Ἔχεις μοι εἰπεῖν, ὦ Σώκρατες, ἄρα διδακτὸν ἢ ἀρετή; ἢ οὐ διδακτὸν ἄλλ’ ἁσκητὸν; ἢ οὔτε ἁσκητὸν οὔτε μαθητὸν, ἄλλὰ φύσει παραγίγνεται τῶς ἄνθρωπος ἢ ἄλλω τινὶ τρόπῳ

A National and International Interdisciplinary Forum for Scholars, Academics, Researchers and Educators from a wide range of fields related to Educational Studies

DOUBLE ASSIGNMENT IN TEACHER EDUCATION: A NECESSITY TO ADDRESS THE GLOBAL CHALLENGES

3rd Thematic Issue
Florina, November 2018
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INTRODUCTION

Our contemporary world is confronted with huge challenges, for example, issues related to climate change, food and health care for all, shortages of clean water, polluted agricultural land, or risks related to biofuels, modern genetics and gene technology. There are obviously no simple solutions to these complicated problems. “The key questions are: How can we confront such gigantic global challenges? What about global justice, equity, equality, and social righteousness? Where can we find solutions to these issues? Are there any possible solutions to be found? How could we approach, and understand the complexity of these questions? Where are the feasible potentials to be found?” (Fritzen & Tapola, 2009, p. 17)

It is considered that some ways out of the challenges may be found within education. We need to cultivate teachers who, in turn, can coach a future generation that will feel responsible for nature and other human beings (Narvaez, 2006). However, since contemporary global challenges most likely also need to be addressed in political arenas, and not least through human behaviour and human action, it is not sufficient to merely rely on various types of subject matter education. The potentials of understanding the global challenges are to be found in the fact that moral and/or democratic dimensions may be linked to subject matters. If we are to find sustainable solutions to these challenges, these solutions probably require subject matter knowledge, a moral compass, and political will. Integration of subject matter and moral aspects in education is sometimes referred to as ‘the double assignment’ (Tapola & Fritzen, 2010), which is supposedly a central task for all teachers (Oser, 1994). “It can be understood as the assignment to communicate knowledge about subject matter and to contribute to the moral upbringing of the learners. Since all professional teachers become qualified via formal teacher education, we have reason to assume that teacher education include training in how to perform this double assignment.” (Fritzen & Tapola, 2009, p. 18)

The Linnaeus Project, an international project organised by the Linnaeus University in Sweden, focused on research issues related to the preconditions within teacher education concerning the double assignment. Researchers from seven European countries (Austria, Cyprus, Germany, Greece, Norway, Sweden, and Switzerland) participated in this project. This special issue of Menon originated from the Linnaeus Project. It will present several research studies which were conducted within the Linnaeus Project.

The authors explore the preconditions for the double assignment in teacher education from different perspectives. All chapters have undergone internal peer review, and some were also presented at international educational conferences. This special issue is useful for researchers, methodologists, students, and practitioners from different disciplines with an interest in the integration of moral and epistemological aims, the moral dimension of teaching, and socio-scientific learning.

Alfred Weinberger reports about a study which aims to explore the significance of the moral dimension as a precondition for the double assignment in school and teacher education. Based on a literature review the results reveal that the moral dimension is neglected or rarely implemented. Thus, the double assignment is not put into practice mainly due to the crowded curricula which focus on knowledge. Given the curricular conditions, the author concludes that
one possibility to foster the moral dimension is to combine moral education and knowledge acquisition in teacher education using appropriate didactical approaches. He suggests the constructivist approach VaKE (Values and Knowledge Education) for the double assignment in teacher education.

Toft et al. explore the field of genetics and gene technology as an example of a key challenge to humanity. Based on an extensive literature search about the advantages and risks of this field they argue that questions related to genetics and gene technology only can be solved by taking into account necessary knowledge and the ability to identify and reveal the underpinning values. Toft et al. show by using the example of genetics and gene technology that a precondition for the double assignment in teacher education is the awareness of the complexity inherent to the key challenges to humanity which involve moral and epistemological issues.

Saether et al. reports about a theoretical study on didactical strategies used when dealing with genetics and gene technology in biology. The authors claim that a precondition for the double assignment is collaboration and interchange between different fields or disciplines of knowledge. They introduce four theoretical-didactic strategies derived from their analysis for dealing with the “double assignment”. They claim that the student who is equipping himself or herself to be a teacher should be familiar with the principles of this model to understand more of what the “double assignment” is about in theory and practice. This understanding is seen as a precondition for relevant teacher education in this context.

The second article by Saether et al. reports about a qualitative and interpretatively-oriented meta-analysis of textbook analyses on genetics. The authors aimed to bring to light the underlying discourses of these analyses, which they have described as more or less hidden educational strategies or curricula. The focus was not on the intentions of the researchers who performed the textbook analysis. Saether’s et al. meta-analysis is based on their model of didactical strategies they described in the third article in this special issue. By demonstrating that each of the research reports can be analysed from the perspective of this model, they want to give those who are preparing to become teachers a vocabulary to grasp some of the challenges of what is called the “double assignment”. They see this vocabulary and its corresponding concepts as prerequisites for pre-service teachers.

Dimitriadou et al. report about a qualitatively oriented study which aimed to examine the ways and the degree to which Greek teachers would be willing to integrate issues of food security in their teaching practices, especially regarding bio-fuels. This presumptive willingness of teachers can be considered as a precondition that highlights the teachers’ eagerness to respond – at least regarding the specific issue – to the double assignment of school. Based on the results of a content analysis and a discourse analysis of responses to focus group interviews the authors conclude that the teachers acknowledge the need to introduce the subject of food security and the bio-fuel issue in teaching. However, the results also reveal that they do not feel prepared adequately to teach it, and they do not assume responsibility for its integration into the instruction. The authors suggest a process of critical reflection which could allow the teachers to implement their values of high-quality instruction to students and start seeking ways to bring about change. They further suggest integrative approaches which could break the traditional boundaries between the subject matters and
moral and democratic education.

Nussbaumer et al. present in their theoretical paper the constructivist approach VaKE (Values and Knowledge Education) as one possible means to achieve the double assignment in teacher education. The paper aims at analysing the preconditions for performing VaKE. Based on theoretical reflections and experiences in teacher training, the authors discuss the different roles of the teacher in VaKE and possible problems and their solutions when implementing VaKE. They conclude that if these preconditions are met, it is possible to integrate the requirements of the double assignment through VaKE in teacher education successfully.

The paper of Latzko et. al. aims at contributing to food security by investigating and educating teacher’s professional ethos which includes food security as a domain of teachers’ professional ethos. By investigating new domains of teachers’ professional ethos with respect to successfully addressing issues of food security, this contribution emphasises the need to integrate moral and democratic aspects into subject matters as conceptualized by the double assignment, and as well as the need to revisit and adapt the concept of teachers’ professional ethos to current challenges.

REFERENCES

The Editors of the 3rd Thematic Issue

Brigitte Latzko
Prof., University of Leipzig, Department of Education

Alfred Weinberger
Prof., Private University of Education of the Diocese of Linz, Austria
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ABSTRACT

The double assignment stresses the notion that teachers should integrate moral aspects in subject matter education. This study aims at exploring the role of the moral dimension of teaching as a precondition for the double assignment in teacher education. Based on a literature review the findings reveal that teachers value the moral dimension of teaching highly but teacher education and school rarely address moral goals due to the crowded curriculum. It is claimed that given the curricular circumstances teachers need to be equipped with didactical approaches that provide the possibility to combine moral and knowledge education.

Keywords: double assignment, moral education, VaKE, values and knowledge education

1. INTRODUCTION

The primary task of the teachers is twofold: They are expected to endow their students with knowledge and skills, and they have to provide moral education to support the moral upbringing of their students and to educate them. Regarding teacher education, such an approach is related to what is sometimes called the teachers’ double assignment (Tapola & Fritzén, 2010). The double assignment refers to the integration of moral and democratic aspects to subject matter education. It stresses the notion that a professional education of teachers must seek a balance, giving adequate attention to all dimensions of practice, the cognitive, the moral, and the practical (Oser, Dick, & Patry, 1994; Shulman, 2005; Terhart, 2007). Due to the significance of the double assignment for a professional education, it may be assumed that, during their education, pre-service and in-service teachers alike develop theoretical insights and practical skills that address the double assignment. The question arises whether teachers are prepared for the double assignment. Particularly, it is of interest whether they are prepared for the moral dimension of teaching since teaching is considered a moral endeavour (e.g. Biesta, 2010; Bullough, 2011; Campbell, 2003; Goodlad, Soder & Sirotnik, 1990; Hansen, 1998; Mahoney, 2009; Oser, 1994; Saether, Patry, & Skrunes, 2014; Schulz, 2014; Tom, 1984). The moral dimension of teaching involves two aspects: (1) the teacher’s moral norms underlying his or her actions (e.g., his or her conduct) and (2) moral education (Fenstermacher, Osguthorpe, & Sanger, 2009; Terhart, 2007). Both aspects overlap since teachers who are concerned with moral conduct cannot avoid the possibility of being taken as a moral model which is a means of moral education (see e.g. Noddings, 2010; Lickona, 2004). In this paper the terms “moral” and “morality”
refer to moral values (e.g., justice, care, truthfulness) which underlie our actions; the term “ethics” refers to the reflection on the moral values which underlie our actions (see Gert, 2017).

The study aims at exploring the significance of the moral dimension of teaching (MD). The following research questions guide the study:

1. How is MD addressed in teacher education?
2. How is MD addressed in school?

2. METHOD

The research questions were examined by conducting a literature review of relevant studies of the last 20 years. The literature review consisted of several steps. First, a systematic query using online database services, such as ERIC, PsycINFO and the German database FIS Pädagogik was conducted. The input keywords for the internet search were: moral, moral education, character education, ethics, values and moral education. These descriptors were combined with terms such as curriculum, teacher education, primary education or secondary education. Second, review articles and theoretical overviews of MD in books were gathered to check the reference (“snowball method”). Finally, relevant journals (e.g., Journal of Moral Education, Teaching and Teacher Education) were screened. The result of these queries yielded more than 140 studies which were selected according to their relevance to answer the research questions. Several inclusion criteria were applied to determine the relevance of the potential studies to the issues of this research. First, the study had to address the central issue of this investigation (role of MD in teacher education or primary and secondary education). Second, the study had to report on empirical results. Third, the study had to be peer-reviewed. Finally, the study had to give an insight into MD in different countries.

As a first and remarkable result of this literature review, only 18 articles were found which described empirical studies. The following section begins with a summary of each study’s method and primary results. Then the studies will be viewed as a whole, and common issues are discussed. The article concludes with implications for teacher education.

3. RESULTS

3.1 The moral dimension of teaching in teacher education

Ten studies examined whether MD is addressed in teacher education. Most of the studies (6) applied a qualitative research method, three studies are quantitatively based large-scale surveys, and one study applied qualitative and quantitative methods (see table 1).

Ryan and Bohlin (1999; Jones, Ryan, & Bohlin, 1998) report about a survey of 600 randomly chosen deans and department chairs from a list of 1,326 teacher education programs in the United States. The study aimed at understanding how the participants perceived the role of MD in teacher education. Educators from 212 schools returned the surveys. The first finding emphasizes the importance of MD. More than 91% of the respondents agreed that core values should be taught in teacher
education programmes. As one dean from California wrote:

Character education is a topic which concerns me deeply. Teachers must be able to model those character qualities which students need to develop. The survival of civilisation depends upon individual citizens choosing to exhibit character qualities which take into consideration ... the value of others. (Jones, Ryan, & Bohlin, 1998, p. 16)

The second finding shows that there exists a gap between rhetoric and reality. Only 24% of the participants reported that MD is highly emphasised within their program offerings. 35% said that MD is highly emphasised informally in areas such as forums, lectures, and ceremonies. Only 13% were satisfied with their institution's efforts to address MD. Moreover, 81% of the respondents stated that the full curriculum is the main hindrance to include MD into coursework. According to the authors, addressing MD is mostly the result of isolated efforts by individual professors.

Revell and Arthur (2007) explored the attitudes of pre-service teachers in England towards MD and their experience of MD in their teacher training courses and their practical school training. Questionnaires were given to two whole cohorts of student teachers (N = 1013) at the beginning and the end of their initial teacher education courses in both primary and secondary programmes in an Anglican and secular/urban university. Revell and Arthur report that the data of the study reveal contradictory relationships between the pre-service teachers' expectations and experiences of their courses and their training in this area. 97% of the respondents said that they expected their course to teach them how to affect learners' behaviour, and 82% said that they expected their course to teach them how to encourage students to behave and act appropriately. Fewer, 54% students from the urban/secular university, compared with their peers 75% at the Anglican university, expected their course to teach them about MD. However, only 34% said that the courses prepared them to develop and influence students' values. 61% said that pre-service teachers should have more input on the topic of influencing students' values. 8% said that they expected their practical training at schools to include this area, yet it was perceived as peripheral to their training. The second contradictory relationship highlighted by the data was the tension between the pre-service teachers' understanding of the moral nature of teaching and their willingness to act on that understanding. The majority of pre-service teachers believed that teaching is a moral endeavour, that teachers have a responsibility to influence the values and behaviour of pupils, and that they should be role models of their pupils. At the same time most believed that the role of the teacher in the context of a moral education lesson is to encourage students to reach their conclusions rather than conclusions that were sympathetic to those held by the school. Revell and Arthur conclude that this option suggests that students believed that it is not the job of the teacher to influence student's behaviour or values unless school rules were breached.

Zia (2007) analysed the curricular objectives of 44 public colleges of teacher education in Pakistan. Zia reports that the results of the content analysis indicate that all of the 25 BEd courses on offer were
reasonably high in subject-area content and pedagogical skills, as specified in the stated aims of the course. 11 of all 25 courses rated "low" in referring to MD-related aims while only two courses "Islamiyat (Islamic education) and Professional Ethics" and "Teaching of Social Studies" rated fairly high in specifying moral objectives. The 20 MEd courses laid even less emphasis on MD or values such as democracy, citizenship, peace or justice. All courses rated "high" for content related objectives, most (18) also rated high on skill-related objectives, while only one rated "high" in MD-related objectives (Islamic System of Education). 11 courses rated low in stating moral objectives, while eight offer no moral aims at all in their statement of objectives. Objectives relating to the inculcation of values, as specified above, were either rare or non-existent. No specific courses were offered in morality (except one grouped with Islamic Education) or in moral education. Where the objectives were stated, they tended to be confused.

