mostly little boys who carried out an extraordinarily rich rhapsody: from hand-to-hand fighting (pushes and real wrestling), to pair tournaments ('sword duels'), to tug-of-war (two teams grouping 6-7 children).[9] Females, just like all children aged 3, never played these games.

In brief, even though they privileged some motor behaviours upon others, children aged 5 showed a greater play rhapsody as they performed the full range of basic motor behaviours. In contrast, given the same environmental conditions, children aged 3 showed a more limited play rhapsody, as it did not include all basic motor behaviours, but only those that were more functional to their actual growth. Generally speaking, to sum up gender differences in free play behaviours, we can assert a different dynamism between males and females, especially in the kindergarten; this is related to a higher need of males to challenge themselves in comparison to their personal limits in motor behaviours, a need which did not emerge in a meaningful way among females.

Presence/Absence of Toys and Tools (Figures 5 and 6)

Our second survey concerned children aged 4 attending two infant schools. We observed them in three different situations: free play; the presence of toys and little tools; the absence of toys and little tools. Non-parametric tests enabled us to observe the homogeneity of the groups in the two schools ($p<.05$) under the three different conditions (Mann-Whitney); the relevance of the eventual differences in the same group under the three different situations (Wilcoxon); possible gender differences (Mann-Whitney).

Concerning the three situations we observed, the analysis of the data did not show any relevance ($p>.05$) between Condition 1 and Conditions 2 and 3, both in terms of general data and in terms of the analysis of females and males only.

9 This is the activity that engaged the highest number of children, whereas all other activities we observed the playing group counted – a part from pairs – three or four children at the most.

What emerges from the latter observation is the presence of a series of *dominant behaviours* (running, carrying, handling, climbing) in comparison with a series of accessory behaviours (jumping, throwing, sliding, swinging, rough/tumble). These behaviours (Figure 5) show the higher percentages of realisation in the 'with tools condition', as well as in the 'without tool' condition.

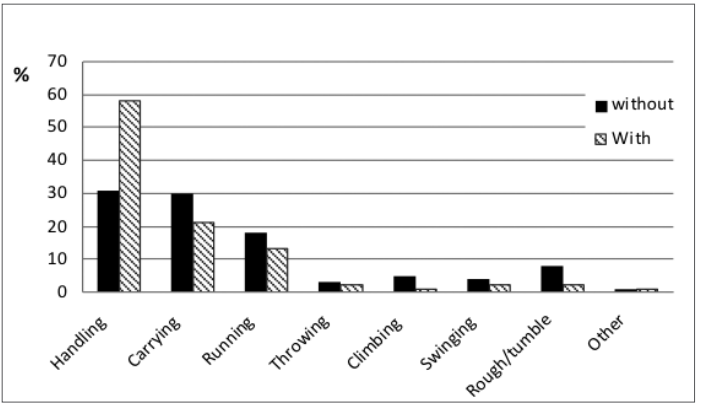

Figure 5. Motor Behaviours of 4 Years Old Chidren with and without Tools and Toys.

Therefore, we can state that some psycho-motor behaviours are dominant in the motor development of children of this age. This is even more valid if we take into consideration the fact that all observations were carried out outdoors, in large spaces equipped with big tools. Even in this condition, children showed the fundamental need for running, handling and climbing and, only in an accessory form, the need for throwing, swinging, sliding, roughing and tumbling).

Obviously, the passage from a situation without tools to a situation with tools increases the manifestation of handling behaviour in a relevant way, thereby decreasing the manifestation of others behaviours (Figure 5). Dynamism diminishes, but that does not affect the previously noticed relation between *dominant* and *accessory* activities. Therefore, notwithstanding the presence of tools/toys, children tended to carry out a certain range of motor actions (i.e. those that we considered as dominant) with a higher frequency than the range of accessory actions. Gender differences are not relevant in the observed situations (Figure 6), even though we could observe psycho-motor aspects related more to male behaviours (such as rough and tumble) or to female behaviours (such as all activities related to the act of 'swinging').

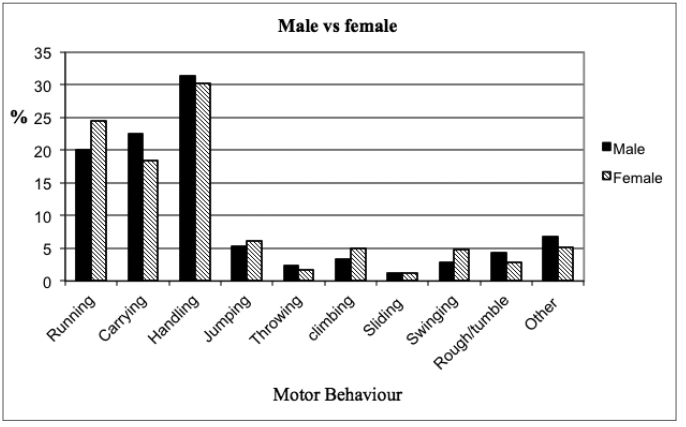

Figure 6. Motor Behaviours of Different Gender Children.

Socio-Motor Behaviour (Figures 7 - 12)

The first survey (Bortolotti & Ceciliani, 2007b; Ceciliani et al., 2009), with reference to Rubin's POS (2001), showed (Figures 7, 8) the following: the presence of all four typologies of play in children aged 5; the absence of competitive play in children aged 3, with a prevalence of solitary and parallel play. Gender differences were present in children aged 5 and showed a higher male propensity for solitary and competitive play. These results are in line with other previous studies (Parlebas, 1986).

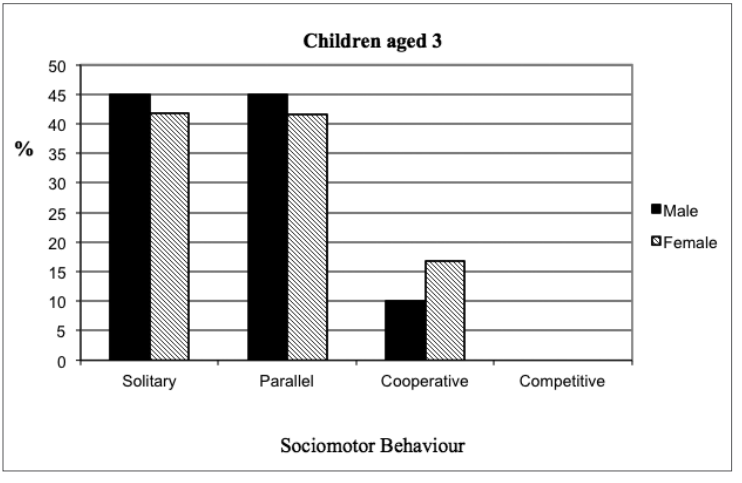

Figure 7. Social Play Behaviours of 3 Years Old Children.

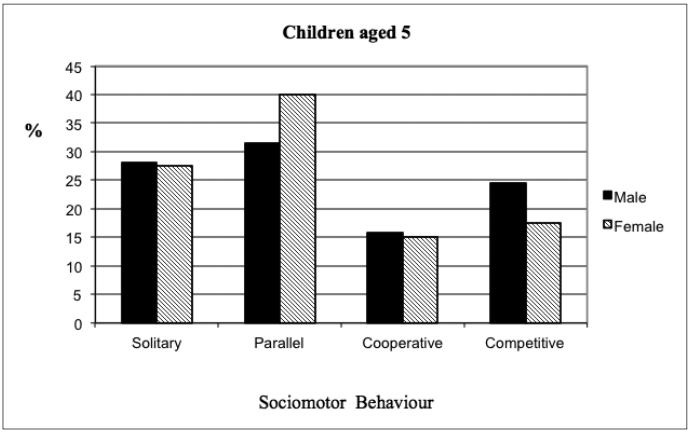

Figure 8. Social Play Behaviour of 5 Years Old Children.

The observations of the three proposed conditions carried out in our second survey (Ceciliani & Bortolotti, 2009), confirmed the rate of the three main socio-motor behaviours: solitary play, parallel play, group play (Rubin, 2001).

Within the relation between these three behaviours and the explorative behaviour (Figure 9), it is possible to notice a constant trend of group play, a constant decrease (even though not terribly relevant ($p>.05$) of solitary play, and a drastic reduction of parallel play in the condition with toys. It is interesting to notice that in the three mentioned conditions, from free play to play with tools, the explorative play increases in a constant way as it shows relevant progress ($p<.05$) from condition 1 to condition 3. To summarise, it seems that the presence of tools better qualifies group play by means of explorative activities, which (in the case of the children we studied) became symbolic games (the search for dinosaur bones; the search for some treasures, etc.).

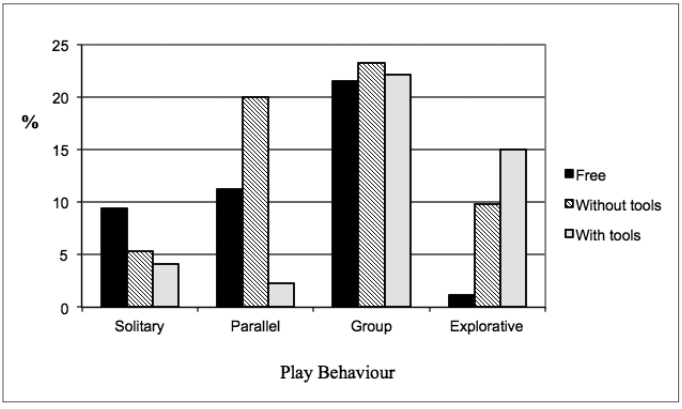

Figure 9. Play Behaviours of Chidren with and without Tools and Toys.

In Figure 10, we can observe some compelling cross-readings of the way the three typologies of play occur. Actually, whereas functional play tends to decrease in the passage from the condition of free play to the condition presence/absence of tools/toys, the expressions of constructive and dramatic play increases. In particular, it is possible to notice that dramatic play is widely present both in the presence and absence of toys, whereas the constructive play is dependent on toys and tools. We could state that play behaviour is fundamentally linked to parallel and group play. In addition, the presence of small tools seems to facilitate group play and to stimulate explorative (Figure 9), dramatic and explorative (Figure 10) play.

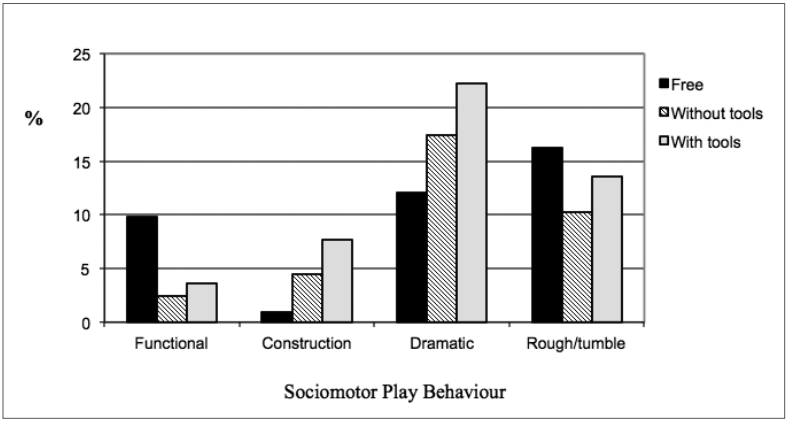

Figure 10. Sociomotor Play Behaviours of Chidren with and without Tools and Toys.