Campbell (2008) reports on a qualitative study which explored, if, how and to which degree experiences in teacher education programs contribute to an appreciation of MD on the part of pre-service teachers and beginning teachers in five different faculties of education in Canada. She gathered data from documentary analyses (e.g., course syllabi) and conducted semi-structured interviews with 45 pre-service teachers and 15 beginning teachers. The data reveal that pre-service teachers received minimal if any, specific education or training in MD. If such issues were mentioned in their courses, the participants claimed, that the treatment of the area was brief, vague and inconsequential to their teaching practice. If MD was mentioned in the programmes at all, it occurred within a broader context of legal requirements and restrictions without an accompanying application of such standards to the actual realities of teaching. Pre-service teachers want to learn about methods of moral education. A significant number of pre-service teachers reported that they witnessed unprofessional and sometimes harmful conduct on the part of their supervising teachers. Efforts to address these "negative role modelling"-experiences upon returning to their teacher education programmes were silenced or ignored.

Willemsse, Lunenberg, and Korthagen (2008) report on a qualitative study of the actual practices on implementing MD of 54 teacher educators within one institution in the Netherlands. This institution emphasises MD according to the general program goals. Nine teacher educators were studied in detail. The teachers were encouraged to make their values explicit and to explain how they put them into practice. Data were mainly gathered from interviews. A remarkable finding of the study is the large number and wide range of values that the data provided. The views of teacher educators concerning the various values appear to differ widely. The results reveal that addressing MD is mostly an individual concern. Teacher educators were particularly likely to practice their values during "moments related to subject matter", during the "supervision of individual student teachers", and during "visiting student teachers during their teaching practice in school" (Willemsse et al., 2008, p. 455). The preparation of pre-service teachers for MD is not implemented in a planned and conscious way. Teacher educators apparently consider
their attitudes and availability as essential aspects of how they express their values.

Krattenmacher, Brühwiler, Oser, and Biedermann (2010) explored the curricula (724 modules) of 15 universities of teacher education in Switzerland aiming to explore the general pedagogical topics which refer to MD. They analysed the curricula using a coding system which consisted of 13 main categories. Their findings indicate that MD is seldom a topic in the curricula. The category “values and moral education” is one of five subcategories of the main category “philosophy of education” which covers 10% of all general pedagogical topics. Within the main category “lesson orientation” only 7% of all topics refer to the subcategory “moral responsibility against students”. There is no topic which points to the teacher’s moral conduct.

Zhu (2010) conducted a case study on teacher educators’ professional development in the context of national curriculum reform in China. The study illustrates the current curriculum of teacher education and highlights significant teacher educators’ professional practices. Data were collected from the faculty, administrators, and pre-service teachers of a national university in China. The study is comprised of five in-depth interviews with faculty and administrators, and one focus group of 12 gender-balanced pre-service teachers. According to Zhu one important finding indicates a deep gap between the ideals of the teacher educators and the reality of professional development. All teacher educators believed in the power of their modelling in morality and scholarship, but few were able to practice what they preach due to the market-oriented curriculum. Zhu concludes that the heavy pressure imposed by evaluation leaves the teacher educators little time for implementing MD and consequently, pre-service teachers are ignored.

Boon (2011) explored in one Australian university pre-service teachers’ (N = 86) perceptions of MD by using a questionnaire with closed and one open-ended question. Additionally, the author examined the content of MD in the curriculum of this university. The survey results show that pre-service teachers “reported a critical need for instruction and training in ethics” and “the uncertainty pre-service teachers experience about ethics” (Boon, 2011, p. 85). The analysis of the curriculum reveals that MD is not taught explicitly at any particular year level. Only in a few elective courses MD was found to be taught explicitly. Boon further reports that the participants of her study stress the significance of context-based and practical scenarios when asked how they wanted MD to be taught.

Lohmann, Seidel, and Terhart (2011) analysed the curricula of 10 universities of teacher education in Germany about their educational themes and topics. The results of the content analysis indicate that “values, norms and reasoning” are rarely themes of the curricula. In eight universities MD was missing. In the two remaining universities, it was mentioned at a highly similar level. Themes like “democratic education” or “education for autonomy” are almost missing in the curricula and if they are mentioned these courses are elective. The authors conclude that MD is rarely a topic of the curriculum.

Maxwell et al. (2016) explored how teacher educators perceive MD as an aspect
of pre-service teacher education, what institutional factors impede the implementation of dedicated courses on MD, and what the objectives of dedicated MD-related courses for teacher candidates are. By way of an online survey, the researchers gathered data from 217 academic unit heads and teacher educators of five countries (Australia, Canada, England, Netherlands, and the USA). Additionally, they conducted a manual academic calendar search for teacher education institutions in Australia, Canada, and the United States through institutional websites. The findings of their study reveal that more than 90% of the participants consider MD to be an essential aspect of the teacher education curriculum. Only 22% of all programs had at least one mandatory course in MD, dealing with ethics, moral values, and morality which “provides evidence that existing ITE [initial teacher education] program structures are to some extent out of step with teacher educators’ beliefs about the potential contribution of ethics content and curriculum to the college-based education of future teachers” (Maxwell et al., 2016, p. 148). The obstacles standing in the way of implementing MD by teacher educators are very practical ones, relating to time constraint on program schedules.

### Table 1: The moral dimension of teaching (MD) in teacher education

<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Country</th>
<th>Research design</th>
<th>Participants</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones et al. (1998), Ryan et al. (1999)</td>
<td>Practice</td>
<td>USA</td>
<td>Survey (questionnaires)</td>
<td>212 deans and department chairs</td>
<td>MD is considered as very important. MD is barely implemented in the coursework. MD is addressed based on individual commitment.</td>
</tr>
<tr>
<td>Revell et al. (2007)</td>
<td>Curriculum, practice and practical school training (Anglican and secular institutions)</td>
<td>GB</td>
<td>Survey (questionnaires)</td>
<td>1013 pre-service teachers of two institutions</td>
<td>High expectations towards MD (particularly in the Anglican institution). MD is seldom part of the coursework. MD is absent from the curriculum. MD is peripheral to practical school training. Relativistic conception of values.</td>
</tr>
<tr>
<td>Zia (2007)</td>
<td>Curriculum</td>
<td>PK</td>
<td>Document analysis</td>
<td>44 public colleges</td>
<td>Less than half of all BEd-courses rate low in referring to MD (except religious subjects). MEd-courses lay even less emphasis on MD.</td>
</tr>
<tr>
<td>Campbell (2008)</td>
<td>Practice and practical school</td>
<td>CA</td>
<td>Document analysis and survey (interviews)</td>
<td>45 pre-service teachers and 15 beginning teachers</td>
<td>Pre-service teachers are not prepared for MD. Pre-service teachers witness harmful conduct in their...</td>
</tr>
</tbody>
</table>
3.2 The moral dimension of teaching in primary and in secondary education

The eight studies resulting from the literature review investigated how MD is addressed in the curriculum and practice in primary and in secondary education. Four studies used interviews as data collection method, one study employed a multi-method design (questionnaires, group interviews, and panel discussions), and two studies applied questionnaires (see table 2).

Tatto, Arellano, Uribe, Varela, and Rodriguez (2001) explored the views on MD of 309 Mexican front-line educators, leaders, and intellectuals who have a record of accomplishment in the field of MD. The
researchers gathered data by using questionnaires. The main finding of their study concerning the research questions of this literature review reveals that respondents ascribe high importance to MD in schools. They stated that close to 25% of the school budget (money, time, and effort) should be contained in specific lessons for MD, and close to 45% of the school budget should be contained in integrated lessons across the curriculum. Further, 67% of the respondents agreed that MD should be integrated throughout the curriculum rather than taught in separate subjects; and 55% supported teaching a standard curriculum for MD. According to the opinion of one-third of the respondents, primary-level children should receive the most exposure to MD another one-third also emphasised the need for pre-service teachers and in-service teachers to be among those who should receive the most exposure. These were followed by students at the middle-school level. 75% of the respondents consider the home and the family as the centre of values formation.

Klaassen (2002) conducted a qualitative study aiming to explore the views of Dutch school teachers on their pedagogical responsibilities. The methods consisted of in-depth one-to-one and group interviews with 15 high school teachers and 34 elementary school teachers. The results show that most of the teachers investigated state that both the pedagogical and moral aspects of teaching are an essential part of their everyday task. However, they reported having troubles in dealing with moral incidents or moral dilemmas in the class. Klaassen reports about teachers not knowing how to deal with these situations.

Klaassen concludes that the teachers appear to be insufficiently equipped for MD. Teachers, in general, avoid moral discussions in classes and talking about norms and values means a danger of moralising for them. They reported that they try to avoid unduly influencing the choices of young people for fear of indoctrination or moral dogmatism. Therefore, they tend to adopt a neo-liberal point of view and think of values as lying mainly in the domain of personal choice. Some of the teachers who participated in the study saw the moral task as a precondition for the cognitive part of their task. Morality and a moral climate were considered as the base to achieve other (cognitive) objectives. The intrinsic educational merit of values and norms was not mentioned. According to Klaassen most of the teachers in his study place a heavy emphasis on setting a good example for students and their nonverbal performance. They, in general, think that they should and do serve as a role model. The data show that the implementation of MD takes place in an ad hoc manner when a concrete incident occurs. The teachers want to make use of concrete incidents that occur in the class. However, when such an incident happens, then teachers tend to react emotionally. Klaassen also reports on teachers' difficulties in discussing pedagogical and moral issues with colleagues and parents. As one teacher of the study said: “Talking about values and norms? That sort of thing often turns into a big mess!” Moreover: “If you talk about values and norms with the parents, then you also talk about punishment. And I don’t see me discussing punishment with all of the parents” (Klaassen, 2002, p. 156). Klaassen’s study shows that an orientation
Towards more traditional forms of “character education” was almost completely absent with these teachers. Words such as “virtues” or “moral” were rarely used, if at all, in the interviews.

Sockett and LePage (2002) explored teachers’ use of moral language in their descriptions and interpretations of their K-12 classroom and graduate school experiences. The authors analysed products of 90 teachers who graduated from a non-traditional Master’s program which emphasised moral activities through teamwork in the United States. All participants had at least three years of teaching experience. They gathered data from the teachers’ end of program exit portfolios, reflective essays, student admission essays, and from an online conference space. A first result of the content analysis shows that teachers could not see beyond the technical role they inhabit and which they wanted to enhance. They wanted faculty to provide technical skills, teaching strategies, and advice about what to do with kids who disturb the lessons. Sockett and LePage state that the behaviourist language (reinforcements, motivators) the teachers use puts the teacher in the role of the technician trying to fix learner’s behaviour. The second finding of this study is that most practising teachers are unprepared by teacher education for MD. This lack of preparation does not result from too little training, but instead from programs which suggest behaviourist strategies for dealing with children and parents and a profound moral relativism. Sockett and LePage conclude that the moral atmosphere of teacher education institutions has a great influence on the teachers’ incompetence on coping professionally with morally relevant situations in class. According to the authors, this atmosphere is determined by control as part of a hierarchical structure, by monitoring devices (like standardised tests) as scare tactics to motivate teachers to do their jobs, and by rewards and punishments. Moral judgment and decision making are de-emphasised.

Veugelers (2003) examined the attitudes of Dutch parents, teachers, and secondary school students about the goals of MD and the division of moral tasks between parents and teachers. Using the Delphi Method, he collected data using questionnaires, group interviews, and panel discussions. 571 adolescents, ages 14 to 17 years, 180 parents, and 86 teachers from eight secondary schools (four general secondary schools and four secondary vocational schools) completed the mail questionnaire. The results indicate that parents, teachers, and students attach great importance to the moral development goals of strategic action (e.g., independence, learning to think critically), conformity (e.g., obedience), social sensitivity (e.g., helpfulness), and emotional development (e.g., dealing with feelings and emotions). Parents are the most active advocates of conformity. Veugelers report that students want the emphasis on formulating their own opinion, parents on the relationship between strategic action and conformity, and teachers on openness to criticism. All those involved in Veugelers study believed that both moral development-providing environments, home and school have a role to play in the moral development goals. Moreover, students, parents, and teachers agreed that the task of the parents in all four categories is higher than that of...
the school. Teachers recognize this pedagogical task as an essential aspect of their professionalism. Students accept and support this pedagogical care for their moral development provided by teachers. Many parents (35%) indicated that they do not know how much attention teachers give to MD. They obviously know little of the MD-related activities of the school. According to the students, only some attention is given to these goals. Teachers already devote a fair amount of attention at school to these goals, but according to students, parents, and teachers, this could increase even more. Teachers too believe it would be better if they could devote more time to MD-related goals.

The aim of the study by Thornberg (2008) was to investigate teachers’ perceptions of their implementation of MD and to explore their degree of professionalism in this matter. The author conducted qualitative interviews with 13 Swedish primary school teachers and analysed the interviews by comparative analysis. For the teachers in Thornberg’s study addressing MD is about fostering students into good manners, characters, and behaviour, to maintain rules in school and the classroom, to manage conflicts between students, and to help students develop social skills. In sum, the teachers’ main concern is to educate obedient students. Thus, in a teacher’s view, addressing MD appears to be to a great extent fused with and reduced to school discipline and classroom management. According to the interviewees, implementing MD is, to a great extent, about intervening when things happen, i.e., reactions to students’ misbehaviour. Thus, as Thornberg states, a significant part of MD is unplanned, occasional, reactive, and situated. Also according to some of the teachers interviewed, their moral education practice is partly unreflective or unconscious. It takes place without any conscious considerations and any larger pedagogical attention and aims. Moreover, Thornberg reports that behaviour and personality, as well as rules and values, are fused together in teachers’ reports, but without explicit references to moral philosophical, moral psychological or moral educational theories. Neither do they refer to theories or research in philosophy, psychology, sociology, education, or other academic disciplines when they describe their practice of moral education. Thornberg concludes that the teachers appear to lack professional knowledge in the realm of morality. According to the interviewed teachers, the values, ideas, and conceptions which guide their implementation of MD are personal rather than professional. They see values as important to mediate to the students. However, if they were asked which values should be mediated, they refer to their own childhood, their personal experiences as children and adults in relation to interactions with others (their parents, friends, colleagues, and others). The teachers also declare that MD most often is addressed within the domain of the informal curriculum. It is embedded in everyday life of school and happens all the time. According to some of the teachers, the implementation of MD means that the teacher acts as a moral role model. Some of the interviewees criticise their teacher training which did not prepare them for critical incidents, as one respondent states: “Well, it’s odd that you didn’t get anything from teacher training. I mean, every...
day we have to confront students who don’t take their responsibility, break the rules, don’t listen to grown-ups, are violent to each other, get into conflicts, call each other names. And we get no training in these situations” (Thornberg, 2008, p. 1796).

Gruber (2009) aimed at exploring the obstacles to implementing MD in German schools. He surveyed 854 teachers of primary and secondary schools. The questionnaire consisted of closed and open-ended questions. The main finding indicates that 56% of all teachers miss time to implement MD because of the crowded curriculum which forces them to teach subject matter. They do not know how to integrate values into the teaching of subject matter. A second finding shows that the missing cooperation between parents and school is a reason that MD rarely is addressed in the coursework of the teachers. 42% of the teachers reported about problems with parents when MD is at stake. They criticised the lack of the parents’ support in this matter and considered conflicting values between parents and school as reasons for their restraint to get involved in MD. Another interesting result of Gruber’s study deals with the aims of implementing MD. 26% of the teachers miss a consensus about the contents, aims, and methods of MD. They experience a variety of values and different views about MD which results in refraining from teaching values and in holding a relativistic view on values.

Mahoney (2009) stresses the need to implement MD into teacher education. The author reports on a case study in England using interviews as a research method to explore MD. Four teachers were interviewed. The main result is that teachers are not prepared to deal with the everyday moral dilemmas in class, which provoked high levels of emotional distress. According to Mahoney, the teachers seemed to be unsure about the legitimacy of making moral judgments at all, at the same time as acknowledging that this is inevitable. Moral judgments are considered as located in the personal opinion.

Thornberg and Oğuz (2013) examined qualitatively Swedish and Turkish primary school teachers’ perspectives on MD. Interviews with 52 teachers were conducted and analysed. The researchers report that among Turkish as well as Swedish teachers, the major aim of MD is to teach students to accept and comply the societal values and norms to maintain the order of society. Democratic-participation values (e.g., freedom of speech) are expressed to a lesser extent by the teachers than relational, self-responsibility, and self-enhancing values. According to most Swedish and Turkish teachers, they use modelling as the primary method of moral education. Many Swedish and Turkish teachers state that their work of MD is mostly in everyday practice embedded in the stream of social interactions. It is an informal curriculum that takes place all the time. Furthermore, the authors report, that Swedish teachers state that their practice of MD is, to a great extent, about intervening when things happen, that is, reacting to student misbehaviour (e.g., rule transgressions or disruptive behaviour). MD appears to be fused with classroom management and school discipline. This reactive approach was rarely mentioned by the Turkish teachers who more often focus on (explicit and implicit) proactive methods and strategies. The interviewees more
commonly differentiated teaching school subjects as their ordinary practice and MD as something they have to do in addition to their ordinary practice. Consistently, both Swedish and Turkish teachers used an everyday language when they described values and MD. Some of the teachers found it hard to verbalize their practice during the interviews. When they were asked about how they have received or appropriated the values, they see as necessary to teach the students, Swedish as well as Turkish teachers referred to their own childhood, their parents, and common sense. Common sense was a popular value reference among the Swedish teachers. When they were asked to explain what they meant by common sense, they referred to making wise decisions guided by social norms, cultural traditions, and religion. Thornberg and Oğuz report about teachers lack moral knowledge; when teachers were asked about the basis for their approaches and methods of MD, no one referred to theories or research within fields like moral education. They referred to personal conceptions and experiences like common sense, an inner moral compass, or their personality. According to some teachers, their teacher education program did not prepare them for MD. The authors conclude that a considerable part of the Swedish and Turkish teachers’ narratives can be associated with the traditional approach of moral education with a strong focus on transmitting taken-for-granted dominant values, particularly regarding rules and character, to the students to create rule-conforming and nice people. Neither the Swedish nor the Turkish teachers’ reports could be associated with a critical approach to moral education.

Table 2: The moral dimension of teaching in primary and secondary school education

<table>
<thead>
<tr>
<th>Study</th>
<th>Setting</th>
<th>Country</th>
<th>Research design</th>
<th>Participants</th>
<th>Main results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tatro et al. PE, SE, and TE: Practice (2001)</td>
<td>MX</td>
<td>Survey (questionnaires)</td>
<td>309 educational leaders and policymakers</td>
<td>MD is considered of high significance; MD should be integrated into subjects; Teachers should receive education in MD; Family is more responsible for values formation than school</td>
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<tr>
<td>Klaassen PE and SE: Practice (2002)</td>
<td>NL</td>
<td>Survey (interviews)</td>
<td>15 high school teachers, 34 elementary school teachers</td>
<td>MD is considered of high significance, MD is only implemented in case of incidents; Relativistic view of values; Instrumental conception of morality; Moral education through role modelling</td>
<td></td>
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<tr>
<td>Sockett et al. SE: Practice (2002)</td>
<td>USA</td>
<td>Case study (in-depth analysis of teachers’ essays, School-based Masters program: 90 secondary)</td>
<td>Lack of professional moral knowledge; Teachers are unprepared for MD</td>
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<tr>
<td>Study</td>
<td>Setting</td>
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<tr>
<td>Veugelers et al. SE: Practice (2003)</td>
<td>NL</td>
<td>Survey (questionnaires, group interviews, panel discussions)</td>
<td>571 students, 180 parents, 86 teachers</td>
<td>MD is considered as very important Parents have higher responsibility for moral education than school Parents know little of MD in school Pre-service teachers want education in MD</td>
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<tr>
<td>Thornberg PE: Practice (2008)</td>
<td>SE</td>
<td>Case study (interviews)</td>
<td>nine primary school teachers</td>
<td>MD is reduced to school discipline and classroom management Moral education is addressed unplanned and occasional Moral education is addressed spontaneously in an unconscious manner Guiding values are personal values Lack of professional moral knowledge MD appears in the hidden curriculum Teachers are not prepared for MD</td>
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<tr>
<td>Gruber (2009) PE and SE: Practice</td>
<td>DE</td>
<td>Survey (questionnaires)</td>
<td>854 teachers</td>
<td>MD is not implemented due to the importance of subject matter MD is not supported by parents Teachers miss methods for implementing MD</td>
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<tr>
<td>Mahoney (2009) PE and SE: Practice</td>
<td>GB</td>
<td>Case study (interviews)</td>
<td>4 teachers</td>
<td>Teachers are not prepared for MD Values taught according to personal opinion Teachers have problems dealing with moral dilemmas in school</td>
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<tr>
<td>Thornberg et al. PE: Practice (2013)</td>
<td>SE and TR</td>
<td>Survey (interviews)</td>
<td>52 primary school teachers</td>
<td>Aim of MD is to accept societal norms Moral education through role-modelling Moral education occurs unplanned MD is addressed reactively</td>
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LITERATURE REVIEW
Alfred Weinberger

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<th>Study</th>
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<td>Lack of professional moral knowledge</td>
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<td>Teaching of personal values</td>
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<td>Teachers are not prepared for MD</td>
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<td>Preference of traditional methods for moral education (transmission approach)</td>
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PE Primary education; SE Secondary education; TE Teacher education

4. DISCUSSION

4.1 Common themes of the studies

The central question guiding this literature review was how the moral dimension of teaching (MD) is addressed in teacher education and school. The following paragraph summarizes the primary results of the literature review and explains them by dwelling on five themes that emerged across the chapters: (1) the significance of MD, (2) the implementation of MD, (3) the obstacles, (4) the aims, and (5) the methods to address MD.

First, the results show that the participants of the studies consider MD to be an essential objective of teacher education and school. Educational leaders, policy makers, teacher educators, pre-service teachers, teachers, parents, and students stress the significance of values and moral education and the importance to implement MD on all educational levels. Pre-service teachers and teachers acknowledge their responsibility to address MD, they view teaching to a great extent as a moral endeavour, and they want to have more time to integrate MD into their coursework and lessons.

Second, the findings reveal that despite the teacher educators’ and teachers’ claim of the significance of MD they barely address it in their coursework and lessons. The actual implementation of MD depends on the initiative of individual teacher educators and teachers. If MD is addressed in teacher education institutions, this is done implicitly either through the informal curriculum or the implicit moral model of the teacher educator. MD is treated in the courses rather briefly, vaguely, and inconsequently to the teaching practice. Quite often, the issue of MD in teacher education is embedded in a broader context of restrictions and legal requirements. In school, teachers address MD either implicitly by moral modelling or explicitly through classroom management strategies and behaviourist strategies in case of critical incidents. In school as well as in teacher education the implementation of MD occurs in a profoundly unconscious, unplanned and unreflected way.

Third, the results shed light on the obstacles to address MD in teacher education and schools. The first obstacle refers to the overloaded curricula emphasising subject matter and content knowledge and leaving no time to address MD. Particularly in teacher education the curricula almost totally neglect MD. Consequently, pre-service teachers obtain an insufficient preparation for MD. The second obstacle to implementing MD follows
from the first one and refers to school. Teachers lack knowledge and methods to address MD. They do not know how to deal with moral incidents and dilemmas and try to solve problems such as students breaking school rules with behaviourist strategies (e.g., punishments) instead of initiating a moral discourse. This practice is encouraged by the teachers’ experience in their teacher education institutions where a moral atmosphere is missing, a moral discussion is de-emphasised, and the pre-service teachers are treated with behaviourist strategies. MD in school explicitly is addressed in case of critical incidents, and it is fused with classroom management techniques. Teachers tend to avoid moral dilemma discussions because they have difficulties to verbalise moral issues and a lack of professional knowledge to conduct them. Further, it occurs that teachers show harmful conduct. The third obstacle to implementing MD in school refers to teachers’ beliefs about MD. Because of the wide range of different and often conflicting values and the missing consensus about the contents, aims, and methods of MD teachers rather hold a neutral position and believe that their students should find their own values. They assume that a neutral position is the only way to avoid indoctrinating the students with certain values. The teachers’ views reflect a considerable uncertainty about MD. They are unsure about the legitimacy of personal moral judgments and locate the moral judgment in the personal opinion. Teachers believe that their ordinary practice is rather teaching subject matter than addressing aspects of MD. They consider MD as an additional task of their usual practice.

Fourth, teachers’ and pre-service teachers’ aim to address MD is primarily to educate children to behave according to the rules and societal norms. Morality is reduced to school discipline and classroom management strategies. Teachers and parents consider conformity and obedience as essential values in education. According to the teachers’ views, the learning atmosphere should be based on order and discipline so that it is possible to teach subject matter. Moral values fulfil a functional role, and the teachers do not see their intrinsic educational merit. Only some teachers stress the aim to educate students towards open-mindedness and criticism. However, moral autonomy, the ability to critically reflect upon values or moral judgment seems not to be a central objective in teacher education institutions or schools.

Fifth, the results reveal the teacher educators’ and teachers’ perspectives about how MD can best be addressed. In teacher education, the two dominant perspectives are the positivistic perspective and the moral model perspective (see Oser, 1994). According to the positivistic perspective, any teaching act includes moral issues. Thus it is not necessary to explicitly address MD. This perspective is based on the assumption that professional education can be reduced to the intellectual and technical dimension and that moral conduct evolves from different competencies (e.g. competence in dealing with subject matters and subject-related instruction, social competence or methodological competence). Because MD is neither an aim nor a professional competence in the positivist ideology the moral outcomes of teacher education remain unclear, and the perils of moral relativism are
existent. In the moral model perspective, it is believed that the teacher’s moral behaviour will communicate itself to the learner. Teacher educators draw attention to theory and research about modelling and its role in MD and try to be themselves a moral exemplar (Sanger & Osguthorpe, 2013; Klaassen, Osguthorpe, & Sanger, 2016). However, the extent of the teacher’s influence as a role model in school also depends on the fact that adolescents tend to orient themselves more to peers and the norms of the peer group than to the teacher (Sanderse, 2013). Oser (1994, p. 94) states that “(t)he most important aspect may be that students do not simply imitate the behaviour of role models but are influenced by an integrated perception of their attitudes, behaviours, and the form of argumentation used.” Thus, the meaning-making activity of the student is a crucial part of learning. This requires that the teacher makes his or her values and value judgments explicit and give the learner the opportunity to discuss them. Besides the positivistic perspective and the moral model perspective other relevant perspectives to MD such as the cognitive developmental perspective or the discourse perspective, the latter being a form of conflict solving involving techniques of sharing viewpoints and considering needs (Oser & Althof, 1993), do not exist in teacher education.

In school, the two dominant perspectives to implement MD are the romantic or clarification perspective and the cultural transmission or transfer perspective (see Kohlberg & Mayer, 1972; Schrader, 2007; Klaassen, Osguthorpe & Sanger, 2016). The romantic or clarification perspective rests on the assumption that education should be permissive enough to allow the inner “good” of the child to develop. Thus, teachers see themselves as “neutral chairmen” (Bergem, 1990) who avoid teaching explicitly moral values. They take the view that values are a personal choice and that it is not their job to influence students’ behaviour unless school rules are broken. This relativistic perspective leaves the choice of the values to the learner of the informal curriculum and treats moral and nonmoral values equally but “(i)n the moral domain, however, one opinion is not as good as any other (…). Overarching principles have been agreed on in our society and within the teaching profession - principles dealing with honesty, fairness, protection of the weak, and respect for all people” (Clark, 1990, p. 252). The cultural transmission perspective rests on the assumption that education consists of transmitting important values and rules of the culture to the learners who should internalise them through the imitation of behaviour models, explicit instruction or reward and punishment. According to this perspective moral values are based on the standards of the particular culture and cannot be further justified, but “certain values or principles ought to be universal and … these principles are distinct from the rules of any given culture” (Kohlberg & Mayer, 1972, p. 468). Evidence also suggests that familiarity with values which can be achieved by way of explicit instruction does not lead to moral behaviour (e.g. Hartshorne & May, 1928-30). A critical reflection upon values to change patterns of moral thinking as the cognitive developmental perspective proposes is missing in school.
4.2 Implications for teacher education

Based on the results of the literature review the following implications to address the double assignment in teacher education are proposed:

One of the most promising strategies to learn to teach suggests drawing upon the practice of the learners (Ball & Cohen, 1999; Rosaen & Florio-Ruane, 2008). Learning according to this strategy is based on authentic situations such as moral incidents teachers encounter in practice. The results of the presented studies indicate that moral incidents and dilemmas (e.g., discipline problems) take on an essential role in the practice of pre-service and in-service teachers. Such incidents can serve as cases representing typical problems which the learners analyse and discuss to find viable solutions (Weinberger, Patry, & Weyringer, 2016). The discussion of cases is a learning method that has a long tradition in teacher education (e.g. Shulman, 1992) and is employed to teach professional knowledge (e.g. Kim & Hannafin, 2008) or moral aspects (e.g. Strike & Soltis, 2009; Warnick & Silverman, 2011).