In the condition of free play, the most relevant gender differences ($p<.05$) refer to an increased practice of rough-and-tumble play for males (Smith et al., 2004; Scott, 2003; Pellegrini, 1998), and an increased practice of dramatic play for females.

Such a difference (see Figures 11 and 12) is not relevant for the two other conditions of play.

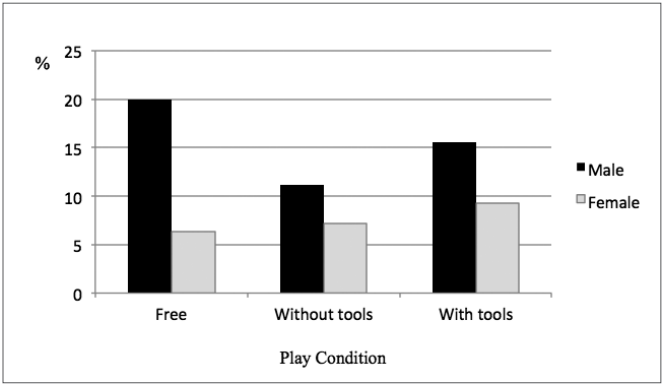

Figure 11. Gender Differences in Rough and Tumble Play.

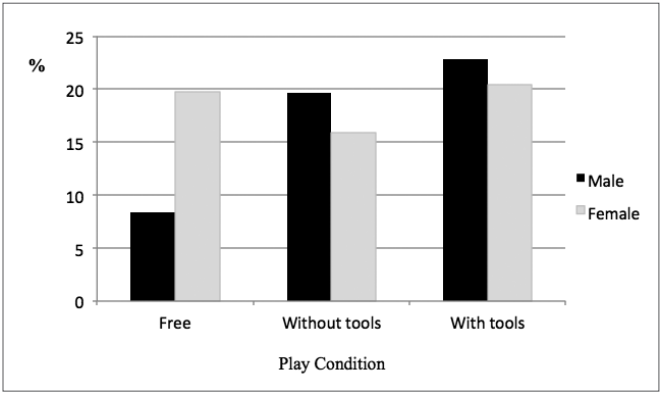

Figure 12. Gender Differences in Dramatic Play.

Teachers' Educational Actions (Figure 13)

In relation to educational care in conditions of free play, our field work brought us to outline four main typologies of educational care (Figure 13):

1) *Participating Presence*: the teacher follows children's play constantly, proposing and stimulating children's activity.
2) *Discrete Presence*: the teacher follows children's play but with a higher active presence, proposing and encouraging but then withdrawing to let the children free.
3) *Limitative Attention*: the teacher follows the children with the constant concern for preventing dangerous situations, and consequently limits children's spontaneous expression.
4) *Detached*: the teacher is constantly separate and intervenes only to prevent

physical dangers or to solve conflicts that might rise among children. The only advantage of this behaviour (which cannot be considered educational care) is that it enables to maximise the manifestation of free play.

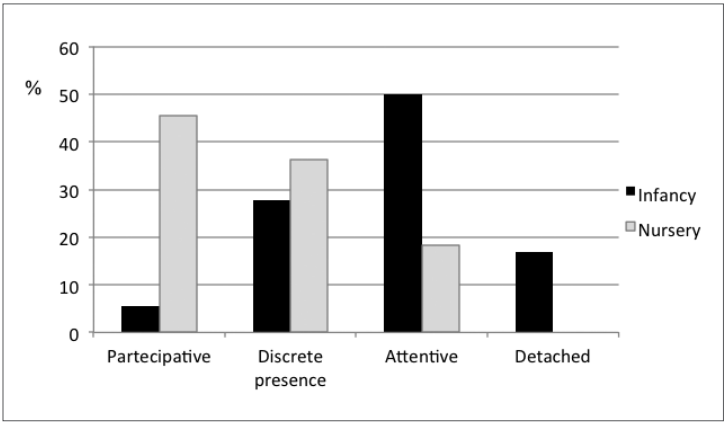

Figure 13. Teacher Behaviours during Children Motor Play in Outdoors.

We can state that there is not a unique typology of educational actions and that all four behaviours described here are needed, even though the present-discrete behaviour should be recommended as best educational action: it engages both teacher and child but leave wide margins of decision to the latter.

Conclusions

Generally speaking, we can state that there is a significant manifestation of some dominant behaviours in relation to both psycho-motor and socio-motor aspects. Concerning psycho-motor aspects, running, carrying, handling are dominant actions present in various situations of outdoor play. This means that some children's behaviours are also manifested through the use of what the natural environment can offer them, independently from the presence/absence of toys and tools. For instance, if handling is not supported by the presence of tools, children use natural objects (little stick, pebbles, sand) to satisfy their needs. For these behaviours, there are no relevant differences between males and females.

With regard to socio-motor aspects, a similar situation can be observed in which the behaviour constantly links (and this is a fundamental aspect) to group games, to rough-and-tumble play, and to drama play.

Gender differences (which, in fact, are not so relevant among children of this age) are mostly connected to the rough-and-tumble behaviours, prevailing

among males, and the drama play behaviour, prevailing among females. About the rest, apart from functional play, no relevant gender differences were observed.

We could conclude by stating that changing the conditions of play does not alter the typologies of psycho-motor and socio-motor behaviours that are dominant at this age in a substantial way. Certainly, to modify the educational setting by adding/removing tools increases the manifestation of some behaviour over others; yet, this does not alter the abovementioned balance existing between dominant and accessory behaviours. This confirms the hypothesis that some children's needs are overriding in a situation and are pursued in any case, through adaptation, imagination and creativity. Nevertheless, the educational action can either increase or decrease the manifestation of accessory behaviours through the setting design, as well as through diversified conditions of outdoor play, on the basis of presence/absence of tools and toys.

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The Benefits of Management and Organisation: A Case Study in Young Language Learners' Classrooms

Christina Nicole Giannikas[1]

This study focuses on primary language education within a Greek region: specifically, on the positive effects of classroom management and organisation on a student-centred approach of teaching. In the case of the Greek education system, language teachers are encouraged to adopt student-centred approaches in their classroom but have not received any guidance on how to do so. Language educators are reluctant to abandon their teacher-centred ways, because they have not been trained to apply classroom management and organisation techniques that could support a student-centred environment.

Keywords: Classroom management and organisation; Young learners; Student-centred approaches; Classroom environment; Classroom layouts; Action research; Qualitative research

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Prednosti vodenja in organizacije razreda: študija primera poučevanja jezika mlajših učencev

Christina Nicole Giannikas

Prispevek se osredinja na poučevanje tujega jezika v Grčiji na razredni stopnji, še posebej na pozitivne učinke vodenja razreda in organizacije pri poučevanju, kjer je v središču učenec. V grškem izobraževalnem sistemu se prav učitelje jezikov spodbuja, da za poučevanje izbirajo pristope, pri katerih so v središču učenci, vendar pa za tak način dela niso dobili nikakršnih smernic. Prav zato, ker učitelji jezikov niso usposobljeni za vodenje razreda in organizacijo, ki bi pripomogla k vzpostaviti učnega okolja, v katerem je v središču učenec, so nenaklonjeni opustitvi pristopov, pri katerih je v ospredju učitelj.

Ključne besede: vodenje razreda in organizacija v razredu, mlajši učenci, pristopi, pri katerih je v središču učenec, razredno okolje, ureditev razreda, akcijsko raziskovanje, kvalitativna raziskava

Introduction

Although there has been significant research in the field of young learners of English, there has been little focus on classroom management, organisation and learner-centred classrooms within a Greek context. While the nature of classroom management and interaction has been a topic of extensive research in language learning and education in general, language lessons continue to be carried out in a rather traditional manner in Greek primary schools. A teacher-centred strategy prevails in most classrooms, based on the general beliefs and values of Greek language teachers, as it is considered to be conducive to student learning (Rixon, 1999).

A feeling of community can be argued to be imperative to successful language learning and learning in general. Educators are expected to create an environment advantageous to student learning where young language learners (YLLs) can feel sufficiently inspired to achieve their goals and leave the classroom feeling confident about themselves. In order for this to be accomplished, a certain procedure must be established. According to Paulsel (2004), teachers learn to establish routines, develop classroom rules to maintain order, and arrange the classroom in such a way as to facilitate the learning process. The teaching environment could be seen as comprising three components: social, physical and educational. Teaching intentions can be communicated to language learners by the way the environment is organised: it can reveal what it is they can anticipate from this experience.

With the intention of accomplishing successful interaction and group activities, a teacher must be aware of the importance of appropriate management in the classroom. Providing a suitable atmosphere during the lesson is essential, so that students can feel secure and confident. Kaulfer (2006) believes in the significance of organised classroom management can be effective in all teaching situations, by supporting the notion that the principles of classroom management, efficient ordering of the language-learning environment and the effective control of discipline. The foreign language class, with the nature of its subject matter taken into account, can provide many opportunities for unique and creative types of control, a luxury other curriculum areas do not have.

In this paper, I will present the significance of classroom management and organisation through a case study conducted within a region in south-western Greece. The main focus of the research is to what extent state schools and private language schools in Greece provide language-learning opportunities within an age-appropriate environment and how the management techniques used affect and benefit YLLs.

Research Methods

This study was separated in two parts; the first focused on language teaching in seven state schools and seven private language schools (*frodistiria*: the Greek term that will be used throughout) across the region. The schools were selected so that all societal backgrounds of language learners are covered. This section will present the research design and methodological approach employed to investigate early language teaching within a Greek regional context. Due to the complexity of English language education in the region where the case study took place, a multi-method research approach was designed to carry out the study and present valuable data that will contribute to the field of early language learning. In this case, there has been an integration of qualitative and action research, which draws on qualitative methods, supported by elements of quantitative evidence. This combination allows the researcher to not only describe events but explore how the phenomena occur and provide a valid contribution and evaluation. In the case of the current study, qualitative research (including both classroom study and action research) gave the researcher the opportunity to observe the given situation, to interact with the participants, and to gain insights and information from the participants' point of view and experience.

The following visual representation is used to clearly show the different phases of the research, the various types of data collecting tools in each phase, the number of participants and the time period spent.

Table 1. *Different Phases of the Research.*

Phases	Time Period	Institution	Participants	Data Collection tools
Phase 1	2007–2008	7 State Schools	151Ss-7Ts	Class Observations-Teacher Interviews
Phase 1	2007–2008	7 Frodistiria	62Ss-7Ts	Class Observations-Teacher Interviews
Phase 2	2008–2009	1 Frodistiria	130Ss-10Ts-1DOS	Field notes, audio and video recordings of 'Action' lessons, questionnaires to all primary students and their parents, interviews with DOS and Proficiency students, DOS observations of 'Action' lessons, Class observations by researcher.

This multi-method strategy is considered to be the most appropriate for this study, as it allowed the phenomena of early language learning to be analysed from different perspectives. As shown in the table above, the study was conducted over a two-year period. The research included observations of English language lessons in both primary state schools and *frodistiria*, concentrating on young learners aged 7–11. The number of students in the language lessons observed in state schools was from 20–25 students and 5–12 in the *frodistiria*. The pupils that participated in the investigation studied in general English language programmes in the morning. Language lessons at the *frodistiria* took place in the afternoons, serving the purpose of supplementing the morning language lessons. Additionally, semi-structured interviews with 14 English language teachers from all 14 schools (state and *frodistiria*) were conducted, providing the opportunity to probe more deeply and explore the interviewee's opinions. Specific classes were systematically observed for five weeks each, in the mornings in state schools and in the afternoons in *frodistiria*. Language lessons and observations took place when English language lessons were carried out, twice a week for one school year. Coded forms were used to record observations for a ten-minute period, which was divided into six minutes of systematic observation, followed by four minutes of contextualising notes and data. Unstructured discussions supplemented the interviews, and opportunities were given for the researcher to seek clarification and ask questions based on the data collected in observations.

When implementing action research, the dilemmas and considerations are vast and complex, since the action researcher was both a researcher and a teacher and was expected to perform a dual role in an environment where no variety of research had previously been conducted. In the current study, there was a specific focus on two groups of children. One class of beginners aged 7–9 and a class of intermediate students aged 9–11. The two levels were chosen in order to investigate the element of change with a group that had experience of language learning in this context and a group that was about to start. The intermediate group had been studying English at the *frodistiria* for four years and parallel to this, three years at (state) school. A research journal was kept during the course of the study to keep a record of a rich and detailed account of various routine procedures, phases of daily lessons and to record any particularly interesting or theoretically significant events. The young, teenage and adult language learners who attended classes at the *frodistiria* were requested to complete questionnaires that focused on their lessons both at the *frodistiria* and primary state schools. A total of 116 questionnaires were given to the students at the end of the school year and were returned immediately. Item analysis was completed at the pilot stage to examine the quality of items included in the questionnaires.

The English Language Classroom Environment in State Schools

The nature of the state school classrooms observed was quite similar from school to school, regardless of the area in which the school was located. It was clear that the English teachers were considered visitors to these classrooms and only mainstream teachers could organise the environment of the classroom as they desired. Only two classrooms revealed signs of language learning taking place. Teacher 12a was provided with her own classroom and Teacher 10a had a few English posters on the walls of the classroom. The other language teachers did not attempt to make changes and revealed in interviews that they did not want a dispute over such matters with their colleagues. Language teachers were expected to keep a distance from the structure of the classroom, which makes it difficult to make alterations in the classroom's environment, even though this may make a difference and have an impact on classroom management.

The year the observations began (2007), the Greek Ministry of Education had altered the mainstream Greek syllabus by introducing the use of new course books designed to encourage mainstream teachers in state schools to apply a cooperative approach to learning in their classrooms. The drawback to this rather radical attempt, since the Greek education system has been known to be highly traditional in its approaches in primary education, is that mainstream teachers had limited guidance on how to put this into practice. Unfortunately, teachers did not have any training or receive any practical information on how to manage and organise group work. Although some did put effort into adopting a new environment in their classrooms, their enthusiasm soon faded when they realised that they were not prepared for the problems associated with a cooperative environment and were not aware of how to prevent such problems from occurring.

This attempt of change for mainstream teachers also had an impact on the English language lessons, where there was no change in their curriculum or syllabus and no input on how to implement, organise and manage the situation. English language teachers that entered the class for 45 minutes were upset to see a seating arrangement that made no sense to them, because as Teacher 13a stated: 'I don't know why the teacher insists on this setting. It makes it difficult for children to face the teacher's desk'.

However, only three out of seven schools followed such classroom seating arrangements. The rest were of a teacher-centred environment, which was considered the norm in primary state schools in Greece, particularly in this region: a traditional teacher-fronted structure, columns and rows of desks and

chairs with pupils facing their teacher and her desk. This specific layout was most convenient for teachers who wished to apply a lesson where students were being *examined*, a term used in Greek classrooms. An example of this occurred during the study when three of the teachers were observed holding a small notebook, asking students theoretical questions on grammatical phenomena and recording the accuracy of their answers, which they would use to evaluate their overall performance at the end of the semester, when parents were given their children's school reports.

The other three classrooms followed a different layout which had no specific purpose or organisation pattern. The structure was mostly chaotic as some classrooms attempted to present an *ad hoc* cluster of chairs and desks; others tried a semi-circular seating, all the while not encouraging students to interact even though they were seated in the appropriate layout. These structures were not kept in their initial form and desks were arbitrarily set without being placed back, resulting in the learners often not having any sense of spatial organisation and positions appropriate for any type of communicative or cooperative activity. Additionally, seating arrangements had not changed from the beginning of the school year for any activity or purpose, even though desks and chairs were movable.

The classroom environment was a neglected source in the context the research took place, and even though this was evident in the eye of the researcher, when interviewed, the language teachers who participated in the study expressed their anxiety for other issues that were considered more influential, such as a poor syllabus, outdated course books and lack of facilities, to name a few. Within this context, teachers appeared to have abandoned the idea of improving the classroom: firstly, because the buildings were relatively old and secondly, because language teachers in state schools were considered outsiders, where teachers entered the classroom as guests and were requested not to change anything because this would disrupt the course of the rest of the lessons. Five out of seven language teachers stated that their lessons were considered an intermission for mainstream teachers and students. They believe children to be less motivated to participate in any way since most children attended language lessons at *frodistiria* in the afternoons, in classes with fewer students who were all of the same language level. According to Mattheoudakis and Alexiou (2009), a unique feature of foreign language education in Greece is a thriving private sector where students attend their after mainstream school. The high percentage of children who attend private language institutions indicates the dissatisfaction that exists with regard to the language teaching in state schools. The socio-emotional atmosphere, the low self-esteem of teachers, the

uninspiring target language use and poor classroom management work against the language-learning process.

The English Language Classroom Environment in a Frodistiria

Observations revealed a number of differences between state schools and *frodistiria*. *Frodistiria*, as language institutions, focused entirely on languages, which was obvious to the observer from the very first visit. The posters on the walls, the listening tasks coming from classrooms and students' drawings of London or Paris were only a few indications of the emphasis on a foreign language environment.

Within the region where the study took place, classrooms in *frodistiria* provide a wider range of critical contexts for language learning. Many factors combine and interact in order to create an appropriate classroom environment with variables, which include structural components, such as teachers' organisation of classroom materials and supplies, frequent language opportunities, exposure and stronger classroom management strategies. Teachers' organisation of classroom materials and supplies, for instance, were observed to differ markedly from state schools, having a significant impact on the quality of the learning environment. These differences and other factors all contributed to making the classroom environment more pleasant, where clear goals were presented to the students and their parents. It is necessary to mention at this point that frodistiria are private institutions; therefore, they choose to improve their facilities regularly and in most cases, have the financial ability to do so. State schools are not supplied with funding for the improvement of the classroom environment or the latest technology to the same extent. Observations recorded that state schools were provided with minimum facilities. The students who attended *frodistiria* were aware that they would have responsibilities and a purpose, even if that purpose was passing future language examinations for the attainment of a certificate. These goals were mostly implanted by parents who consider language lessons at *frodistiria* necessary for their children's future. Language certificates are essential for survival in the competitive and distressed Greek employment market, and the employees of tomorrow will likely need a strong educational background to succeed.

The classrooms were similar from *frodistiria* to *frodistiria*, meaning that they were equipped with what were considered basic facilities, such as a whiteboard and a CD player. One out of seven classrooms had a computer, which was used once during observations, for games where students took turns

approaching the teachers' desk, where the computer was placed and play a round each while others sat behind their desks anxiously awaiting their turn. There were English language posters, phrases and words written on colourful cards around the wall of the classroom, labelling various objects in full view of the students.

The layout of the classrooms in *frodistiria* was analogous to those in state schools. In the private sector, the school authority predetermined most of the physical environment. There was a preference for teacher-centred environments, as well as a tendency towards examination-focused instruction from the very start of the learners' tuition at *frodistiria*. Teachers controlled the direction and pace of teaching, monitored and corrected the learner's performance. Nonetheless, the classroom environment was not as neglected as in state schools. However, in this context, there is a great deal of competition among *frodistiria*; therefore, the owners pay more attention to what some may consider minor details, because of the fact that it may attract more customers.

Understandably, language learning in state schools and *frodistiria* faces many challenges; however, ensuring a supportive classroom environment can be regarded as a suitable starting point. It may not determine how effective teaching can be, but it can be a contributing factor. Furthermore, with simple changes it may be possible to encourage an entire new attitude towards learning. By focusing on classroom variables that promote foreign language learning, language teachers have the ability to support language opportunities, exposure and classroom management strategies. In the following section, the effects of the teacher-centred context and the outcomes of classroom management and organisation will be discussed.

Classroom Management and Organisation and the Effects of the Teacher-Centred Context

State school language teachers blamed the perception pupils and parents had towards them, making them feel inadequate, since their work was not taken seriously. Pupils' dependence on *frodistiria* alone resulted in them not focusing on the language lessons provided at state schools. Language teachers at state schools continued to work through the course book and did not make any attempts to introduce something new and more challenging despite being fully aware that the level of their lessons is extremely low for the pupils in question. As Teacher 15a mentioned in an interview, teachers were not required to use the course book or complete it by the end of the school year; nonetheless, they chose to diligently employ it even though children seemed to resent it, and they themselves were not happy with the content. In relation to this, as Teacher 17a reported, as children grew older, the majority would become increasingly less

interested in their subject, so that by the time they reached Year 6 they would become even more difficult to manage than when they were younger. Teachers blamed the situation on the *frodistiria*, claiming that because the lessons that take place there are of a more rapid pace, children are familiar with the material presented in their class. This data relates to Smith and Larsett's (1999, p. 7) argument that:

> [...] difficulties in learning and consequent problems with behaviour often happen because the content of a lesson is not matched to the ability of the pupils to whom it is delivered. Because persistent failure can easily result in disgruntled disaffection, careful scrutiny of the curriculum by subject departments and by individual teachers is needed to ensure that it is appropriate.

Data gathered from the observations in state schools indicated that teachers regularly interrupted their lesson in order to make a critical comment on something a pupil may have been doing, which was usually trivial and could have been dealt with privately. Kounin (1970) describes this as *stimulus-bounded events* in which the teacher draws the attention of the entire class from an on-going task to an insignificant action that does not necessitate attention. One example of this occurred when the researcher had been observing a teacher explaining a grammatical point. She was writing examples on the board when she became aware of one of the students in the back writing on a piece of paper instead of their exercise book, used especially for grammar lessons. When the pupil explained that he had left the activity book at home, she commented that his grades will decrease if he continues this behaviour, a warning that was frequent among teachers. Observation data showed that other students started commenting on this among themselves, and all communication between the teacher and the pupils rapidly vanished, resulting in the teacher needing to take additional time to reinstate the children's concentration. This conversation may not only have a negative effect on a child's willpower to participate, but also took valuable time out of the task. If the teacher draws her pupils' attention towards such events, she makes it difficult for them to stay focused and actually appreciate what it is she is trying to teach them. These signs of ineffective managing often disrupt the course of learning and are some of the elements that lead parents to believe that the work done in state schools is not adequate, compared to the effort teachers make at *frodistiria*.