The cognitive developmental perspective to professional morality (e.g. Bergem, 1990; Sprinthall, Reiman, & Thies-Sprinthall, 1996; Cummings, Maddux, Cladianos, & Richmond, 2010) and to moral education (Kohlberg, 1984; Rest, Narvaez, Bebeau, & Thoma, 1999) provides an alternative framework to addressing MD in teacher education and in school which cuts between the sort of relativism present in the romantic and positivistic view and the sort of absolutism prevalent in the cultural transmission view and the moral model view. The cognitive developmental view does not focus on values; it instead emphasises the discussion about conflicting moral values (moral dilemma discussion). According to this approach, the aim of education is not conformity to given rules but to actively change patterns of moral thinking towards higher cognitive levels which are characterised by an increasing reciprocity between the individual and the needs of others. Pre-service teachers who move to more complex levels of moral judgment can acknowledge the perspective of their learners, consider different instructional methods, and encourage learners for participation (Johnson & Reiman, 2007). Due to the overloaded curricula (see chapter 4.1) moral dilemma discussions are seldom implemented in teacher education and school. A possible way to solve this problem is presented by Patry, Weinberger, Weyringer and Nussbaumer (2013) who developed the didactical concept VaKE. VaKE combines values education through dilemma discussion and knowledge education through inquiry-based learning (VaKE). It can be applied to a wide range of knowledge-centred subjects or courses.

Evidence suggests that teacher beliefs are powerful and complicated to change (Richardson, 2003). A promising approach to change beliefs is to create dissonance or disequilibrium by confronting pre-service teachers with oppositional views and let them critically reflect upon these views. Existing inadequate beliefs about values and moral education such as values being a subjective matter, morality primarily dealing with punishment or moral education being synonymous to indoctrination are modifiable if pre-service teachers are provided with the opportunity to challenge these beliefs. The
dilemma discussion and VaKE-concept offer an appropriate method for creating cognitive dissonance and can help the learners to change their inadequate beliefs about values and moral education (Weinberger, Patry, & Weyringer, 2017).

The literature review revealed that teacher educators and teachers rarely implement MD. Pre-service teachers rarely obtain theoretical insights and practical skills concerning MD. Thus, MD as a precondition for the double assignment is almost neglected. However, a professional education of teachers and the education of students cannot be reduced solely to the cognitive dimension. Methods which are based on a critical reflection upon values and beliefs such as the discussion of dilemmatic situations including moral implications, as it is proposed in VaKE, provide a possibility to integrate MD in the subject matter in teacher education and schools.

REFERENCES


Literature Review

Alfred Weinberger


Shulman, L. S. (2005). Signature


**Brief Bio**

Alfred Weinberger was a secondary school teacher; obtained his Ph.D. at the University of Salzburg; teaches moral education and research methods at the Private University of Education of the diocese of Linz.
MODERN GENETICS AND GENE TECHNOLOGY: ETHICAL CHALLENGES TO HUMANITY

Geir Olav Toft  
NLA University College, Bergen, Norway  
GeirOlav.Toft@NLA.no

Solveig M. Reindal  
NLA University College, Bergen, Norway  
SolveigM.Reindal@NLA.no

Njål Skrunes  
NLA University College, Bergen, Norway  
Njal.Skrunes@NLA.no

Jostein Sæther  
NLA University College, Bergen, Norway  
Jostein.Saether@NLA.no

ABSTRACT

This paper corresponds with two other papers in this special issue: “A model for analysing genetics and values in biology textbooks with a focus on teacher education”, and “13 textbook analyses on genetics, the fact-value issue and the hidden curricula on teaching strategies”. The field of genetics has rapidly evolved during the last decades and is widely recognized as vital to understanding modern biology and its applications. Although contested, it seems the benefits of gene technology are immense in areas such as the production of food and the fight against diseases. An example of a new step in this development is the study of human chromosome inactivation to prevent trisomy 21 (Down’s syndrome). Obviously, the informed citizen needs comprehension of this field in order to participate in decisions about issues such as genetically modified organisms, stem cell research, genetic screening and so forth. In the following, we will give a brief introduction to the field of genetics and highlight some ethical challenges.

Keywords: bioethics, genetics literacy

1. THE FIELD OF GENETICS

In 1905, the British scientist William Bateson coined the term genetics, which was based on the Greek word gennō, γεννώ; “to give birth”. He proclaimed the birth of this new science shortly after reading Mendel’s “rediscovered” papers on heredity, 35 years after they were originally published (Moore, 2001). Mendelian inheritance theories were derived from these papers. When the Mendelian theories were integrated with the chromosome theory of inheritance (that is, the theory that chromosomes are identified as the carriers of genetic material and are linear sequences of genes), they became the core of classical genetics (GNN, 2013; O’Connor & Miko, 2008). This synthesis initiated a new era.

Three decades later the Mendelian theories were integrated with natural
selection and diversification. When the theory of evolution by natural selection jointly published by Wallace and Darwin in 1858 emerged as the “new synthesis” in the 1940s, it finally escaped its eclipse (Bowler, 1983). The new synthesis became a significant tool in the understanding of the diversification and functioning of living organisms (Mayr, 1982).

The discovery of the DNA double helix, the genetic structure, in the early 1950s was followed by the discovery of the nucleotide triplet, the genetic code, in the early 1960s (Watson & Crick, 1953; Ralston & Shaw, 2008). Revealing the “language of life” announced the birth of molecular biology. The body of knowledge increased rapidly, within a short period the mechanisms of gene and chromosome mutations were revealed. A mutation is a permanent change of the nucleotide sequence in the DNA. Mutations range in size from a single DNA building block to a large segment of a chromosome.

When the term chromosome was coined in 1888 by Wilhelm Waldeyer, it was chosen because it meant “coloured body”. Today, however, a chromosome is viewed as an organized package of DNA found in the nucleus of a cell, and DNA is a structure that encodes biological information, using a four-letter language.

The discovery of restriction enzymes in the 1970s led to the development of recombinant DNA technology (Arber & Linn, 1969; Cohenet et al., 1973). This triggered a biotechnological revolution and a new era for humanity. Discovering the cut-and-paste enzymes enabled scientists to cut, move, and paste genes between strands of DNA, as well as to construct transgenic animals and plants (Jaenisch & Mintz, 1974).

A decade into the new millennium, molecular biological development is expanding very quickly. When the concerted efforts that resulted in the decoding of the human genome were completed in April 2003, it had spanned almost 20 years at costs equal to the Apollo moon-landing project. A decade later, the complete human genome may be sequenced in a couple of days and at the cost of about USD 100. A genome is the complete set of DNA within a single cell of an organism. Chromosome and whole-genome mapping are being implemented as a standard routine and seem to have the potential to completely change the medical treatment of individuals. Medical treatment may be tailored to the specific requirements of the genes of a person. Whole genome mapping is also transforming biology. A rapidly increasing number of organisms have their genomes mapped out. The new information is completely transforming or even overturning the current knowledge on the systematics of species. Genomics is a discipline in genetics that applies recombinant DNA sequencing methods and bioinformatics to sequence, assemble and analyse the function and structure of genomes.

Biotechnology, the use of living systems and organisms to develop or make useful products, and synthetic biology, the design and construction of biological devices and systems for useful purposes (Schmidt, 2012) are overlapping scientific fields. One current expression for the relation between these fields is the Registry of Standard Biological Parts, established in 2003 at the Massachusetts Institute of Technology (http://parts.igem.org/Main_Page). This registry is a collection of genetic parts used in the assembly of systems and devices in
synthetic biology. For instance, bacteria are used in order to make a living computer. A possible result emanating from this is to make pocket-size biological computers (Baumgardner et al., 2009). The first replicating synthetic bacterial cell has already been constructed, the creation of Synthia, the first artificial lifeform (Gibson et al., 2010), and this team is progressing in assembling the first synthetic organism (Coghlan 2013). “This is a Pandora’s box moment, like the splitting of the atom or the cloning of Dolly, the sheep, we will all have to deal with the fall-out from this experiment” (Sample, 2010). Two significant discoveries in one year are remarkable examples of how synthetic biology can be used to rewrite chromosome sequences or to design chromosome sequences from scratch. At the John Hopkins University Build a Genome course a landmark achievement in synthetic biology was when undergraduate students built the first eukaryotic chromosome from scratch (Annaluru et al., 2014). Being able to build a synthetic version of a chromosome instead of having to manipulate an existing chromosome marks a coming revolution. With the kind of direct control provided by a synthetic chromosome, former barriers in synthetic biology may easily be overcome. Another landmark achievement published in 2014 was the creation of the first life with “alien” DNA, an engineered bacterium containing unnatural genetic code which was able to copy DNA (Malyshev et al., 2014). This breakthrough is not only a step towards the synthesis of cells that may produce useful molecules, but it also opens up the possibility that cells may one day be engineered without any of the four DNA bases used by all living organisms on earth.

2. NEW DISCOVERIES

The discovery of the function of the CRISPR-Cas system in 2012 (Lander 2016) is a paradigm changing event in gene technology which has initiated a genetic revolution on our doorstep. The CRISPR-Cas system is a sophisticated adaptive immune system in microbes, allowing a microbe to learn the signatures of new viruses and remember them. The CRISPR-Cas system is a programmable DNA and RNA cutting tool with unprecedented accuracy, a potentially revolutionary tool for editing DNA (Doudna & Carpentier, 2014). CRISPR is a molecule that can be programmed, or tailored, to fit a specific sequence in a genome, a gene. CRISPR guides an enzyme to cut the DNA strand; the Cas9 enzyme cause “blunt end” breaks in DNA, the Cpf1 enzyme will leave “sticky ends”, allowing for more precise gene edits. Ever since scientists realized the potential of CRISPR in 2012, we have experienced a race “to invent ever-more-versatile or efficient variations of this powerful tool, which vastly simplifies the editing of DNA. Base editing is a subtler way for editing DNA” (Cohen 2017). The discovery was published in October 2017 (Cox et al., 2017). This technique significantly increases the options for altering genetic material. The CRISPR gene editing tool will cut the double-stranded DNA at a target site in a genome, while the CRISPR based gene editing tool, base editing, can alter the DNA sequence without cutting it. Base editing involves the use of enzymes to precisely rearrange some of the atoms in one of the four bases that make up DNA or RNA, converting the base into a different one without altering the bases around it.
The new wonder tools in gene technology are extremely accurate, easy to use and inexpensive, and “It’s going to be like PCR, a tool in the toolbox” says Jennifer Daoudna (Travis, 2015). The simplicity of CRISPR’s “creates opportunities for scientists in any part of the world to do any kind of experiments they want” (Cryanoski & Reardon, 2015, p. 594). The pace of innovation is unprecedented and breathtaking. Half a decade after its invention, this technique is already having a major impact on biomedical research. A tremendous number of applications have followed in a very short time. A staggering flow of “firsts” have been reported, for instance: Engineering transplantable organs in pigs by knocking out PERV genes at all sites in the pig gene (Servick 2015); fighting malaria by manipulating the mosquito vector (Gantz et al 2015); making a better, synthetic yeast by correcting random mutations in 3331 base pairs in the chromosome (Xie et al., 2017); making a vaccine against H5N1 avian influenza virus (Zou et al. 2017); the first ever attempt to edit genes in cells inside the human body, a world first trial initiated in July 2017 that aims to disable the tumor growth mechanism in human papillomavirus (HPV) (clinical trials 2017); and an ethical challenging world first (Liang et al 2015) and world second (Ma et al., 2017), the manipulation of human embryos.

Terms like breakthrough and revolutionary probably underestimate what is going on, and for better or worse, we are all now living in CRISPR’s world. This new technique is rapidly transforming science and raising difficult questions. This cheap and readily available technique allows researchers to figure out what different genes actually do, destroy viruses like HIV, herpes and hepatitis, develop new cancer treatments, identify potential Alzheimer’s treatments, reduce our reliance on hydrocarbons, or engineer plants to improve food security or to make drugs and vaccines. However, “eugenics lurk in the shadow of CRISPR. The opening of germline modification is, simply put, the opening of a return to the agenda of eugenics … Rational eugenics is still eugenics” (Pollack, 2015, p.871). Moreover, “on the immediate horizon, we are starting to see the silhouette of what Marcy Darnowsky, director of the Center for Genetics and Society, calls ‘market-based-eugenics’” (Kozubek, 2017).

3. GENE ENGINEERING

Genetic engineering on humans raises ethical and political questions. The first tinkering with human heredity, published by Chinese scientists (Liang et al., 2015), crossed a long-standing bioethical red line and forced scientists to question the future and implications of such a powerful technology. It triggered an intense international debate and controversy among scientists about human germline gene editing (Cryanoski & Reardon, 2015), which is formally prohibited in more than 40 countries (Geneticsandsociety). The highly-rated science journals Nature and Science rejected the 2015 Chinese article on ethical issues (Cressey & Cyranoski, 2015). The article was subsequently published in the Springer Journal Protein & Cell, which received some criticism for doing so. They defended themselves by arguing they “published the paper ‘to sound an alarm’
about such work" (Cressey & Cyranoski 2015, p. 594). However, the 2017 US-based article was published in Nature, signalling an opinion shift by the editors of this world apex journal in less than two years. In 2015, the influential Hinxton Group concluded that research into early human development and disease was ethically justifiable. “Genetic editing of human embryos has tremendous value to help solve important scientific questions, and should proceed despite potential worries about use of the technique in the clinic” (Vogel, 2015). Scientists who want to use genome editing in human embryos urged to “consider carefully the category of embryo used”. The group wasn’t able to agree on what, if any, applications might justify editing human embryos, sperm, eggs, or eggs for reproductive purposes. It does say, however, that ‘policymakers should refrain from constraining scientific inquiry unless there is substantial justification for doing so’ (Vogel, 2015).

Following the 2015 controversy, the influential National Academy of Sciences (NAS) organized a summit which concluded that “it would be irresponsible to proceed with any clinical use of germline editing” without more research on safety and societal discussion (Kaiser, 2017). In February 2017, NAS released a 261-page report titled Human Genome Editing: Science, Ethics, and Governance, a thorough review of what might be possible with new genome-editing techniques, and why scientists should be cautious. The report notes that editing the human genome for enhancement raises all sorts of thorny issues. However, if scientists could one day edit viable embryos to eliminate diseases, they could also edit embryos for enhancement. Opponents of embryo editing state “We’re very disappointed with the report. It’s really a pretty dramatic shift from the existing and widespread agreement globally that human germline editing should be prohibited” (Kaiser, 2017). Supporters of embryo editing are negative to the NAS report or see the report as only lowering the bar for such experiments because it does not explicitly say that embryo editing at this moment in time should be prohibited. However, “It changes the tone to an affirmative position in the absence of the broad public debate this report calls for” (Kaiser, 2017), and a society often needs only one compelling argument to initiate a new social norm. “More than 10,000 monogenic inherited disorders have been identified, affecting millions of people worldwide” (Ma et al. 2017, p. 413).