Positive reinforcement was rare and occurred mostly when children successfully completed a task and was repeatedly addressed to the same children, usually those seated in the front rows. There were, as the data confirms,

teachers who ignored pupils' misbehaviour for most of the lesson and worked with the children who were seated in the front rows. If the situation became unbearable, the teacher would yell at the children until there was absolute silence in the room. According to Collin and Laslett (1993), it is often difficult for a teacher to attend to every sign of misbehaviour, though the emphasis must be *planned ignoring*, rather than hoping that the provocative nuisance will exhaust itself. As most teachers were recorded to explode, when ignoring misbehaviour, it did not seem planned but a management technique they had adopted, which was effective for a short amount of time. Nonetheless, this was considered a suitable attempt to manage misbehaviour.

> 'We generally do not have behaviour problems in primary school. They are still at an age where they are easily disciplined. If you yell at them once or twice they will eventually calm down' (Teacher 13a).

Learners were seated in rows and faced the teacher, who was the centre of the communication network, as mentioned earlier. Language teachers naturally felt this was the *right way a classroom should be organised* after years of being exposed to the same environment as students themselves, i.e. their own *apprenticeship of observation*, as Dörnyei and Murphey (2003) identify it. Another valuable point they make is that teachers do not often realise that they have a spatial advantage to the students. They are able to see everyone and face anyone they wish, assuming the same for the students. However, for language lessons especially, the principal means of learning is the interaction between members of the classroom.

In relation to the above point, there was a particular perception language teachers had concerning group and pair work. In interviews, teachers appeared to be against employing any form of cooperation when tasks were being conducted and would only consider it when students played games. In most cases this was infrequently employed, especially with children in Years 5 and 6 since, according to all teachers, students stopped appreciating these activities when reaching the age of 10. Interviews revealed that six out of seven state school language teachers were not aware of the concept of cooperative learning in class and referred to group work as an extracurricular project that was too complicated for the young learners of Years 3 and 4.

> Teacher 16a: 'I usually do not assign group work to students of Year Three or Four; they are too young. At the end of every chapter of the book, I assign a project and put them into groups, and they decide whose home

> they will go to in order to complete it. We would use the end of one of our lessons for them to present their pictures or posters.'

Six out of seven teachers considered pair work related only to a reading task, in which students read out dialogues from the book aloud and translated afterwards.

> Teacher 15a: 'I use the pair work given in the course book where there are dialogues and the pairs read them aloud, conversations such as 'How old are you?' and so on. I generally do not use pair work a lot because it is not offered in the course book. I do, however, believe that this task helps their language development. As students read to each other, they hear each other and translate, and this helps them develop their speaking in the foreign language'.

When an interactive in-class form of learning was brought to their attention, all teachers stated that theory is different to practice. Children are not familiar with group and pair work, and the use of it would not be fruitful nor benefit or contribute to any learning. It was thought that the pupils who were at a higher level than others would complete tasks and simply provide the information to those who were at a lower level. The problems that arise from the introduction of group work are many and, according to teachers, there is not enough time to discipline pupils and apply new classroom management techniques, therefore, this approach would only add a new dimension of confusion.

> Teacher 17a:'It is a waste of time. It would take too long to calm the children down and actually get something done. We do not have much time for the actual lesson. There's a lot of noise, and the weak students do not participate, practice is different to theory, the reality is that there are no results. Children do not learn from their peers; they just copy from each other'.

This statement contrasts sharply with the view of Smith and Larsett (1999, p. 22) who argue that:

> [...] group work is considered usually in terms of cooperative learning in a less threatening setting than individual performance. Astute tailoring of tasks or questions can ensure that team or group success depends as much on the least able as on the most able member. Competition can be an enjoyable method of enlivening the learning and recall essential facts,

> but it carries the threat of being the source of heightened illumination of individual ignorance. Working with groups offers the chance of providing the element of excitement without the potential limelight hogging or ego bruising of individual competition.

Equivalent observational study and interview material was collected in *frodistiria*, where there tended to be a feeling of clear existing aims of the teaching-learning process comprising the language examinations and certifications compared to state schools where the aims were in a blur.

The data gathered from observations revealed that there was a more positive response to the presence of warm colours, spacious areas in a moderate and orderly fashion and fewer children in every classroom, a maximum number of 12. The classroom layout and arrangement of classrooms at *frodistiria* did not differ substantially from the hierarchical, teacher-centred arrangements in state schools. Students in this context again were seated in rows and communication was only planned to be between the teacher and the students; the goal is for children to pay more attention to what is being presented without interruptions, leaving the teacher to occupy the centre of the communication network. Group and pair work were seen as methods used for play, and teachers were not convinced that they would improve the children's learning in any way. As a result, children generally worked alone or in whole-class presentations (Doyle, 1986).

> Teacher 13bF: 'I use it [group work] when playing vocabulary and grammar games and likewise pair work where I get a chance to listen to what they are saying and at the end talk about things they've done right or wrong, not for every lesson though.'

> Teacher 11bF: 'Students do learn from interaction, but they learn more from me when I correct them.'

Observation data shows that pupils were well-behaved at *frodistiria* compared to state schools which, since management techniques and teaching approaches are similar, may be simply because language lessons at *frodistiria* are taken more seriously by parents and evidently have a similar influence on the children. Language teachers in both sectors feared that they would relinquish control of their classes if they changed the layout and introduced a student-centred approach that would encourage children to interact, not only with their teacher, but their peers as well. The following section presents the findings of

the action research and the effects age-appropriate classroom management had on a student-centred environment.

The Evaluation of the Classroom Context through Action Research

As one part of the action research procedure, the 'traditional' layout of the classroom was not rearranged when the beginners were first welcomed. The children were seated in rows, as they would be normally, so that they would not undergo a change from the very beginning. With the annual start of the new school year (following the year where the qualitative research in state schools and *frodistiria* took place), there was general enthusiasm when students returned to the *frodistiria* after the summer holidays, which quickly faded as the typical situation in classes progressed. The curriculum assigned was oriented to a course book and children were obliged to go through every bit of homework reading out each task, taking turns and receiving feedback. The children would become extremely quiet, awaiting their turn without receiving any meaningful instruction by the teacher and their engagement was more mechanical than spontaneous and communicative.

After analysing pedagogical structures and activities in state schools, where children were not exposed to an interactive student-centred environment, the researcher/teacher anticipated that an immediate exposure to change at the *frodistiria* would confuse or maybe even intimidate YLLs. This would make the adaptation of any type of change even more difficult for them to become accustomed to. Since the children were very young and familiar with a predominant discourse under the direction and control of the teacher, the new environment being introduced gradually was regarded as likely to be more efficient. The intermediate group, for instance, was accustomed to routine lessons, at the *frodistiria* and at their state school, as they were seated in rows next to the same children they were seated next to every year. Therefore, as a first step, I attempted to greet students as they walked into the classroom. Being present before the class arrives can institute a role of host. The teacher, in a discreet manner, can greet the students and highlight a sense of authority without that being intimidating to the children. Consequently, the teacher has the comfort to ensure that the classroom is in an appropriate state and that all that is needed for the lesson is there. This will 'provide the mental composure essential to relaxed assurance' (Smith & Laslett, 1999, p. 4). This 'technique' was not observed in any of the state schools or *frodistiria*; however, it was a simple way to ease students in the classroom and help teachers reduce misbehaviour, to some extent.

As a part of the introduction of the set up, the *rules* of group work and its purpose were explained to students and parents in writing. It was also emphasised that stars (a form of reward on a poster next to each child's name) were to be used frequently if pupils followed the guidelines. Great emphasis was placed on the way they behaved towards each other and children were warned that there would be no rewards if any kind of bullying, either physical or verbal, occurred. With the introduction of the 'stars', punishment (for instance, lower grades as mentioned earlier) was replaced with rewards since there was a focus on good behaviour rather than bad, where the teacher expects the best from the learners. As Doyle (1986) has argued on the issue of solving such problems, classroom management is a process of attending to the issue of *order* in classrooms. The problems of misbehaviour and student engagement are not insignificant; however, they are not the language teacher's primary issues. The teacher's primary and foremost management task is to establish and maintain work systems rather than punishing misbehaviour. Nonetheless, the physical characteristics of the classroom in general are often neglected (Weinstein & Mignano, 1997). The milieu is one aspect of classroom organisation that can reduce the potential of serious disruption by avoiding pupils becoming discouraged, feeling inadequate, incompetent and seeking attention any way possible as a sign of lack of confidence or loss of interest (Smith & Larsett, 1999). The environment can provide the teacher with opportunities when the necessary attention is commanded. This does not imply that organisation of a pleasant learning environment is a simple task. The primary teacher must have a high organisational ability in order to be successful. Kyriakou (1992) argues that the appearance of the classroom indicates to children the effort and care that the teacher puts into providing them with an environment that will make them feel comfortable and is advantageous to learning. When children enter a language classroom, especially if it is their first encounter with the foreign language, they need to feel that they are entering an environment where they can feel safe and welcome. An environment that they perceive as hostile may bring about negative feelings that may be difficult to discard at such a young age. Colours, drawings, posters can intrigue students and bring out positivity that can guide them all through their course and facilitate the task of applying successful classroom management techniques in the teacher's starting stage. The general displays of the language classroom, as Cullingford (1991) states, can make a distinct impression on the pupil.

Based on the documented evidence during the action research, it was interesting to note from the lesson observation data that, at the start of this newly established seating arrangement, the pupils with strongest personalities

dominated the groups. There was a need for repetition of the rules and the purpose of group work in order for all members of a group to participate and put forward their ideas and knowledge equally. This took some time, especially for the beginners' group. They were of a younger age, which made them more reluctant to take risks. They needed constant reassurance that they had as much to offer as their peers. By the end of the school year, with systematic reassurance, positive reinforcement and practice, all group members played a significant part in task completions and cooperated well together in response to given time limits by which children were expected to complete their task so as not to overlap the next planned activity. According to Wright (2005), time limits are considered boundaries for formal education but can be porous as well. In these tasks, children assigned roles to each other, cooperated and stayed focused on what was asked of them. The participants of this research responded well to time limits and were determined to meet them. Additionally, the time limits assisted the teacher/researcher in the organisation of the lesson.