Proteins by design, or protein engineering, has opened a new era in the construction of designer proteins for medicines and materials (Service, 2016). Proteins are complex organic molecules, vital for life, but often notoriously complex designs. The new field of computational biology, designing elaborate programs and algorithms for computational protein design (Davey et al., 2017), allows the exploration and construction of structures, unimaginable just a few years ago. Computational protein design is a powerful technique to engineer existing proteins or to design novel proteins that may display desired properties. Computational protein design and modelling requires extensive computer resources, a need which has paved the way for the creation of crowdsourcing computer capacity and international cooperation. The Rosetta Commons is a central hub for a unique partnership between universities,
governments, laboratories, institutes, and research centres, which makes close collaboration between laboratories the norm (rosettacommons.org). The Rosetta software suite, a dynamic and evolving macromolecular modelling suite addressing biomolecular structure prediction and design, is available for common use (Löffler et al., 2017). Being able to predict how an amino acid sequence will fold, and how a complicated protein will fold, reveals how the protein will function. Such knowledge allows for the designing of novel proteins that can catalyse specific chemical reactions or act as medicines or materials. When a functioning protein has been designed, genes for this protein can be synthesized and inserted into microbes, which will build the protein (Service, 2016). The new methods represent a breakthrough in protein design and production, initiating a revolution in the exploration and production of new and existing proteins.

The DNA molecule has a simplicity that disguises its colossal powers. The three-dimensional shape of DNA molecules remains mostly mysterious; however, the knowledge of the 3D structure and physics of the genome and the organization of the chromosome has increased rapidly during the last years. "The folding of genomic DNA from the beads-on-a-string-like structure of nukleosomes into higher order assemblies is crucial to nuclear processes" (Stevens et al., 2017, p. 59). Inside the nucleus, genomes fold into organized structures that are characteristic of cell type, and this three-dimensional organization plays critical roles in gene regulation, DNA replication, and genome stability. A DNA molecule is about five cm long, the interior of a nucleus is 0.001mm. The DNA molecule is tightly wound up, and cells have to unfold and refold DNA in order to read their genes. How the long strands of DNA are packed and unpacked in the tiny nucleus in cells is crucial for the cell functioning. Totally normal genes can malfunction if they get folded in the wrong way. The expanding science of DNA 3D structure may "reveal a hidden world of 'folding diseases'" (Zimmer, 2016).

Genetics, in the sense of heritable changes in gene activity caused by changes in the DNA sequence, has also been extended to the field of epigenetics (Berger et al., 2009). Epigenetics concerns heritable changes in gene activity that are not caused by changes in the DNA sequence, but rather by which sequences of DNA are switched on and activated or switched off and deactivated. Epigenetics extends and explains the influence of lived experience and the environment in the life of an individual. These epigenetic changes occur in response to our involvement in the environment we are surrounded by, the food we eat, exposition to various forms of pollution, and even social interaction. However, unlike mutations, epigenetic changes are reversible (Francis, 2011). Epigenetics can be understood as the clothing of our genes. Our parents make separate but equal genetic contributions to who we are, but at the same time, they can also make separate but unequal epigenetic contributions to our genetic inheritance. Some genes are epigenetically activated if they come from the mother, but inactive if they come from the father, and vice versa.

During the timespan of one century, genetics has changed from revealing how genetic information is transferred from parents to offspring and how gene frequencies are distributed throughout
populations, to the use of genetic information to design and construct living systems and organisms to suit the purposes of human beings (cf. the study of human chromosome inactivation to prevent trisomy 21\(^1\) Jiang et al. (2013)).

This development has taken us to the doorsteps of an entirely new era in the history of human life. Science has changed forever. New biological technologies are about to change the world as we know it. New and unpredictable possibilities for creative design are emerging. The potential of “garage biology” is immense, everybody is attempting magic right and left (Mooallem 2010), in an era when scientists imagine they can construct organisms just like you can construct bridges (Cathcart 2008). Exploiting some of the most significant advances of our time and one of the most important technologies of this century, humans are enabled to utilize other living organisms and design new organisms in hitherto unthinkable ways. The growing of human organs in a surrogate animal, designing properties of a child to suit the preferences of its parents, manipulation of embryos, children, adults or elderly poses huge, unsolved and never-ending ethical questions to human life. This follows when new technologies develop faster than ethics or regulations. For instance, gene editing techniques have been rapidly improved and were applied for the de-extinction of some extinct species. One of the easiest species to resurrect would be the Neanderthal. However this opens a new dimension to the ethical concerns around this scientific potential (Biello, 2014).

The impact of the emerging technologies seems overwhelming, and indeed, it is. “Over the next 20 years, synthetic genomics is going to become the standard for making anything”, predicted John Craig Venture, who aims to synthesise life itself (Aldhous, 2007). Future historians of science will divide biology into the pre- and post-genomic eras (Carr, 2010)\(^2\). Human genetic disorders have recently been prevented by genetic engineering and regarded as medical development. However, should we accept genetic engineering on human embryos, also to manipulate genetics for desirable traits? Transhumanists are promoting the use of genetic engineering for cosmetic changes, improving athletic traits, or improving intellectual capacity. This raises “the fear of creating a eugenic driven human population” (Sivapatham, 2015). Regulation is challenging, as techniques develop quickly and legislation, if existing, lags behind. Regulation, often in the form of guidelines rather than statues, also varies between countries, and countries vary in their attitudes towards gene editing in embryos. These differences may be linked to more generally approving attitudes toward eugenics programs, such as selective abortion of foetuses with severe genetic disorders.

4. SOME CHALLENGES

Genetics and epigenetics have made current the question of what it means to be a human being, both from an understanding of what characterises human nature and from the issue of ethics posing the question of how important human nature is as a source of

\(^1\) Down’s syndrome.

values (Fukuyama, 2005, p.3). For example: Who should be defining the normal range of human difference between corrective therapy and psychological or physical enhancement (Fitzsimons, 2007; Wolbring, 2015)? The ultimate questions that genetics and biotechnology raise are: What happens to political rights once we are able to breed some people with superior abilities both physically and intellectually? Moreover, how does this influence our values and attitudes towards persons with less ability, as for examples people with various impairments? Furthermore, what happens to the moral status of human beings when it is possible to engineer creatures that are partly human and partly nonhuman animal?

Although theories of human nature have varied and philosophers and social scientists have disagreed on what the core of human nature is, Fukuyama argues that philosophers have not contested the principle of human nature as a basis for rights and justice (2005, p.7). Whatever academic philosophers and social scientists may think of the concept of human nature, the fact that there has been a stable human nature throughout human history has had great political consequences (p. 7). The new genetics challenges this tradition within ethics and political philosophy.

4.1 The human embryo and ethics

Some examples of ethical dilemmas raising from genetic counselling and embryo research are:

1. Why should embryo selection be used only for genetic conditions? …
2. Should embryo selection be available to all? …
3. How can we assess the emotional impact on all parties involved in embryo selection for tissue typing?
4. Is the use of this technology likely to lead down the slippery slope towards “designer babies”?
5. Is any form of genetic screening a form of discrimination against those disabled by genetic conditions? …
6. What are the rights and the responsibilities of all parties involved in genetic screening? … (Levinson, 2006, p. 1203.)

With the completion of the Human Genome Project, science has an ever-increasing ability to predict the future as geneticists can give prospective parents a list of genetic conditions and predispositions in a given foetus at an early stage in pregnancy (Patterson and Satz, 2005). In the wake of offering prenatal testing disability activists (Parens & Asch, 2000) argue that whether or not the counsellor can achieve nondirective prenatal counselling the process by its very nature presupposes an implicit bias to abort selectively any foetus deemed “defective” or with a “harmed condition”, the term used by bioethicist John Harris (2000). Implementation of the NIPD technique leaves a complete screening of a foetus a blood test away. The genetic counsellor stands in the intersection between the disability community and the community at large because their own values directly or indirectly affect societal

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3 NIPD (Non Invasive Prenatal Diagnostics) and NIPT (Non Invasive Prenatal Testing) are new and rapidly evolving technologies. NIPD and NIPT work by analysing the DNA fragments present in the maternal blood plasma during pregnancy. This is known as cell-free DNA, 10% - 20% of it comes from the placenta, which is representative of the unborn baby. Cell-free fetal DNA is first detectable from 4-5 weeks’ gestation.

The evaluation process carried out within the field of genetic counselling has profound implications for society in shaping attitudes about what constitutes a life worth living and what counts as “disabling traits” (Patterson and Saz, 2005, p. 34; Parens & Asch, 2000, p. 8). For example, in some countries there is no time limit for the possible termination of a severely impaired foetus, abortion is authorised up to and even during birth (Reeve, 2009, p. 207). Reeve argues that prenatal diagnosis and selective abortion represent a normative scheme of what is considered to be a liveable life and that, while the non-disabled foetus has expectation of a ‘political life’, this is far less certain for the disabled foetus (p. 208).

People with impairments argue that this represents a threat to their experience of worth as human beings, and the ideal of inclusion (Amundson & Tresky, 2007). For example, Reindal maintains that this concern is justifiable (e.g. Reindal, 2000, 2010a) because many theorists within the field of bioethics depart from an understanding of disability as objectively abnormal which often is called “the personal tragedy model” by disability theorists (Oliver, 1990). Departing from another understanding of disability, emphasising social and cultural oppression, they, therefore, argue that identifying impairment as a harmed condition influences disabled people’s experience of dignity, inclusion and rights (Parens & Asch, 2000; Carlson, 2010; Kristiansen, Vehmas & Shakespeare, 2009). To judge whether a life is worth living measured in relation to abilities, as often viewing a life through a genetic lens leads to, is what Wolbring (2008) calls ableism.

*Ableism is a set of beliefs, processes and practices that produce - based on abilities one exhibits or values - a particular understanding of oneself, one’s body and one’s relationship with others of humanity, other species and the environment, and includes how one is judged by others.* (pp. 252-253)

By approaching moral and philosophic questions in a “logical” way, Richard Dawkins concluded “Abort it and try again. It would be immoral to bring it into the world if you have the chance” (“Richard” …, 2014a). Later he elaborated this sentence further.

*If your morality is based, as mine is, on a desire to increase the sum of happiness and reduce suffering, the decision to deliberately give birth to a Down's baby, when you have the choice to abort it early in the pregnancy, might actually be immoral from the point of view of the child's own welfare.* (“Richard” …, 2014b)

### 4.2 Transhumanism and modern gene technology

Obviously, when seen from the natural sciences, the human being is a biological creature. However, what does this mean? The traditional nature/nurture debate places culture and biology in opposition. Barbara Rogoff describes this view as “… if
something is cultural, it is not biological, and if something is biological, it is not cultural”. This is an artificial dichotomy, she argues. Humans are “biologically cultural” (2003, p. 63), and “… human biological development works together with the cultural institutions and practices that characterize humanity. Development over the life course takes place within both the course of cultural history and the course of phylogenetic history.” (p. 65) Spokespersons from a socio-cultural tradition (e.g. Rogoff) as well as from the natural sciences say much the same. Jeremy Castéra et al. summarize this thinking, saying that during the last ten years, the traditional genetic determinism has been replaced by epigenetics, which underlines the interaction between genes and the environment (2008, pp. 163-165), and, we would add, the individual as an agent. In other words, genes may change their activity and influence in response to intrinsic or extrinsic conditions.4

The fact that the nature/nurture distinction has been blurred by new technologies opens up new scenarios. The human being has the possibility to become “created co-creator” (Dahlin, 2012, p. 58) to a larger degree than earlier in the history of science which is a hallmark to the intentionality of transhumanism. From the 1990s the transhumanist movement has grown steadily. Dahlin (2012) distinguishes between two kinds of transhumanism: “1) an explicit ideology and movement with its own gurus like Ray Kurzweil and others; and 2) a tendency (trend) within Western… culture” (p. 58). The latter is more difficult to define, but their aim is to overcome fundamental human limitations, to upgrade the human body and postpone death by using new sciences and technologies to enhance human mental and physical abilities and remove undesirable and unnecessary aspects. The aim is to fundamentally transform the human condition using available technologies for their full potential in order to greatly enhance human intellectual, physical and psychological capacities. The goal is to improve the human race, leaving behind the defects found in humans and to merit the label “posthuman”.

Transhumanism also challenges our understanding of dignity, because what is human dignity referring to? Jotterand (2010) argues that there is a strong contrast between human dignity and posthuman dignity in relation to the ontological status of human beings (s. 47). The transhumanist aspiration thus challenges a host of concepts like human dignity, equal moral status, human rights, all values that earlier were founded on a concept of human nature either derived from ethical, political or religious understandings of human nature. Finally, the transhumanist paradigm also challenges the relationship and understanding of education and pedagogics (Hebert and Damberger, 2017).

5. A NECESSARY VALUES AND KNOWLEDGE BASIS IN AN EDUCATIONAL CONTEXT

The above examples show the importance of literacy within the genetic field, as it has wide consequences for education and values communicated within education. As Peter John Fitzsimons emphasises

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Education is not a free-floating entity. Nor is it a set of abstract principles to be learned in a politically neutral space. It is a complex and multi-level political tug-of-war in the lives of individuals, the shape of communities and the global future. (2007, p. 10)

Knowledge about the field of genetics is important, but also the ability to identify and reveal the underpinning values. The implication of an alteration of the human being challenges the tradition within ethical and political philosophy that previously rooted ethical and political values and rights on human nature. Our model for analysing genetics and values in textbooks, presented in the next article in this special issue, is an attempt to contribute to the debate on the scientific literacy of genetics in teacher education.

Safeguarding literacy in genetics and synthetic biology emerges as a goal of increasing importance in the basic education of young humans. We have developed a model for the analysis of the content of information on genetics in textbooks and teaching. A two-dimensional model assesses interdisciplinarity and focuses on values and ideological aspects. Four strategies for how to handle value-related, ideological and/or interdisciplinary questions in teaching and learning processes are presented and discussed. See the next article in this special issue.

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**BRIEF BIO**

Geir Olav Toft is a professor at the science department of NLA University College in Norway, Bergen. His teaching and research interests include zoology and evolutionary biology.

Solveig M. Reindal is a professor at the education department of NLA University College in Norway, Bergen. Her teaching and research interests include educational theory and special education.

Njål Skrunes is a professor at the NLA University College in Norway, Bergen. His teaching and research interests include theology, religion and philosophy.

Jostein Saether is a professor of education at NLA University College in Norway, Bergen. His teaching and research interests include educational psychology and science education.
A MODEL FOR ANALYSING GENETICS AND VALUES IN BIOLOGY TEXTBOOKS WITH A FOCUS ON TEACHER EDUCATION

Jostein Sæther
NLA University College, Bergen, Norway
Jostein.Saether@NLA.no

Solveig M. Reindal
NLA University College, Bergen, Norway
SolveigM.Reindal@NLA.no

Njål Skrunes
NLA University College, Bergen, Norway
Njal.Skrunes@NLA.no

Geir Olav Toft
NLA University College, Bergen, Norway
GeirOlav.Toft@NLA.no

ABSTRACT

The theme of genetics is an issue that challenges educators not only to introduce relevant subject matter but also to grapple with moral-ethical topics in various contexts. We claim that textbook studies can contribute to the strengthening of critical consciousness about the moral aspects of teacher education, pointing out dimensions that are more or less hidden or ignored. We present and discuss a model for analysing textbooks and teaching practices in which we identify four basic (albeit non-discreet) educational strategies classified as more or less hidden discourses or curricula: (1) To ignore value/ideological questions. (2) The "hand-over strategy": To accept or raise value/ideological questions, which are (more or less implicitly) handed over to other contexts. (3) To encourage value/ideological questions in science education without systematically involving other disciplines or subjects. (4) To encourage value/ideological questions in science education by systematically collaborating with other disciplines or subjects. We exemplify this model in the next article of this special issue.