As a further element of this research study, all teachers of the *frodistiria* were encouraged to observe the researcher's lessons once a month and in that time, they were asked to take notes of tasks they felt they could perform in their own classes and methods they would like to adopt to improve their lessons. After a number of observations, teachers were convinced that group and pair work were not just theoretical outlooks. They slowly became convinced that the techniques they witnessed were possible in practice. Two months prior to the end of the school year, they conducted observations of these teachers' classes, during which they adopted a student-centred approach. It was evident that the teachers felt nervous at first. For this reason, the first two lessons were not taken under consideration. The language teachers needed their time to get used to the idea of observations since this was something entirely new to them and, once they felt more comfortable (after Lesson 3), data was recorded. As their lessons progressed, they became more confident. By the end of their lessons, they were more able to ignore being observed and had become entirely involved in the lesson and the outcomes. They later commented that they were pleased to experience full participation from the students, and productive cooperation and positive behaviour, as reflected by the quote below:

> Teacher 1400: I was afraid that when I introduced group work most students would see it as an opportunity to copy the work of the stronger ones. I was given the impression though that when I explained what was considered appropriate cooperation and that it would be rewarded, the students immediately made great effort to carry out the task as they were instructed to and actually enjoyed doing it.

The teacher was not wrong to have second thoughts about the approach of a student-centred environment. The teacher/researcher also came across difficulties when first introducing group and pair work to the children at the *frodistiria*. Although, there was a belief that this new approach would be more of a challenge for the beginners, it turned out to be more difficult for the intermediate group to adopt. Having been used to a teacher-centred approach at school and the *frodistiria*, they were not sure how to handle this new freedom given to them by a new teacher. The intermediate class enjoyed the fact that they would be working with their peers; of course, some did see it as an opportunity to lose focus and misbehave, which took some time for them to overcome. The management technique of rewarding good behaviour with stars expedited the process. After the first month, when 'Great Worker' certificates were given in a special ceremony held to celebrate children's achievements, the students started realising the benefits of gaining as many stars as possible. Once they were rewarded with more stars while working together in their groups and focusing on their task, they could see that they learned whilst having fun.

The results of the current study have shown that classroom management and organisation combined with a communicative and interactive environment are factors that contribute substantially to progress in foreign language learning and teaching. Undoubtedly, an increased knowledge of how to apply effective classroom management coupled with an understanding of the potential effects of a student-centred interactive environment would benefit individual teachers and their students. Furthermore, teachers should be trained and prepared beforehand in how to apply effective classroom management and organisation, appropriate methodology and awareness of key elements of classroom life such as space management and pupils' engagement are essential to any educator. The language lessons can become effective within a pleasant non-threatening environment where most students can be involved, active and participative, an element which was not observed in traditional teacher-centred environments. When teachers have undergone the necessary training, they will be able to confidently maintain the students' involvement and choose the appropriate material that would appeal to the learners and their age groups.

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Biographical note

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European Higher Education Area and the Introduction of a Quality Assurance Program in Greek Universities: Is Policy-Oriented Learning Present?

George Stamelos[1] and Aggelos Kavasakalis[2]

This paper aims to investigate the production (or not) of policy-oriented learning during the establishment and implementation of a specific policy program in the policy sub-system of the Greek university as well as the interpretation of the existence (or not) of policy-oriented learning. The theoretical tools were drawn mainly from the theoretical work of Sabatier and Jenkins-Smith, termed the 'advocacy coalition framework (ACF)'. The Greek university is therefore considered to be a policy subsystem in which actors form coalition networks that share policy core beliefs and values, and engage in coordinated action in order to translate these beliefs and values into public policy. Thirty-five semi-structured interviews were used for the production of data, in combination with policy paper analysis.

Keywords: Greek higher education; Higher education policy; Policy analysis; Quality assurance

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Evropski visokošolski prostor in vpeljava programa za zagotavljanje kakovosti na grških univerzah – ali obstaja produkcija s politikami usmerjenega učenja?

George Stamelos* in Aggelos Kavasakalis

Cilj prispevka je po eni strani raziskati produkcijo (ali odsotnost) s politikami (policy) usmerjenega učenja med pripravo in implementacijo določenega strateškega (policy) programa v grškem univerzitetnem podsistemu, po drugi strani pa interpretacijo obstoja (ali neobstoja) s politikami usmerjenega učenja. Teoretično izhodišče je izpeljano na podlagi teorije zagovorniške koalicije (advocacy coalition framework – ACF), ki sta jo podala Sabatier in Jenkins - Smith. Tako lahko grško univerzo obravnavamo kot strateški (policy) podsistem, v katerem akterji oblikujejo koalicijske mreže, ki delijo ista ključna strateška (policy) prepričanja in vrednote ter se vključujejo v koordinirane akcije z namenom, da bi ta prepričanja in vrednote prenesli v javne politike (policy). Za potrebe raziskave je bilo opravljenih 35 polstrukturiranih intervjujev v kombinaciji z analizo strateških (policy) dokumentov.

Ključne besede: grško visoko šolstvo, visokošolske politike (*policy*), analiza politik (*policy*), zagotavljanje kakovosti

Theoretical choices

An overview of the framework

The advocacy coalition framework (ACF) was initially designed in the late 1980s by Paul Sabatier and Hank Jenkins-Smith to help explain advocacy coalition structure and behaviour, the role of scientific and technical information in policy (policy-oriented learning) and policy change in policy subsystems. The ACF has since been applied worldwide to analyse the formation and implementation of policy programs through policy network analysis in different policy regimes and in different policy sectors.[3] Among these works, some educational policy programs have been analysed.

The ACF considers mapping out policy to be a continuous process without a concrete beginning and end. The content of reforms is influenced by the permanently altered coalition networks, which represent different policy beliefs, values and interests. Coalition networks are defined as groups of actors coordinating their behaviour to some extent in order to achieve a common, or complementary, political objective (Hula, 1999). As Sabatier claims, the ACF recognises

> 'the importance of problem perception; shifts in elite and public opinion concerning the salience of various problems; periodic struggles over the proper locus of governmental authority; incomplete attainment of legally-prescribed goals; and an iterative process of policy formulation, problematic implementation, and struggles over reformulation' (Sabatier, 1988, p. 130).

A basic principle of this framework is that coalitions possess a well-developed belief system that is organised on three levels: deep core beliefs; policy core beliefs and secondary beliefs.[4] This system of beliefs organises fundamental values and perceptions and connects them to the causes of policy problems and consequently to suitable approaches for their resolution (Zafonte & Sabatier, 2004, p. 78).

A general depiction of the policy process inside the ACF framework is as follows:

> '[A] few people perceive a [policy] problem or source of dissatisfaction. They identify one or more causes and then propose one or more policies to deal with the specific causes. Thus, a policy belief system is developed and employed in the policy process […] Those who feel themselves aggrieved by

3 The links below provide readers with a categorisation of ACF's applications worldwide.
http://www.des.ucdavis.edu/faculty/Sabatier/Sabatier.htm
http://www.ucdenver.edu/academics/colleges/SPA/BuechnerInstitute/Centers/WOPPR/ACF/Pages/AdvocacyCoalitionFramework.aspx
It has to be mentioned that Paul Sabatier died on 3 February 2013.

4 For further study: Leach et al. (2005); Sabatier and Jenkins-Smith (1999), Sabatier (1988).

> the proposed policy have a number of options […] Thus the aggrieved actors construct an alternative, conflicting belief system and, with it, weigh in against the initiative of the first group. The original group normally responds to these challenges, thereby initiating the process of strategic interaction. In this process each group attempts to (a) convince key policy decision makers that its belief system is the appropriate one, leading to the preferred policy choice, or failing that, (b) to restructure the policy space as perceived by key decision makers in order to achieve a policy outcome as closely approximating their own position as possible' (Jenkins-Smith, 1988, p. 172–173).

In the case of high levels of conflict, wherein advocacy coalitions in the subsystem rigidly adhere to the existing belief system, repeated attempts to ignore or refute compelling analytical criticisms result in the loss of analytical credibility (Heintz & Jenkins-Smith, 1988, p. 270).

The ACF proposes a set of hypotheses regarding: (a) formation and action of advocacy coalitions; (b) production of policy-oriented learning during the establishment and implementation of a policy programme; and (c) policy change due to policy sub-system internal events and external parameters.

This paper focuses on the determination of data that is related to the production (or not) of policy-oriented learning during the implementation of the policy programme for quality assurance in Greek universities. Consequently, we will focus only on the ACF hypotheses that are related to policy-oriented learning.

Policy oriented learning

Heclo (1974, p. 306) believes that policy-oriented learning refers to relatively enduring alterations of thought or behavioural intentions that result from experience during the implementation of a programme and that are concerned with the attainment (or revision) of policy objectives. Policy-oriented learning also involves perceptions concerning external dynamics and increased knowledge of the state of the specific policy issue parameters and the factors affecting them.

It has to be mentioned, however, that policy-oriented learning is unlikely by itself to significantly alter the core attributes of a policy program. However, it is 'an important process in understanding changes in at least the secondary aspects of governmental action programs and may occasionally even lead to a revision of core aspects in the absence of perturbations from beyond the subsystem' (Sabatier, 1988, p. 149).

However, what can be regarded as policy-oriented learning? Jenkins-Smith and Sabatier say that this acquisition of knowledge concerning a policy program can be a variety of things, such as:

> '(a) improving one's understanding of the state of variables defined as important by one's belief system (or, secondarily, by competing belief systems) […] (b) refining one's understanding of logical and causal relationships internal to a belief system […] (c) identifying and responding to challenges to one's belief system. Exogenous events, a loss of political resources, opponents' activities, or a variety of other factors may force proponents to revise their belief systems by incorporating some new elements' (Jenkins-Smith & Sabatier, 1993, p. 42–43).

The acquisition of (policy) knowledge via political experience can be separated into two categories: (1) policy knowledge that is acquired within an advocacy coalition as a result of the interaction of actors in a political process taking place among the coalition's networks, and (2) the knowledge acquired between the conflicting networks' coalitions. Regarding policy knowledge between conflicting networks' coalitions, there are three basic parameters that affect policy-oriented learning: the level of conflict, the nature of the analytical forum and the analytical tractability of policy issue (Heintz & Jenkins-Smith, 1988; Jenkins- Smith, 1985, 1988).

The general hypotheses that ACF provide us to search for and analyse the existence (or not) of policy-oriented learning during the establishment and implementation of a policy program are:

> '(a) policy-oriented learning across belief systems is most likely when there is an intermediate level of informed conflict between the two coalitions, (b) problems for which accepted quantitative data and theory exist are more conducive to policy-oriented learning across belief systems than those in which data and theory are generally qualitative, quite subjective or altogether lacking, (c) problems involving natural systems are more conducive to policy-oriented learning across belief systems than those involving purely social or political systems because, in the former, many of the critical variables are not themselves active strategists and because controlled experimentation is more feasible and (d) policy-oriented learning across belief systems is most likely when there exists a forum that is prestigious enough to force professionals from different coalitions to participate and when it is dominated by professional norms' (Jenkins-Smith & Sabatier, 1993, p. 50, 52, 54; Sabatier & Jenkins-Smith, 1999, p. 124-125).

As can be seen from both categories, policy-oriented learning results in a change in the belief system of coalitions. In the possible absence of this production, particularly in policy themes that cause considerable tension, we usually have the

phenomenon of a deaf dialogue between competing advocacy coalition networks.

It has to be mentioned, however, that policy-oriented learning is not the only way for a policy change to take place during the establishment and implementation of a policy program in a specific policy subsystem (Heintz, 1988, p. 216). At this point, it is necessary for the understanding and interpretation of the analysis of this paper to depict the ACF view about policy change, although this is not the focus of this paper.

According to ACF, policy change could be understood through two different processes:

– The *first* process is related to the coalitions' efforts from within the subsystem to defend and promote their own belief systems in the policy programs. In this process, a prominent, but not exclusive role is played by the acquisition of policy knowledge via political experience (policy-oriented learning).

– The *second* process could result in policy change by alternations that are external to the subsystem, such as: (1) changes in socioeconomic conditions, (2) changes in public opinion, (3) a change in the systemwide governing coalition, or (4) outputs from other subsystems. Moreover, as Sabatier and Jenkins-Smith state,[5] these non-cognitive opportunities for policy change should be skilfully exploited by the minority coalition if it is to gain power, since the dominant coalition will almost certainly resort to a variety of delaying strategies in an effort to ride out the shock (Sabatier & Jenkins-Smith, 1993, p. 211–236).

Implementation of a quality assurance program in Greek universities and ACF policy-oriented learning

The research was conducted through the lenses of theoretical tools that link policies and procedures with actors and policy networks. In the policy area of education, besides the existence of interests and interest groups, there are powerful value systems and (educational) beliefs that are instrumental in the actions of networks. Therefore, it was necessary that a theoretical tool that could express and analyse the conjunction of interests, values and belief systems be used in this research. In accordance with the ACF, the formation of and interaction between different advocacy coalition networks are not analysed simply in terms of interests and power relations but also in terms of belief systems and values that policy networks possess.

An additional feature that makes the ACF a useful analytical tool in this

5 In a future paper, they also include another non-cognitive change that may cause policy change: 'turnover in personnel constitutes a second non-cognitive source of change that can substantially alter the political resources of various coalitions and thus policy decisions' (Sabatier & Jenkins-Smith, 1999, p. 123).

research topic is that advocacy coalition analysis has often been used when the formation and implementation of a policy program creates tension and conflicts between opposing networks. This is present, as will be highlighted, during the formation and implementation of a quality assurance system in Greek universities.

Quality assurance on a European level

In 1998, the 'Recommendation of the Council of 24th September 1998 on European cooperation in quality assurance in higher education' was published. It recommended that transparent evaluation systems of quality should be supported and created (Official Journal of European Communities, 1998, p. 57–58). Due to this recommendation, the quality assurance of European universities came to the forefront of the European education policy agenda. Moreover, in the Bologna process at the second ministerial communiqué in Prague 2001, there was extensive mention of quality assurance and the ministers 'recognised the vital role that quality assurance systems play in ensuring high quality standards and in facilitating the comparability of qualifications throughout Europe' (Bologna Process, 2001, p. 2).

In the Bergen communiqué of 2005, ministers of education adopted the proposals of the report 'Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)' for the three levels of standards and guidelines on quality assurance that was submitted by the E4 group (Bologna process, 2005, p. 5). The levels of standards and guidelines in the report were internal evaluation, external evaluation and the rules that will condition the creation and operation of the independent national quality assurance agencies.

Quality assurance in the Greek higher education system

The developments in the European Higher Education Area (EHEA) concerning QA put pressure at a national level on the Greek higher education system for the establishment of a quality assurance law. Prior to 2003, an institutionalised evaluation system had not been implemented.[6] In that year, the ministry of education (MoE) published a Draft-Law for the enactment of a quality assurance system (MoE - Draft Law, 2003). The MoE expected to pass the law by the end of 2003, but the reaction among academics along with national elections and a change of administration halted the process.

The efforts of the new administration concentrated on the passing of the law for Quality Assurance in 2005. In essence, this law provides for the implementation of evaluation procedures (as part of a QA system) in two phases, internal and external,

6 Nevertheless, it has to be mentioned that most Greek universities had been evaluated either by the 'Institutional Evaluation Programme (IEP)' by EUA or through other European national evaluation programs.

in Greek higher education institutions every four years. Internal evaluation is carried out by the academic members of each department. A unit of internal evaluation is formed and is responsible for the completion of internal evaluation procedures and the passing on of the internal evaluation report to an independent authority. External evaluation is organised by an independent authority, the Hellenic Quality Assurance Agency for Higher Education (ADIP). A final report on external evaluation then has to be published in accordance with Law 3374/2005. This law was passed in July 2005, despite reactions in universities (Kavasakalis & Stamelos, 2011, p. 38). The law is entirely in accordance with the 'ESG' report and the procedures followed by ENQA.[7]

Methodology

Two methodological tools were used to carry out the wider research. The main methodological tool was the conducting of qualitative semi-structured interviews. These interviews were conducted during 2009, four years after the voting of the specific law (Law 3374/ 2005) and two years after the operation of the independent body responsible for the QA procedures. This was necessary since the beliefs of actors (individual or collective) should be investigated after a period of time has passed from the formation and implementation of the institutionalised QA system in European higher education systems (in early 2000). The analysis of research findings beyond the scope of this paper was completed two years later, at the end of 2011.

The discussion topics of the semi-structured interviews were decided on, taking into consideration issues that resulted from public consultations with regard to the establishment and implementation of a quality assurance policy programme in Greek universities.[8]

Policy discourse analysis also took place for the analysis of the related policy program. In general discourse, analysis is the study of change or the bringing into being of a social reality through the production, distribution and consumption of texts. However, the discourses of policy documents are not neutral. They usually have a hidden relation between proposed policy process and power struggle among actors.[9] This is the reason that policy discourse analysis often focus on points of conflict and change in their field of research, as they are indicators of power relations.

7 The independent authority (ADIP) started its operation two years later, at the end of 2007.

8 The 'axes of discussion' were: the Greek University today; educational policies for the 'European university'; the notion of quality and evaluation of universities; Law 3374/2005; conditions for public dialogue concerning quality assurance in the Greek university, and the way the dialogue was conducted; proposals for a modern Greek university.

9 As Foucault states about power in a policy process: 'power [...] which is assumed to exist universally in a concentrated or diffused form, does not exist. Power exists only when it is put into action, even if, of course, it is integrated into a disparate field of possibilities brought to bear upon permanent structures. This also means that power is not a function of consent' (Foucault, 1982, p. 219–220).

In this research, the analysis of policy documents questioned the specific policy-making processes, the power relations between policy actors (individual or collective) and managed to initially reveal the networks[10] and key-actors that are usually active in the policy subsystem of the Greek university and finally point to the possible shifts and changes of power inside and between active to this policy program networks.

Subsequently, thirty five semi-structured interviews were carried out.[11] From an elaboration of the produced texts, the policy beliefs of each interviewee were structured and categorised. Finally, the composition of the networks' belief systems and the belief systems of the advocacy network coalitions was realised.

Findings

At the beginning of the data analysis, it is necessary to make a general clarification. It is believed that it is not necessary for all actors who belong to a network (or a network coalition) to have identical belief systems. However, the activation of each actor inside a network means that, in general, the belief system of the network expresses him/her. Therefore, we will attempt to determine the common component in the beliefs of our interviewees (who belong to the same network) for the necessary production of each network's beliefs system.

From the research and the initial analysis, it emerged that to the network coalition that is in favour of the specific policy programme belong the classic[12] networks: 'Governmental network' (this network belongs the network of political party New Democracy (ND) and the Ministry of Education, since it is the political authority responsible for the implementation of education policy programmes), 'PASOK', 'INE-GSEE' and 'SEV-IOVE', as well as the key-actors I.21, I.23 and the experts on the specific policy programme (i.e. on quality assurance systems in universities) I.28, I.16. Respectively, to the anti-policy networks' coalition belong the networks 'POSDEP', 'KKE' and 'SYRIZA', as well as the experts I.13 and I.31.

This initial analysis brought to light important differentiations in all categories of the belief systems of the two advocacy coalitions. Moreover, the tension that is

10 Networks active during the quality assurance policy program: 'Rectors' Conference'; 'POSDEP' (Professional and trade union association of the university academic staff); 'AR.SI.' (Left Today); 'GURF' (Greek University Reform Forum); 'Initiative' (Initiative for the reform and upgrade of Greek university); 'KIPAN' (Movement for University Upgrade); 'INE-GSEE' (General Confederation of Workers of Greece with the specialised Institute of Work of GSEE); 'SEV-IOVE' (Hellenic Federation of Enterprises (SEV) and especially its institute of research named Foundation for Economic and Industrial Research - IOVE); and finally the networks of parliamentary political parties in Greece: 'ND' (neo-liberal party); 'PASOK' (socialist party); 'KKE' (Greek communist party); 'SYRIZA' (left wing party).

11 In this paper, the interviewees are referred to as I.1, I.2 etc.

12 Networks active in the subsystem for a much wider period of time than the period in question, which saw the formation and implementation of the quality assurance policy program.

produced concerning beliefs that are related to the European education policies for higher education is exceptionally acute, since these differences appear to go beyond the examined policy theme and acquire a wider ideological background. The wider research also reveals that 'new'[13] networks emerge and become active during the examined period. From the initial analysis of the belief systems of these networks, it appeared that 'GURF', 'KIPAN' and 'Initiative' emerged within the pro-policy coalition, whereas the network 'AR.SI.' played the role of policy broker.[14]

Findings concerning policy-oriented learning within coalitions

A first question concerns the possible connection between the emergence of new networks and the production of (policy) knowledge, mainly within the 'in favour' coalition due to the actions and interactions of new networks' members. To answer this question, a comparison is made of the beliefs system of the 'classic' networks inside this coalition and the beliefs system of the 'new' networks inside the pro-policy coalition. The following table (Table 1) summarises this comparison. It has to be mentioned that none of the 'new' networks possess beliefs that would enable them to act inside the anti-policy coalition. Therefore, there is no need for a similar comparison between 'classic' and 'new' networks within the anti-policy coalition to take place.[15]

13 New networks are those networks that were activated during the specific policy programme: 'GURF' (Greek University Reform Forum); 'Initiative' (Initiative for the reform and upgrade of Greek university); 'KIPAN' (Movement of University Upgrade) and 'AR.SI.' (Left Today).