Keywords: Genetics, double assignment, values education, analysis

1. INTRODUCTION

The socio-scientific aspects of science education have received increased attention over the last two decades. The theme of “genetics and human beings” is an issue that challenges educators not only to introduce relevant subject matter but also to grapple with moral-ethical topics in various contexts. In this article, we present a model for analysing textbooks and teaching practices. We claim that this model is useful in the context of the “double assignment” in teacher education. We define the “double assignment” as an interdisciplinary approach to teaching that focuses on the integration of values and facts (content knowledge) (Tapola & Fritzén, 2010). See the
introduction of this special issue for an elaboration of the “double assignment”. In our model of analysis, we identify four theoretical-didactic strategies for dealing with the fact-value issue and the challenges of interdisciplinarity. These four strategies, we argue, are more or less unintended discourses or hidden curricula, and they include implicit norms and values (Apple, 2004, p. 78). The article’s main purpose is to present this model of analysis and to discuss its application. In the next article of this special issue, we demonstrate how the model can be used by analysing thirteen analyses of textbooks.

Our underlying normative interest is to clarify the preconditions for values education in the field of genetics and human beings. This is especially important if teacher education is to be based on the idea of the inclusion of all children in education, regardless of their personal preconditions for learning. We will not discuss this normative issue per se, but by disclosing the more or less hidden strategies (also described as approaches, discourses or hidden curricula), we show the elements of a knowledge base which we see as a precondition for teacher education.

2. GENETICS, GENE TECHNOLOGY AND EDUCATION RESEARCH

The field of genetics has rapidly evolved during the last decades and is widely recognized as fundamental to understand modern biology and its applications. See the previous article in this special issue. When seen against this background of explosive growth, it is not surprising that references to the ethical and socio-scientific aspects of genetics easily can be found in the literature published within this field of teaching and learning. The literature can be grouped according to six non-exclusive categories: (1) studies of conceptual understanding, change or learning processes in the field of genetics (e.g. Gericke, Hagberg, & Jorde, 2013; Sadler & Zeidler, 2004; Venville & Dawson, 2010); (2) discussions about socio-scientific issues, principles and ideas in science education, where genetics-related issues are used as the main examples (e.g. Lederman, Antink, & Bartos, 2014; Levinson, 2006b); (3) the literature that discusses socio-scientific issues and scientific literacy in science education more generally, where genetics is just one example among others (e.g. Levinson, 2006a, 2010; Pedretti & Nazir, 2011; Sadler & Dawson, 2012; Zeidler, 2014) (the first part of our article falls within categories two and three); (4) the literature that explicitly discusses genetics in science education from various perspectives, for instance, curriculum perspectives and classroom discourses (e.g. Boerwinkel, Swierstra, & Waarlo, 2014; McElhinny, Dougherty, Bowling, & Libarkin, 2014); (5) edited books on various aspects of bioethics in science education, which give genetics a major role to play (e.g. Jones, McKim, & Reiss, 2010); and (6) genetics in textbooks (e.g. Gericke, Hagberg, dos Santos, Joaquim, & El-Hani, 2014). This last category is the focus of our study of textbook analyses.
3. TEACHER EDUCATION: PRINCIPLES FOR VALUES EDUCATION IN THE FIELD OF GENETICS AND HUMAN BEINGS

Stated briefly and generally, science education should be implemented according to the full range of educational aims and values set out in official documents regulating education. All pupils have the right to education according to international declarations. This implies the right to know and be educated according to their actual competence and maturity level (understood contextually). Controversial topics should be taught in ways that are balanced and based on the students’ right to know and participate, their level of education, the state’s right and obligation to organize educational institutions, parents’ prior right to choose the kind of education given to their children, and educators’ professional knowledge about education. Those who teach prospective science teachers should have a realistic and honest view about what can be achieved in fact-value education.

Those who are preparing to teach science need a broad outlook that is illuminated by literature on, for instance, scientific literacy (e.g. Roberts, 2007); education in the relation between science, technology, society and the environment (Pedretti & Nazir, 2011); socio-scientific issues in science education (e.g. Sadler & Dawson, 2012); moral and democratic education and reasoning in science education (e.g. Levinson, 2010; Saether, 2012; Zeidler, 2003); and on ethics (e.g. Jones et al., 2010), values (e.g. Corrigan, Dillon, & Gunstone, 2007), ideologies (e.g. Saether, 2003), controversial topics (e.g. Levinson, 2006b), worldviews (e.g. Matthews, 2009), and what are called “companion meaning”1 and discourses in science education (e.g. Roberts & Östman, 1998). Certain qualities must be added to learning to satisfy the criteria of an educational process (Biesta, 2006). To transmit information effectively does not make a person an educator. For example, Jean-Luc Patry and his collaborators highlight that constructivism and participatory and dialogical approaches should be a framework for a learning process that deserves the label “educational” (Patry, Weinberger, Weyringer, & Nussbaumer, 2013; Patry, Weyringer, & Weinberger, 2010). A parallel example is related to Biesta’s concept “subjectification”. Subjectification allows students to be more independent and autonomous, which is not always the case through qualification and socialization processes, he claims (Biesta, 2010, p. 21). Discussions about how to make educational theory “educational” are found in several places in the literature (Biesta, 2011; Saether, 2012; Tapola & Fritzén, 2010). This integration of educational and specific subject-matter perspectives is obviously also a challenge for textbook writers.

We claim that a precondition for the double assignment is collaboration and interchange between different fields or disciplines of knowledge. The arguments for this stand are diverse. The knowledge base of science education is founded on the disciplines of the natural sciences and their related methodological and philosophical

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discussions. However, when value-related questions are raised in the context of science education, this knowledge base might be challenged, not because it is incorrect, but because it is insufficient for discussing controversial normative questions. During the last decades, scholars have increasingly been aware that not only the social sciences but also the natural sciences are connected to values and ideologies (e.g. Alexander & Numbers, 2010; Douglas, 2009). Several examples can be mentioned on controversies in areas such as intelligence, race, sex, and eugenics research (e.g. Herman, 1995; Ladson-Billings, 2012). A specific issue is the discussion on the future of human nature (e.g. Habermas, 2003), which, from the new genetics perspective, implies many controversial questions that demonstrate the linkage between ethical and scientific perspectives.

A specific philosophical issue, namely the fact-value debate, is connected to the precondition for a successful focus on the double assignment. Our stand is that interdisciplinarity is the only viable route in the search for possible answers to fact-value problems. Said differently, there must be a process of collaboration and exchange in the interaction between different disciplines or fields; no discipline or field should be excluded from making contributions, not least the field of ethics (Afdal, 2004; Føllesdal, 2005).

4. A MODEL FOR ANALYZING CURRICULA DOCUMENTS, TEXTBOOKS, AND TEACHING STRATEGIES

We introduce four theoretical-didactic strategies derived from our analysis for dealing with the fact-value issue, the challenges of interdisciplinarity, and the “double assignment” (Fig. 1). These strategies can easily be developed from the more general curriculum theory (e.g. Eisner, 1992; Joyce, Weil, & Calhoun, 2003; Orlosky & Smith, 1978; Schiro, 2013).

Strategy 1 is the traditional academic approach of not raising ideological or value-related questions. The term “ignore” in Figure 1 is, in this context, not used negatively in every case. Strategy 2 is much like the first but combined with explicitly raising or accepting value-related or ideological questions in the classroom or in textbooks. It is, however, primarily based on an (often implicit) “hand-over-strategy” without indicating any content-related perspective, that is, the view that socio-scientific issues should be discussed in other contexts such as social studies, ethics, philosophy, and religious education, or that such issues should be dealt with in contexts external to the educational institutions.

Strategy 3 is to let science and its technologies remain the organizing centre of teaching, but to actively encourage questions about values or ideology. Here students are stimulated to involve their own values and political, religious or philosophical views, and to collect information on their own. However, the teaching does not actively or systematically involve other school subjects. The main feature of this approach is the willingness to
pursue discussions about values from the viewpoint of the student or the teacher – that is, from the perspective of someone who lacks competence, opportunity, or willingness to see the given problem from the perspective of other school subjects, disciplines or knowledge domains. Strategy 4 is to encourage collaboration between the sciences and other subjects (social science, ethics, religious studies, philosophy, etc.).

Figure 1. Four strategies for how to handle value-related, ideological and/or interdisciplinary questions in teaching and learning processes

1 Our four strategies are academically oriented, with more or less emphasis on interdisciplinarity. The four strategies do not reflect the question of how to implement dialogical, humanistic, constructivist or reconstructivist approaches, or specific values or ideologies. See models or traditions in curriculum theory (e.g. Eisner, 1992; Joyce et al., 2003; McNeil, 2009; Schiro, 2013).
We conceive of these four strategies as “theoretical”, meaning that in educational practice they are more or less mixed and can be regarded as points on a continuum from a narrow single-discipline subject focus (Strategy 1) to a broad, thematic and interdisciplinary approach with more or less of an orientation towards values or ideology (Strategy 4) (See Figure 1).

Figure 1 can be elaborated further by distinguishing between two dimensions: one for interdisciplinarity and one for values or ideological aspects (see Figure 2). The point is that we can find interdisciplinarity without there being any interest in values or ideological aspects; “Ideology” and “ideological” are difficult terms to grasp. In this context, we focus on their value-related, ethical, moral, and/or political dimensions. We do not talk about ideology or ideological aspects if the focus is restricted to the internal controversies of competing ideas or “isms” in the philosophy of natural science (for further clarification see Freeden, 2004; Saether, 2003). The concept of value is used with emphasis on its moral-ethical aspects (for more about different conceptions of value, see Thomas, 1998).

**Figure 2. Two dimensions: interdisciplinarity and the focus on values or ideological aspects**

![Diagram](image)

We conceive of interdisciplinarity as the cultivation of relations between the natural sciences, social sciences and humanities (ethics, philosophy, etc.). In particular, we focus on values, ideologies, political standpoints, and dilemmas that are discussed from the perspective of the social sciences and the humanities, in combination with the knowledge base that comes from the natural sciences and their related technologies.
5. PRINCIPLES FOR THE FACT-VALUE ISSUE IN TEACHER EDUCATION FROM THE PERSPECTIVE OF THE “DOUBLE ASSIGNMENT”

This description of the four strategies (Figures 1 and 2) does not imply that either Strategy 3 or 4 is the best one in all circumstances. Strategy 2 (Figure 1) can in some cases probably be the most intellectually honest or realistic, perhaps in combination with certain aspects of Strategies 3 and 4. We should also add that dimension A (values or ideological aspects) is not always relevant when laying a knowledge base in science education. For this reason, Strategy 1 should not generally be regarded as inferior. Our claim is that the student who is equipping himself or herself to be a teacher should be familiar with the principles illustrated by these models (Figures 1 and 2) to understand more of what the “double assignment” is about in theory and practice. This understanding is seen as a precondition for a relevant teacher education in this context.

The contexts for science educators are diverse. The aim and structure of different programs give various opportunities for collaboration with other subjects, and it is often not realistic to expect much from integrative approaches. Science educators usually lack degrees or university credits in fields such as ethics, philosophy, social science or religion, any of which could help them discuss the value-related questions raised in their biology courses. Therefore, if Strategy 4 is unrealistic, what could be done to lay a foundation for honest intellectual discussions? The most radical answer is to say that Strategy 2 is the only alternative to guarantee that teachers do not leave their areas of scientific competence in their teaching. Strategy 4 expresses an ambitious idea about collaboration and integration that is seldom realistic. We therefore contend that Strategy 2 should not be categorically abandoned. Nevertheless, Strategy 2 does represent a narrow approach which seems to go too far in a direction that does not give students the opportunity to discuss spontaneously and to collect information from various perspectives. Is then Strategy 3 best? Perhaps this approach best reflects the actual conditions in teaching. Furthermore, the literature on scientific literacy and socio-scientific issues in science education seems to correspond largely with this strategy. Nevertheless, a danger might be that by practicing this strategy, the teacher may lack competence enabling him or her to contribute relevant knowledge to the discussions, or to recruit and organize relevant contributions of knowledge. In our view, the science teacher needs an understanding of the limits of his or her competence, because such insight is necessary to understand when to deploy a “hand-over” strategy.

Although our model gives no final answer on what the principles should be for values education in the field of genetics and human beings, it demonstrates some possible perspectives that should be kept in mind. Gericke and Hagberg and their collaborators summarize their textbook research and comment on value-related aspects in genetics:

*Genetics not only plays a central role in students’ understanding of Biology, but is also connected with socio-scientific issues of central importance, such as cloning, stem*
cell research, genetically-modified organisms, genetic engineering, use of genetic tests in society, human genetic improvement (eugenics), and so forth, … to properly learn Genetics will be important in the future life of students, as citizens that need to be informed by a proper scientific understanding of this subject in order to fully participate in democratic decision making in a world infused by science and technology. (Gericke et al., 2014, p. 382)

It is not obvious where this knowledge and technology will lead, especially in terms of providing premises for value-imbued decisions about equal rights and educational opportunities for all children regardless of their genetic equipment.

Teacher educators therefore need more than a general focus on interdisciplinarity and values or ideological aspects in education. We must have an overarching view on education, but one that is also specifically normative in order to ensure that those who become teachers reach a level of responsible personalization of knowledge (Figure 3). The basic idea of education should be that the student goes through a process that makes him or her more independent, free and responsible as a human being. According to this view, a student’s participation and knowledge acquisition per se are not enough for education (i.e., Bildung) to occur (Biesta, 2010; Reindal, 2013).

However, our specific research contribution is not about normatively clarifying the usefulness of our model and its related strategies in educational practice. Rather it is to analyse existing textbook analyses from the perspective of this model, and thereby illustrate the model. See the next article in this special issue for an exemplification of the model of this purpose.

6. CONCLUSION

Based on theoretical studies (this article) and our 13 research reports (see the next article in this special issue), we have identified four basic (albeit non-discreet) educational strategies classified as more or less hidden discourses or curricula (see Figure 1 above):

1. To ignore value/ideological questions.
2. The “hand-over strategy”: To accept or raise value/ideological questions, which are handed over to other contexts.
3. To encourage value/ideological questions in science education without systematically involving other disciplines or subjects.
4. To encourage value/ideological questions in science education by systematically collaborating with other disciplines or subject.