14 For further study cf. Kavasakalis, 2011, pp. 332–374.

15 Two general remarks that facilitate the reader throughout this part of the paper since it analyses only a part of the wider research:
- Concerning the absence of deep core beliefs: this level of beliefs is largely the product of childhood socialisation, it involves very general normative and ontological assumptions about human nature, fundamental values such as liberty and equality and therefore it is very unlikely to change during the establishment and implementation of a policy program (Leach et al., 2005, p. 192).
- Concerning the notion of quality referred to in the table, Harvey and Green (1993), in their discussion of the relationship between quality and standards in higher education, identify different aspects of quality. These different notions of quality obviously have different implications not only for the methods used to measure quality but also for the beliefs and values concerning the role of university in modern society. Quality as excellence: this notion of quality underpins the elitist view of the high quality of an 'Oxbridge' education, which equates it to excellence and high standards (Harvey & Knight, 1996). Quality as fitness for purpose: this requires that a product or service fulfil customer's needs, requirements or desires. In a university's mission of statement its goals are clarified, and at a lower level these goals are defined in the program's aims. In this notion of quality, universities are required to say what they do, do what they say and then prove it to an external assessor. Quality as value for money: it is a popular notion for quality that equates quality with value for money. Since all public sectors ought to be accountable, this notion gives the right to the state, the major financier of higher education, to demand efficiency and effectiveness. Quality as transformation: in the context of quality in higher education, transformation is not restricted to apparent physical transformation but also to cognitive transcendence with the provider 'doing something to the customer rather than just doing something for the customer' (Harvey & Green, 1993, p. 24).

Table 1. *Comparison of belief systems between 'classic' and 'new' networks within the pro-policy coalition.*

Pro-policy networks' Coalition 'Classic' networks	Pro-policy networks' Coalition 'New' networks
Policy Core Beliefs	
Role and operation of university	
– We have a more democratic institution due to expansion policies. But these policies either had no planning or were implemented under the influence of powerful political pressures. This creates problems such as high economic cost, and in many cases the difficulty for university campus culture to exist – A looser framework-law is needed so that real autonomy and independence become possible – Main characteristics of the university: internalisation, transparency, social accountability, quality assurance – Connection of the university with the needs of society – Autonomy and independence need to be balanced with social accountability	– The university is a public, mass institution and its goal should be its internationalisation and the increase in its flexibility (through institutional changes) – Upgrading the university cannot be combined with the stifling framework-laws and the stranglehold of the ministry – There is no independence today. The university has to be able to make decisions on all issues, and the State has to determine the public finance in connection with certain data, such as the results of evaluation – Increase in public finance in parallel with a change in the financing model – Aid to research with an increase in financing along with simultaneous aid for excellence and competition for the attraction of additional financing
Notion of quality in the university	
– The most powerful version of quality is 'quality as value for money'. Many networks also adhere to the version 'quality as fitness for purpose' – The notion of quality is a complex one since it is related to the overall policy planning of each university. However, this difficulty should not be used as an excuse for not starting evaluation processes – Transparency, promotion of research and excellence are elements of quality	– The difficulty in defining quality is recognised – Versions of quality: 'quality as fitness for purpose' (for the strengthening of university independence and autonomy) and 'quality as value for money' (for more effective investment in universities)
Evaluation and the university	
– In favour of an institutionalised evaluation system, with internal evaluation as an obligatory stage – The most important stage of an evaluation process is the 'after'. Evaluation findings should be used by the ministry and the university so that the evaluation system will not end up being just a formal, bureaucratic process – The university is nowadays a massive, internationalised institution. Therefore, institutionalised evaluation that follows international standards is an important policy tool	– In favour of an institutionalised evaluation system that will be aimed at the improvement of university quality – Evaluation should not just be an idea a theory. It should become a tool for quality assurance in the university and for the identification of problems. It should be, therefore, a tool for the implementation of any education policy – Evaluation should avoid the trap of uniformity and be differentiated depending on the particularities of each higher education institution and each scientific subject/area – The evaluation system should follow international standards and practices

European Education policies in the university	
– The Bologna process and, more generally, European education policies (EEP) 'push' the Greek university towards positive reforms. It is positive that the Greek university attempts, as part of these processes, to follow international developments – EEP result in the internationalisation of the Greek university and research – Due to European education programmes, the Greek university becomes, for the first time, a centre for international research – There are a few negative effects due to EEP, but the balance is positive – The reaction to EEP stems from (a) ideological reasons and (b) incomplete knowledge and analysis of EEP	– The formation of the European Higher Education Area (EHEA) is a significant educational, political, and cultural issue, and Greek universities should participate in its development – Due to EEP, reforms are being promoted such as internationalisation, increase of mobility, and the improvement of the connection between the university, society, and the labour market
European Education policies for Quality Assurance in the university	
– Quality assurance procedures at a European level are a central line of action in the formation of EHEA. They promote co-operation, mobility, and recognition procedures – In addition, the comparable evaluation and quality assurance procedures offer the transmission of valid information about universities and national higher education systems	– The quality assurance line of action in EEP is directly connected to the recognition of degrees or any part of one's studies, and more generally to the transfer of information between universities and European higher education systems
Secondary Beliefs	
Law 3374/2005	
– The Law is, in general, in agreement with the standards and guidelines for quality assurance that have been proposed at Bergen – A basic disadvantage of the Law is that its formation is connected to Greece's international commitments and not to a 'bottom-up' procedure – The Law promotes social accountability and the notion of 'quality as fitness for purpose' along with an initial recording of issues and problems without any sanctions	– The 'new' networks are clearly in favour of the Law and of an institutionalised evaluation system. – The independence of the Hellenic Quality Assurance Agency for Higher Education (ADIP) must be reinforced – In the phase of external evaluation, the presence of an external reviewer from another country should be obligatory
Structures for the concretisation and implementation of the Law	
- The initial phase of implementation has difficulties, a slow pace and many reactions, but the important point is that it has already begun - Reactions to this initial phase are intense and excessive since they stem from ideological and political factors - A 'quality culture' should be present for the effective implementation of the Law – Often, the critique of the material that ADIP has produced, is that it is undertaken without a thorough study of these proposed guidelines and indicators	- The preparation of guidelines and indicators by the ADIP, although essential, presents problems in its implementation. The material is overly detailed, and thus increases bureaucracy and standardisation – The intense reactions are due to political and 'corporate' reasons

From the comparison of core and secondary beliefs between 'classic' and 'new' networks inside the pro-policy coalition, as they are presented in the previous table, it can be seen that there are no considerable changes in the belief systems between the two networks. Therefore, it could be concluded that no refinement of the belief systems takes place due to strategic interaction, and consequently there is a lack of production of policy-oriented learning inside this coalition.

As a result, the appearance of 'new' networks is not related to policy-oriented learning on the specific policy issue. Hence, a further question concerns the reason for the appearance of these networks, and the difference they bring with their activation on the policy issue. An answer to this might be the activation of previously non-activated members of the subsystem due to the continuing intensity and conflict during the establishment and implementation of the policy programme. Indeed, from the analysis of policy documents produced by these networks,[16] it emerges that these new actors decided to act in order to decrease the particular intensity and to strengthen the pro-policy coalition with their activation. Furthermore, some interviewees believe that the activation of these actors was not connected with the refinement of (policy) knowledge but was mainly connected with actions that were related to the decrease of intensity and the change of the political climate in the sub-system:

> 'The trade-union body (POSDEP) with its beliefs and actions has created a climate among many academics that what POSDEP supports and promotes in the public dialogue does not represent them and their beliefs' (I.5 – anti-policy networks' coalition).
>
> 'My opinion is that new networks played an important role in changing the climate inside universities, and they led to developments, which in my opinion, were very positive, as was proved afterwards with the change in the trade-union network' (I.37 – pro-policy networks' coalition).

Findings concerning policy-oriented learning between coalitions

For the research concerning the production of (policy) knowledge

16 Initiative of Academics for the Reform and the Upgrade of the Public University (2007). Conference for the Upgrading of Public Universities: targets and prerequisites: final results (Athens, March 2007); Declaration of 'Initiative' (2007). Declaration of Initiative for the reform and upgrade of the Greek university, Athens, Retrieved June 2009 from http://greek-academics-initiative.blogspot.com/2006/09/blog-post_23.html; Founding declaration of 'KIPAN' (2004). The founding declaration of the Movement for University Upgrade, Athens, Retrieved June 2009 from http://www.ntua.gr/anavathmisi/; KIPAN (2005). Beliefs concerning evaluation, Athens, Retrieved June 2009 from http://www.ntua.gr/anavathmisi/files/08062005 /KIPAN_SxedioTheseon_axiologisi_3_06_05.pdf; Greek University Reform Forum (2005). 'Manifesto' – Initial declaration of the forum: 'A few thoughts on Universities', Retrieved June 2009 from http://www.sci.ccny.cuny.edu/~themis/greekuniversityreform/

between the conflicting network coalitions, the factors that are related to this type of policy-oriented learning were analysed, i.e. the level of conflict, the nature of the analytical forums, and the analytical tractability of policy issue (Heintz & Jenkins-Smith, 1988; Jenkins- Smith, 1985, 1988).

From the data analysis, it may be argued that there was a general lack of dialogue culture, the discussion/debates were usually full of slogans, and remarkably intense. Especially during the period of conflict, opinions that go beyond the logic of conflict were rarely heard. The pro-policy coalition and many policy brokers[17] were of the opinion that the attitude of resistance and not that of likely conciliation was dominant.[18] Indicatively, relevant quotations from the texts that were produced from the analysis of interviews with the corresponding annotation.

The dialogue was full of slogans, claiming that responsibility was of the networks or the media:

> 'I lived through [this] from the inside. It did not surprise or impress me that the dialogue between actors was very intense and superficial' (I.32 – 'governmental' network).
>
> 'Systematic, devastating propaganda by the Media which systematically discredits the public university has been continuously present since the '80's whenever there is public dialogue concerning a university-related theme. The media have no scientific approach to policy actions connected with the Bologna process and more generally with the European university' (I.24 – 'POSDEP').

Lack of dialogue culture and culture of synthesis/formation of education policy:

> 'Social dialogue is usually a line of parallel monologues. This is a conclusion formed by someone studying what has been written in the past few years by academics on issues concerning policies for universities. [But] public dialogue ought to follow the notion of synthesis' (I.12 – 'INE-GSEE').
>
> 'I have the feeling that we do not know anything about education policy.

17 *Policy brokers*. In a policy program where conflicting coalition networks are active, as Sabatier says 'there will almost certainly be a category of actors (here termed 'policy brokers') whose dominant concern is with keeping the level of political conflict within acceptable limits and with reaching some 'reasonable' solution to the problem. […] The distinction between 'advocate' and 'broker' is, however, a continuum. Many brokers will have some policy bent, while advocates may show some serious concern with system maintenance' (Sabatier, 1988, p. 141).

18 As an example, see a few related articles in Greek newspapers: (Koumantos, 2005; Lavdas, 2005; Maistros, 2005; Markatos, 2005; Milonakis, 2005; Theotokas, 2005; Venieris, 2005; Xrysochoou, 2006).

> I have to mention that, after all this tension, no representative from any political party came to discuss and analyse the policy subject with us. […] Therefore, there was no real dialogue and analysis' (I.10 – 'Rectors' Conference').

The logic of resistance and not of synthesis was dominant in the public debates:

> 'Resistance always exists. It says that you may change but without disturbing anything. This is, I believe, due to the lack of real dialogue inside universities about the needs that lead to these changes' (I.8 – 'AR.SI.').
>
> 'Have you heard 'POSDEP' say yes to any change? I do not believe that there is in the area of the university a more conservative force […] I felt offended when I heard [central actors of POSDEP] playing the role of academics' representatives and saying things that were from the 18th century' (I.4 – 'governmental' network).

Consequently, the above findings, in combination with the wider intense conflict between the two coalitions, lead to the conclusion that the conditions for public dialogue did not facilitate the production of policy-oriented learning between the conflicting network coalitions.

From the research and data analysis on the nature and characteristics of the analytical forums that took place during this policy issue, it appears that: (i) in the debates on official dialogue there was a considerable homogeneity of beliefs between the networks that ultimately participated in the official dialogue and (ii) in the 'open' forums intense conflict was usually present. As a result, no new (policy) knowledge capable of influencing the developments in the specific policy issue was produced.

Characteristically, two of our interviewees said:

> 'Public dialogue has many levels: the official level, the level of the Rectors' Conference, the level of the academic community and finally the level of the general, open public debates. I know that inside all universities at the Senate level, and in certain universities also at other levels, such discussions took place. There was also discussion in the trade-union body (POSDEP). […] Whether there was a considerable production of new ideas is questionable. But, even if some ideas/proposals have been produced, it is also [questionable] whether the government took them into account' (I.9 – 'KIPAN').
>
> 'I have also signed various documents (texts), as my other colleagues did, in an institutional context. I also signed some texts that I considered to be close to my opinions. But however positive these movements/

> actions were (as they were good for achieving a conciliatory perception and attitude in the things that we discuss) I do not know if there was a positive enough environment for them to result in a synthesis' (I.22 – 'Rectors' Conference').

Finally, from data analysis on the particular characteristics of the policy issue itself (the analytical tractability of the issue), it emerged that the notion of quality central to the policy issue is a multilevel and abstract notion. Furthermore, the theoretical discussion on this notion is encountered as an especially complex discussion. In addition, the discussions and analyses with regard to the values that the university as an institution should serve as well as its role in modern society appeared to have only qualitative and multidimensional characteristics. Moreover, these discussions conceal and include an intense ideological background. This creates unfavourable conditions for the production of scientific analysis and conclusions relevant to the subparts that compose the specific policy issue.

Indicatively, two quotations concerning the analytical tractability of the policy issue:

> 'The usual reply [when there is a discussion about evaluation]: who will be the one that will evaluate me, when I have 10-12 years' service in this institution […] As you may understand a climate, a perception and more generally a mentality exists among a percentage of academics that creates negative conditions [for evaluation processes]' (I.22 – 'Rectors' Conference').
>
> 'And because they cannot formulate their positions with regard to this [the defence of vested interests], what do they present as a serious argument in public dialogue? They invoke some values that are supposedly under pressure, or in danger due to the proposed changes [of the policy programme]. As a result, we are led into a dialogue that has nothing to do with the substance of the policy programme' (I.29 – 'SEV-IOVE').

Conclusions

From the previous analysis, a few conclusions could be summarised:

1) The conditions for public dialogue concerning the QA policy program in Greek universities did not facilitate the production of (policy) knowledge. As has been shown, a lack of dialogue culture was permanently present, and the debates concerning the QA program were usually full of slogans and tensions.
2) The activation of 'new' networks during the establishment and implementation of the QA program in Greek universities took place without the

production of policy-oriented learning. This activation seemed to be a reaction to, in their opinion, inflexible and dead-end policy practices of the anti-policy networks' coalition and simultaneously seemed to be related to the growth of the strategic movements of networks inside the pro-policy coalition, aimed at the inversion of forces and power correlations in the policy subsystem of the Greek university.

3) The analytical tractability of the policy issue related to the QA policy program is rather low: the notion of quality, central to this program is a multi-level and abstract notion, the discussions and analysis concerning the values and the modern role of the university appeared to have only qualitative and multidimensional characteristics. Moreover, the specific policy issue has an intense ideological background. And as Jenkins-Smith says:

'[When the] analysis is subject to a great deal of uncertainty, and not surprisingly different analysts are prone to provide estimates and analytical conclusions quite at variance with one another [and in general] the less well developed an area of inquiry, the more elusive the necessary data, and (above all) the weaker the agreement on theory and data, the greater the analytical intractability. Such intractability, in turn, admits a greater degree of analytically plausible difference of opinion among analysts' (Jenkins-Smith, 1988, p. 194).

Therefore, as has been shown in this paper, the formation and implementation of a policy program (in our case the QA program in Greek universities) without the parallel production of policy-oriented learning inside or between the opposing advocacy coalition networks takes place under certain conditions. Given this finding, certain questions emerge: what is the meaning and the result for the relationship between policy and society when there is an absence of policy-oriented learning along with the policy changes that result from the formation and implementation of a new policy program? Could this perhaps be an indication of a mismatch between society and political word? Could this be related (as an example) to the social crisis and social political delegitimisation that we are experiencing today? These wider issues ought to be investigated in the future.

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Warburton, N. (2012). Vprašanje umetnosti [The Art Question][1]. Afterword study by Marjan Šimenc. Ljubljana: Sophia. 158 p., ISBN 978-961-6768-48-1.

Reviewed by Blaž Zabel[2]

Nigel Warburton is a philosopher, best known for his work in the popularisation of philosophy across the globe. The podcast series he made with David Edmonds, *Philosophy Bites*, publishing interviews with some of the most noted philosophers of our time, was a monumental success – as were many of his other written works, especially *Philosophy: The Basics, Philosophy: The Classics and Thinking from A to Z*. Besides the extensive work he has done for the promotion of philosophy, Nigel Warburton is also an influential author for art theory and history, specialising in photography and architecture; he has written about Ernö Goldfinger in his book *Ernö Goldfinger: The Life of An Architect* and edited a book about the photographer Bill Brandt. *The Art Question* is his attempt to summarise the analytical tradition of modern art theory. At the same time, however, the author builds, with different comments and critical remarks, his own standpoint. His own contribution to art theory is clearly explicated in the last chapter.

In his work, Nigel Warburton is interested in the question: 'What is art?' The question is, he adds, equally important for the aesthetics of the 20th century as well as for artists and art itself. Already in the introduction, he contradictorily remarks that the question of art is more in the domain of philosophy than in the domain of arts. He even hints that the sole question is worth tackling simply because it is a complicated one. This position can be followed throughout his book: while the author investigates different aesthetic theories and even interprets different art works with their help, he constantly provides counter-examples to prove them wrong, stating that art is not something theory can fully embrace and define.

The Art Question is divided into five chapters, each devoted to a certain theoretical aspect in the history of aesthetics. The first chapter is devoted to the formalist theory of Clive Bell, which argues that the form of the picture is essential for its aesthetic value and experience. In the second chapter, Warburton analyses the expressive theory of art as introduced by R. G. Collingwood. The third chapter examines the idea that the concept of art bears so-called family

1 Translation of the original Warburton, N. (2003). The Art Question. London: Routledge.

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resemblance, an idea introduced by Ludwig Wittgenstein. The idea of family resemblance signifies that there is no actual rule to describe all the forms of art and all the artistic objects, but each of them must have at least one resemblance to at least one other. In the fourth chapter, the author analyses the well-known institutional theory of art, which was introduced by philosopher George Dickie, who stated, that 'a work of art in the classificatory sense is 1) an artefact 2) upon which some person or persons acting on behalf of a certain social institution (the art world) has conferred the status of candidate for appreciation'. This eventually means that everything can be presented as art, as long as the 'the art world' accepts it as such.

The most intriguing part of the book is by all means the last chapter, which contains Warburton's own contribution to the theoretical discourse about art. He would suggest that it is not possible to define art, since all works of art do not have even one collective characteristic. However, the definition of art is still useful for three reasons: it helps us discuss borderline examples, it helps us understand why something was declared art in the past, and finally, it shows which objects will satisfy us if we pay particular attention to this particular object. The author tries to demonstrate his hypothesis with comparison of two photographers, Cindy Sherman and Stuart Franklin. While Sherman has been accepted into art canon as an artist, Franklin is regarded more as an esteemed journalist photographer. Their photographs are labelled differently, although there is no definable difference between them. What Nigel Warburton suggests in *The Art Question* is that we ought to stop searching for an absolute definition of art but rather try to discuss particular works of art. We should be interested in real artistic work rather than in the general idea of art that is detached from artistic objects.

This position, however, is in itself contradictory. While Warburton argues that the absolute definition of art is not possible, he proposes just such a definition. If he says that 'no definition is possible', his position is in the same way total and all-embracing as the absolute definition of art. He assumes the same logic as all of the theoreticians he tries to oppose. The assertion 'there is no possible definition of art' is in no way different from any other definition, as it is in the same way absolute and should apply to all possible examples. This fallacy can be certified by analysing the author's methodological approach. Following Jakobson's communication model, we can understand different approaches to art in the following schematic: author–work–context–audience. For instance, to oppose Dickie's institutional theory, Warburton provides the example of outsider art, which is produced outside the art world. This argument clearly focuses on the author's production and intention, and on the aesthetic

characteristics of the work itself, while forgetting the reception of the artwork. Outsider art might truly be produced and exist outside all the artistic institutions, but its reception is dependent on them. What Nigel Warburton is doing is to think about the art as it is on itself; in other words, he talks about the general idea of art (which is in his opinion impossible to define). In all of his arguments, he is stating that art is just art, without production, reception, context etc. In this way, he assumes the art as an idea while trying to argue against it. Or, as said above, he is opposing the theoretical definition of art while stating his own theoretical definition of art.

Moreover, the equalisation between the theory and the definition Warburton (unconsciously?) applies bears heavy consequences. Arguing that the main purpose of theory, in this case, art theory, is to propose a definition, is a grave diminution of theory itself. Accepting the position that theory is not necessary for understanding of art might result in a 'passive approach' to art (a term used by Terry Eagleton for literature), since theory is always a part of understanding of artistic objects. It may not be the only way of its understanding, but it plays and has always played a vital role. Arguing that theory is talking only about the definition of art or the general idea of art is simply not tenable. It can be plausible only if we falsely assume that the sole purpose of art theory is to find some absolute and general rule about art. But theory is, as Nigel Warburton demonstrates throughout his discussion about different aesthetic theories, much more than that. It is a way of thinking about art, a way of understanding and comprehending different artistic objects, a way in which we interpret them. Thus, Warburton's call to focus on particular works of art should not exclude art theory but rather include it.

Nevertheless, *The Art Question* brings us, in a highly understandable and readable form, a survey of some of the most notable aesthetic theories of our century, which are constantly questioned and challenged by critical commentaries. Furthermore, every theory and their problematic aspects are well demonstrated with different art works from the same period. However, Warburton's own theoretical contribution, while equally readable and comprehensible, is much less plausible. First, the author is unclear about what art theory actually is, as it sometimes seems it is nothing more than defining what art is. Second, his argument that it is not possible to define art is made from the same absolute position he is trying to oppose. He urges us to start discussing particular works of art, but at the same time assumes the opposite, the absolute and general idea of art.

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Vol.3 | No3 | Year 2013

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ISSN 1855-9719