Prospective teachers need knowledge in all the area illustrated in Figure 1 and Figure 3 (see below); particularly insights in the principles for value-oriented interdisciplinarity. These insights obviously are preconditions for a teacher education programme focusing on the “double assignment”.

3rd Thematic Issue
In the next article in this special issue, we demonstrate that analysts of genetics in textbooks, in various ways and to various degrees, address ethical, value-related, political or ideological aspects, and interdisciplinarity. These aspects exemplify different discourses that imply more or less integrative consequences, from a narrow single academic strategy to an interdisciplinary-oriented teaching strategy. Our focus in the next article is strictly on the texts and on the underlying identifiable discourses. Based on our analysis of these texts we cannot say that one strategy generally in all circumstances is better than another. Our single normative claim is to reject the strategy that denies that science and its technologies have or may have normative implications. However, our analysis demonstrates perspectives relevant for discussing preconditions in teacher education programmes that focus on the fact-value issue in the field of “genetics and the human being”.

REFERENCES


**BRIEF BIO**

**Jostein Saether** is a professor of education at NLA University College in Norway, Bergen. His teaching and research interests include educational psychology and science education.

**Solveig M. Reindal** is a professor at the education department of NLA University College in Norway, Bergen. Her teaching and research interests include educational theory and special education.

**Njål Skrunes** is a professor at the NLA University College in Norway, Bergen. His teaching and research interests include theology, religion and philosophy.

**Geir Olav Toft** is a professor at the science department of NLA Universtiy College in Norway, Bergen. His teaching an research interests include zoology and evolutionary biology.
THIRTEEN TEXTBOOK ANALYSES ON GENETICS, THE FACT-VALUE ISSUE AND THE HIDDEN CURRICULA OF TEACHING STRATEGIES

Jostein Sæther
NLA University College, Bergen, Norway
Jostein.Saether@NLA.no

Solveig M. Reindal
NLA University College, Bergen, Norway
SolveigM.Reindal@NLA.no

Njål Skrunes
NLA University College, Bergen, Norway
Njal.Skrunes@NLA.no

Geir Olav Toft
NLA University College, Bergen, Norway
GeirOlav.Toft@NLA.no

ABSTRACT
This paper corresponds with two other papers in this special issue: “Modern genetics and gene technology. Ethical challenges to humanity” and “A model for analysing genetics and values in biology textbooks with a focus on teacher education”. Based on our model, we ask: What do recent analyses of genetics in textbooks express about hidden teaching strategies, particularly as seen from the perspective of the ‘double assignment’? Our interpretative analysis is based on three analytical perspectives: (1) Focus, or the lack thereof, on moral values or ideological aspects; (2) identifying topics related to human genetics; and (3) emphasis on interdisciplinarity, or not. Four strategies (discourses) are identified on a continuum ranging from what we have called a narrow single academic strategy to an interdisciplinary value- or ideology-focused strategy: (1) To ignore value/ideological questions. (2) The “hand-over strategy”: To accept or raise value/ideological questions, which are (more or less implicitly) handed over to other contexts. (3) To encourage value/ideological questions in science education without systematically involving other disciplines or subjects. (4) To encourage value/ideological questions in science education by systematically collaborating with other disciplines or subjects. We have exemplified this model in our study of textbook analysts’ perspectives on biology textbooks. We have made it clear that the focus on four hidden curricula (seen as discourses) does not imply that we claim to uncover the analysts’ intentions. The researchers have limited their projects in specific and legitimate ways that do not correspond to our project. However, our analysis serves to illustrate the model presented in the previous article aimed at clarifying conditions for the “double assignment” in the area of “genetics and the human being”.

Keywords: Values education, textbooks, genetics

1. A REVIEW OF TEXTBOOK ANALYSES: WHY AND HOW, LIMITATIONS AND FOCUS
Since textbooks often play a decisive role in education, textbook research and development are crucial (Georg-Eckert-
Institut für internationale Schulbuchforschung, 2012; Pingel, 2010). All would agree that textbooks must be based on scientific methods and knowledge; they must be age-relevant, motivate readers and stimulate activity and dialogue. Furthermore, textbooks should use new media technologies and stimulate pupils and students in their knowledge construction. However, among the variety of textbooks, we find different approaches to a fundamental question: Should the textbook be exclusively based on one (or a restricted number of) scientific discipline(s), or should it be interdisciplinary and relate the subject matter “to the full spectrum of educational goals” (Holbrook & Rannikmae, 2007, p. 1351)?

Our underlying interest is on the preconditions for values education in the field of ‘genetics and humans’ with a focus on teacher education: What should the principles be for values education in this field? This question is normative and cannot be answered by referring to descriptive statements only. Our intention is not to give a sufficient answer but to highlight some important aspects. Given that our underlying interest concerns the preconditions for teaching values in the field of genetics and human beings, we try to identify some of the more or less hidden underlying strategies (discourses) that textbook analysts seem to take for granted, thereby exemplifying possible approaches to the “double assignment” in science education. This exercise will provide a background for further discussion on how to handle the fact-value issue in this particular field. Our focus on hidden or underlying strategies does not imply that we claim to uncover the analysts’ intentions. Each researcher has limited his or her project in specific ways that in most cases do not correspond to our project. Our focus is strictly on the texts and on the underlying discourses, seen as hidden curricula, which are possible to identify.

Figure 1 (below) illustrates the structure of our study. The background for it is the new genetics, its technologies and dilemmas (Level 1, see our first article on modern genetics in this special issue). This body of knowledge represents one of the socio-scientific issues discussed in science education literature and in ethics and philosophy. To our study we have developed our theoretical and methodological approach based on this literature and on literature of a more general character (Level 2, see the previous article). The field of genetics, as represented in science education textbooks that we have not had access to (Level 3), has been analysed in several studies during the last decade (Level 4). Based on our perspectives on genetics in science education, we have reviewed existing analyses of textbooks in this article (Level 5). Based on this review (which is not a literary review in the traditional sense but an analysis from a certain perspective) and on our theoretical introduction (Level 2), in the previous article we also commented on the question: What principles should be used for teaching values in the field of genetics and human beings in a teacher education context? (Level 6). Our specific research contribution (Level 5) is only part of a necessary broader background for the discussion of this overarching normative question.¹

¹ See the introduction to this special issue.
2. SOURCES

13 textbook studies from 2002 to 2012 covering twenty countries and different age levels, methods and theoretical approaches are included. Our intention is to cover all of the most relevant studies about genetics in textbooks from this period published in English. 12 are journal articles, and one study is published in a book chapter.

We identified our data by using our general knowledge of the field combined with searching for peer reviewed articles in ERIC, ISI, and EBSCO1 using terms as “genetic*” (i.e. including genetics, genetical, genetically) and “textbook*” (i.e. including textbooks).2 11 or 12 of our studies use

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1 ISI: Institute for Scientific Information, now: Thomsen Reuters Web of Knowledge.

2 This combination of terms yielded 38 hits in ERIC for the period 2000-2012, however not all of them are relevant for our purpose. In ISI the same search gave 197 hits, and by limiting it to educational research, we had 16 hits left. We also visited the ‘online first’ archives of the most important journals in science education (e.g., Science and Education, Research in Science Education and Science Education). We concluded by selecting 12 relevant peer reviewed articles and one book chapter from a well-reputed and edited book on the field of socio-
various forms of content analysis, one claiming to use a phenomenographic method (Flodin, 2009), and one using interpretative methodology combined with content analysis (de Jong-Lambert, 2009). Table 1 gives an overview of the main sources analysed in this article. These 13 studies vary in scope, some having a broad outlook on the value and societal aspects of genetics, while others focus more strictly on scientific correctness in textbooks. Scientific issues in science education (Puig & Jiménez-Aleixandre, 2011), all from the period 2002-2012 (see Table 1). Two studies of Martinez-Gracia et al. are reported, and both use the same textbooks as sources, albeit from some different perspectives (Martinez-Gracia, Gil-Quilez, & Osada, 2006; Martinez-Gracia, Gil-Quylez, & Osada, 2003). The article Conceptual variation or incoherence? Textbook discourse on genes in six countries (Gericke et al., 2014) is not reported since it is based on two studies already presented in Table 1 (dos Santos, Joaquim, & El-Hani, 2012; Gericke & Hagberg, 2010a). From our perspective, this article does not give much new information, and is therefore not included. Recent analyses not included: Aivelo & Uitto, 2015; Hicks, Cline & Trepanier, 2014; Morris, 2014. As stated introductorily, textbook research in the area of genetics has grown rapidly in the last decade. In this study only the 13 most recent reports are included. However, previous studies also deserve to be mentioned. For example, four relevant studies from the 1980s are excluded from our project (Abroms & Bennett, 1980; Bordson & Bennett, 1983; Cho & et al., 1985; Mertens & Polk, 1980). Not many relevant sources from the '90s are available (e.g. Goodwin, 1990; Price, 1996).
Table 1 English language textbook analyses on genetics (2002-2012) – An overview

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Methodological emphasis said to be</th>
<th>Age group focused on</th>
<th>Textbooks analysed</th>
<th>Country focused on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque, de Almeida, &amp; El-Hani, 2008</td>
<td>Gene concepts in higher education cell and molecular biology textbooks</td>
<td>Content analysis</td>
<td>College level</td>
<td>3</td>
<td>Used internationally, no specific country focused on</td>
</tr>
<tr>
<td>Castéra, Clément, et al., 2008</td>
<td>Genetic determinism in school textbooks: A comparative study conducted among sixteen countries</td>
<td>Content analysis</td>
<td>12-19</td>
<td>50</td>
<td>12 from Europe + Tunisia, Morocco, Senegal and Lebanon</td>
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<tr>
<td>Castéra, Bruguière, &amp; Clément, 2008</td>
<td>Genetic diseases and genetic determinism models in French secondary school biology textbooks</td>
<td>Quantitative content analysis</td>
<td>15-18</td>
<td>18</td>
<td>France</td>
</tr>
<tr>
<td>deJong-Lambert, 2009</td>
<td>The new biology in Poland after the second World War: Polish Lysenkoism</td>
<td>Content analysis/interpretive methodology</td>
<td>High school, higher education</td>
<td>?</td>
<td>Poland</td>
</tr>
<tr>
<td>dos Santos et al., 2012</td>
<td>Hybrid deterministic views about genes in biology textbooks: A key problem in genetics teaching</td>
<td>Categorization content analysis / aspects of discourse analysis</td>
<td>High school (14-18)</td>
<td>18</td>
<td>Brazil</td>
</tr>
<tr>
<td>Forissier &amp; Clément, 2003</td>
<td>Teaching &quot;biological identity&quot; as genome/environment interactions</td>
<td>Content analysis</td>
<td>16-17</td>
<td>3</td>
<td>France</td>
</tr>
<tr>
<td>Flodin, 2009</td>
<td>The necessity of making visible concepts with multiple meanings in science education: The use of the gene concept in a biology textbook</td>
<td>Phenomenographic college level analysis</td>
<td>College level</td>
<td>1</td>
<td>USA. The textbook Flodin analyses is used worldwide</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Title</td>
<td>Methodological emphasis said to be</td>
<td>Age group focused on</td>
<td>Textbooks analysed</td>
<td>Country focused on</td>
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<tr>
<td>Gericke &amp; Hagberg, 2010b*</td>
<td>Conceptual variation in the depiction of gene function in upper secondary school textbooks</td>
<td>Content analysis/ holistic perspectives</td>
<td>Upper secondary (16-19)</td>
<td>13 + 7</td>
<td>Sweden + 7 textbooks from English speaking countries</td>
</tr>
<tr>
<td>Gericke &amp; Hagberg, 2010a*</td>
<td>Conceptual incoherence as a result of the use of multiple historical models in school textbooks</td>
<td>Concept mapping / content analysis / holistic</td>
<td>Upper secondary</td>
<td>8 +7</td>
<td>Sweden + 7 textbooks from English speaking countries</td>
</tr>
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<td>Martinez-Gracia et al., 2003**</td>
<td>Genetic engineering: a matter that requires further refinement in Spanish secondary school textbooks</td>
<td>Content analysis</td>
<td>High school, grade 10-12</td>
<td>34</td>
<td>Spain</td>
</tr>
<tr>
<td>Martinez-Gracia et al., 2006**</td>
<td>Analysis of molecular genetics content in Spanish secondary school textbooks</td>
<td>Content analysis</td>
<td>Grade 10-12</td>
<td>34</td>
<td>Spain</td>
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<td>Hott et al., 2002</td>
<td>Genetics content in introductory biology courses for non-science majors: Theory and practice</td>
<td>Analysed for six content areas</td>
<td>Graduate</td>
<td>5</td>
<td>USA – internationally used</td>
</tr>
<tr>
<td>Puig &amp; Jiménez-Aleixandre, 2011, pp. 210-212</td>
<td>Different music to the same score: Teaching about genes, environment, and human performances</td>
<td>“contents … analysed”</td>
<td>10th grade +3</td>
<td></td>
<td>Spain</td>
</tr>
</tbody>
</table>

*) Two studies by Gericke and Hagberg use overlapping samples of textbooks: Gericke and Hagberg (2010b) use more recent editions compared with a previous study (2010a).
** ) Two studies by Martinez-Gracia et al. (Martinez-Gracia et al., 2006; 2003) use the same textbooks as sources, but study them from different perspectives.
3. ANALYTICAL PERSPECTIVES

None of the studies listed in Table 1 matches exactly our field of interest. Our paper is therefore not a meta-analysis in the sense of presenting studies with similar or somewhat similar research questions. However, all of the studies presented here do focus on genetics in science education on different levels, all of them are textbook analyses, and they are therefore of interest to us. They include aspects that, to a greater or lesser extent, fall into our three analytical perspectives for analysing textbook analyses in genetics-related fields:

1. Focus, or the lack thereof, on (moral) values or ideological aspects; examples of topics and perspectives illustrating these aspects. (In this context, ethical and political aspects are of decisive importance.)
2. Topics related to human genetics.
3. Explicit emphasis on interdisciplinarity.

Based on our interpretative approach, our intention is to discuss each article from the perspectives we have launched, exemplifying the strategies (discourses) we are talking about, rather than coming up with clear-cut classification in every case. We use the analyses to draw tentative conclusions about the underlying educational strategies presented in Figure 1 in our previous article in this special issue.

Martyn Hammersley has summarized necessary decisions to make when conducting literary reviews. He challenges researchers to answer the following questions:

Who is the intended readership? How is the review to be structured? How are relevant studies to be found, and which studies are to be included? How much detail is to be provided about each study discussed; in particular, how much information is to be given about the research methods employed? How are the studies and their findings to be evaluated and related to each one another? (2004, p. 578)

The focus, says Hammersley in the same passage, should be on relevance, validity and “… making sense of the findings of different studies to construct a holistic picture of the field, a picture that may well reflect the particular interests and sensibilities of the reviewer”. This challenge corresponds to our aim, which is to construct “a holistic picture of the field” from the perspective that we have presented above. Although we give some general information about each of the 13 studies, our purpose is not to give a full summary or to discuss their quality as a whole.

The first stage of our analysis involves analysing the articles by using the three analytical perspectives presented above. Based on the corresponding outcomes (Table 2, below), the next step is to interpret the underlying discourses named as different educational strategies (cf. Figure 1 in the previous article and the conclusions summarized in Figure 4 in this article). Analysing the articles by using the three analytical perspectives presented below is relatively uncomplicated. However, we have to be clear about the relationship between these three analytical perspectives as criteria for drawing conclusions about educational strategies: Our hypothesized strategies are
not explicitly found in our sources. In other words, there is no one-to-one correspondence between our sources, our three analytical perspectives and our conclusions about educational strategies. On the other hand, our sources do give information that enables us to argue for our conclusions about the educational strategies that are probable consequences of stands and foci in those sources. The core of our interpretative strategy is to see in what sense or degree the various researchers bring into their discussion aspects about values, ideology, ethics, and interdisciplinarity in issues pertaining to genetics and human beings. Based on this, we can discuss the educational strategies that appear to be disclosed.

From each article, we present details that are necessary to take into account when drawing conclusions about the analytical perspectives 1, 2, and 3 presented above. As such, we do not present the complete range of details that correspond to our analytical perspectives. However, our qualitative content analysis requires enough of these details in our presentation. We have found very few explicit references to other disciplines or fields of knowledge in the articles, but we find many references to societal, ethical, value-oriented or ideological aspects. Therefore, the simple and practical guideline that we have followed when drawing our conclusions is to see the focus on societal, ethical, value-related or ideological aspects as indicators of (more or less) Strategy 4-oriented thinking.

The principles for our qualitative and interpretatively-oriented meta-analysis can be summarized as follows (cf. Figure 1 in our previous article):

1. If the study gives no (or in practice very little) presentation of societal, ethical, value-oriented or ideological aspects, the study is classified as Strategy 1-oriented.

2. If the study does present such aspects, but without giving them much emphasis, the study is classified as Strategy 2-oriented: “to accept or raise value-related or ideological questions, but hand them over to other contexts to deal with”.

3. If the presentation of societal, ethical, value-related or ideological aspects is emphasized, the study is classified as Strategy 3-oriented: “to encourage value-related or ideological questions in science education without systematically involving other disciplines or subjects”.

4. If a study can be classified at level three and, in addition, treats the societal, ethical, value-related and ideological aspects in subject matter terms, the study is classified as Strategy 4-oriented.

To make it clear, our focus is not on the researchers’ intentions, but on underlying discourses, which we have described as more or less hidden educational strategies or curricula. This is not in conflict with the researchers’ legitimate need to limit their research project by, for example, focusing on scientific correctness in textbooks. Ultimately, by demonstrating that each of the research reports can be analysed from our perspective, we want to give those who are preparing to become teachers a vocabulary to grasp some of the challenges of what we have called the “double assignment”. We see this vocabulary and its corresponding
concepts as prerequisites for teacher-education students.

4. RESULTS

Our selected papers cover a broad field of genetics, textbooks and educational levels. Five overlapping topics can serve to give a general description of what they highlight:

1. **Conceptual variation** in the field of genetics is not only a fact in the philosophy and history of this knowledge area but also in textbooks. We have therefore found not only one single gene concept but several (Albuquerque et al., 2008; dos Santos et al., 2012; Flodin, 2009; Gericke & Hagberg, 2010a, 2010b; Martinez-Gracia et al., 2006).

2. One special topic is *genetic determinism*, also referred to as *hereditarianism vs. epigenetics*. The opposite of genetic determinism may be expressed in slogans such as “environment affects inheritance” in more or less moderate or extreme forms. The new epigenetics will hopefully prevent naive or extreme thinking. Several articles address this broad field to a greater or lesser extent (Castéra, Bruguière, et al., 2008; Castéra, Clément, et al., 2008; deJong-Lambert, 2009; dos Santos et al., 2012; Forissier & Clément, 2003; Gericke & Hagberg, 2010a, 2010b; Puig & Jiménez-Aleixandre, 2011).

3. Textbooks may conflate *storytelling about nature* with *nature itself*, by using models, analogies, theories, concepts, and metaphors. This is a topic in at least two articles (Gericke & Hagberg, 2010a, 2010b).

4. **Varying ontologies** emerge through efforts to describe genetics: idealistic vs. naturalistic thinking, and realism vs. instrumentalism (dos Santos et al., 2012; Flodin, 2009; Gericke & Hagberg, 2010a, 2010b).

5. **Ethics, values, politics, and ideologies**. Traditionally, science has been seen as neutral and free of values and ideologies. Yet when scientific knowledge is combined with technology and politics, the dimension of values comes clearly to the fore (Hott et al., 2002). This thinking has been extended in the view that the social practice of conducting research and teaching science has some in-built or implicit value-related implications for our understanding of human beings (Castéra, Bruguière, et al., 2008; Castéra, Clément, et al., 2008; deJong-Lambert, 2009; Forissier & Clément, 2003; Martinez-Gracia et al., 2003).

We primarily focus on this last perspective.

4.1 Overview

Table 2 and our conclusions in Figure 4 (below) summarize our analysis.

It might seem unfair to present studies that have a very specific, limited focus and pull them into new contexts. Our intention, however, is not to discuss or criticize these studies per se, but to use them to exemplify the various educational strategies we have described above. A broader discussion
should take into consideration the limitations
given in each of the studies. Our paper
should therefore not be used to describe or
assess the intentions of the authors, or the
general quality of each study.

Table 2: Analyses of values and ideological aspects of genetics in textbooks (2002-2012)

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Cat. 1: Focus on moral values or ideological aspects; examples of topics and perspectives illustrating these aspects</th>
<th>Cat. 2: Topics related to human genetics</th>
<th>Cat. 3: Focus on interdisciplinarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque et al., 2008</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Castéra, Clément, et al., 2008</td>
<td>Yes</td>
<td>Yes</td>
<td>To some extent, by focusing explicitly on analysing hereditarianist ideology</td>
</tr>
<tr>
<td>Castéra, Bruguière, et al., 2008</td>
<td>Yes</td>
<td>Yes</td>
<td>To some extent, by focusing on a multidimensional concept of health</td>
</tr>
<tr>
<td>deJong-Lambert, 2009</td>
<td>Yes</td>
<td>Yes</td>
<td>To some extent, by analysing the ideology of Lysenkoism</td>
</tr>
<tr>
<td>dos Santos et al., 2012</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Forissier &amp; Clément, 2003</td>
<td>Yes (ideologies, but not in value terms)</td>
<td>Yes (e.g. “twins”)</td>
<td>To some extent, by referring to Cartesian dualism</td>
</tr>
<tr>
<td>Flodin, 2009</td>
<td>No</td>
<td>Yes</td>
<td>No (but empiricist vs. realist philosophy is mentioned + the essential vs. relational views)</td>
</tr>
<tr>
<td>Gericke &amp; Hagberg, 2010b</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Gericke &amp; Hagberg, 2010a</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Martinez-Gracia et al., 2003</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Martinez-Gracia et al., 2006</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Hott et al., 2002</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Puig &amp; Jiménez-Aleixandre, 2011, pp. 210-212</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
4.2 Each article classified

Five studies can be classified as oriented towards Strategy 1; one study can be classified between Strategies 1 and 2; three fall under Strategy 2; one study falls under Strategy 3; three studies can be situated between Strategies 3 and 4.

4.2.1 Three studies of graduate level textbooks

Introductory textbooks at graduate level are covered in three studies: (Albuquerque, de Almeida, & El-Hani, 2008; Flodin, 2009; Hott et al., 2002). Two of these we classify as oriented towards Strategy 1 (Albuquerque et al., 2008; Flodin, 2009). Both open up for some integration between genetics and the philosophy of biology, but not in terms of value discussions. This conclusion, however, should be further clarified:

In general terms, Albuquerque et al.’s article *Gene concepts in higher education cell and molecular biology textbooks* refers to philosophical literature on the gene concept, its related ideas (2008, pp. 219, 222, 223), metaphoric character (pp. 221, 227), and historical perspectives on genetics (pp. 223, 228, 231). The authors introduce the term “genetic determinism”, and genetic engineering is one of the key entries. They also mention aspects of a more general context:

the gene concept has come to play an increasingly important role in contexts other than the scientific domain, and a ‘gene talk’ marked by oversimplified and often deterministic views invaded the public opinion, generally without thoughtful criticism. (p. 222)

Albuquerque et al. conclude that the “textbooks … harbour a proliferation of meanings about genes that may make the concept look vague and confused, and even lead to ideas that are at odds with our current knowledge about genomes” (p. 219). On a very general level, they open up to the societal relevance of genetics (gene technology is one of the analytic categories), but not in value-related terms or from perspectives drawn from the social sciences or humanities.

Flodin, in her article *The necessity of making visible concepts with multiple meanings in science education*, studies one very influential textbook in higher education and has identified five gene concepts connected to five different discourses. She introduces the empiricist vs. realist approach, which is essential for understanding genetics (2009, p. 78f), and is aware of the historical and sociological contexts that have shaped the field:

In the textbook … the chapters are organized according to the time when different sub-disciplines of biology were developed. These sub-disciplinary contexts are constituted by historical, sociological and scientific processes—as practices. Different practices create different discourses, different ways of talking about and referring to genes. The ways we use concepts today often carry a historical burden, which has influence on the meaning of them. The ‘gene’ certainly has a long and rich history, and the textbook carries in that sense an historical imprinting. Since the development of knowledge often is not linear but instead might grow in relation to different questions of research, this may have an effect on how the gene concept is used differently. The use may be depending on which aspect of the
gene that is in focus. Therefore this article starts with the historical development of the gene concept, since this development has had an importance as to how the gene concept is used within different sub disciplines of biology, and also on how the content is organized in the textbook. The next step is to study the use of the gene concept in the different parts of the textbook, in order to find out about inconsistencies and variation in the gene concept. (p. 76)

Yet, however aware Flodin is about the “historical, sociological and scientific processes”, she avoids commenting on them in terms of values, ethics and politics. She mentions that studies of textbooks may “include the relations of textbooks to ... values in society ...” (p. 76). She also uses the term ‘discourse’ several times and makes reference to Norman Fairclough (p. 87), who, through his discourse analysis, may open up to perspectives on values and ideological perspectives. “Technology development” is mentioned once (p. 85), as are genes in humans (pp. 74, 84), and in her discussion, one can read that “[i]f we widen the perspectives, the gene concept is also important in areas that concern questions of health insurance and patenting” (pp. 92-93).

Still, we claim that Flodin’s analysis is more oriented towards Strategy 1 than Strategy 2, since she does not raise or elaborate on the perspective of values, nor does she refer to other disciplines or contexts. Her idea about various discourses and philosophies (empiricist and realist; essential/relational) opens up for some interdisciplinarity in terms of different philosophical approaches (philosophy and history of biology or the natural sciences), but the focus of her analysis is on the “scientific content ... of subject matter” (p. 76) and not on values. It therefore seems reasonable to classify her study as Strategy 1-oriented, or as lying in-between Strategies 1 and 2 (see Figure 6 “Educational strategies disclosed in 13 textbook analyses” in the foregoing chapter).

Hott et al.’s project Genetics content in introductory biology courses for non-science majors: Theory and practice is not only about analysing textbooks; it also includes a study of instructional coverage of the six content areas used in the analysis of textbooks. One content area is ‘genetics and society’. Human genetics are often focused upon in this article. The authors introduce this area by saying that “[t]he growing ability to analyze and manipulate the genetic material of *Homo Sapiens* and other species raises a variety of complex and sometimes controversial issues for individuals and society” (p. 1,027). When writing about one of the sub-concepts, they refer to two stands: “The application of genetics and genetic technology to health care holds great potential for improving personal and public health by allowing identification of individuals and groups whose genes increase their risk of disease.” Moreover: “Like all technologies, genetic technologies are fallible and have unintended consequences, some of which can be harmful to individuals, families, or groups.” (p. 1,027). In the conclusion, they talk about “the ethical, legal, and social implications of genomics and genetic medicine” (p. 1035).

Against this background, there is no doubt that Hott et al. are raising value-related questions. But since they do not give any hint about educational approaches in their study, we classify it as oriented more towards Strategy 2 than Strategy 3; it
actively raises value-related and ideological questions more than focusing on how these issues could be discussed in the context of science education.

4.2.2 Three (more or less) Strategy 1-oriented studies of upper secondary-level textbooks

Gericke and Hagberg’s studies are about ‘conceptual variation’ and ‘conceptual incoherence’ in the field of genetics. They build their analyses on the most recent knowledge in genetics, philosophy and the history of biology, as well as on previous textbook analyses. Their conclusion is that school science should be developed as “a story about scientific knowledge about nature” (2010b, p. 991). The storytelling, they underline, is not the same as mirroring nature, for it mirrors or implies ideologies and values and affects a person’s participation in democratic society:

... knowledge of genetics will be important in the future life of students since citizens need to be informed by a proper scientific understanding of such subjects in order to participate fully in the democratic decisionmaking process in a world infused by science and technology. (p. 963)

They refer directly to ideologies:

... the contents of the textbooks are not just scientific knowledge, but ... [also] implicit messages related to values such as innatism and hereditarianism. The ideology of the society and the textbooks’ authors may then explain the discrepancy between the modern scientific view and the scientific view presented in textbooks. (p. 986)

Thus, Gericke and Hagberg (2010b), rather than isolating science education, open up to broader contexts. They demonstrate an interest in the philosophy of genetics, for instance the naturalistic vs. idealistic gene function. Nevertheless, they have no explicit focus on ethical values, but choose instead to talk about “values such as innatism and hereditarianism” (p. 986), “genetic determinism [as] an implicit ideology” (p. 986), and “the democratic decision-making process in a world infused by science and technology” (p. 963).

It might seem as though their study can be classified as oriented towards Strategy 1 rather than Strategy 2 since their value-related perspectives do not include ethical-political dimensions and their approach is so strongly determined by arguments from the natural sciences. However, they do talk about “participat[ing] fully in the democratic decision making process” and the proper scientific background necessary in this context. They also talk about genetic determinism as an ideology (without indicating any value-related or societal implications). This seems to be an argument for classifying the article as oriented towards Strategy 2. Yet since it lacks references to ethical or political challenges in the field of genetics and human beings, we classify it as situated between Strategies 1 and 2.

Turning to Gericke and Hagberg’s study on Conceptual incoherence as a result of the use of multiple historical models in textbooks (2010a); this article clearly can be classified under Strategy 1. We deduce this, not least, from what they themselves claim the study to show:
The study shows that several different historical models are used in parallel in textbooks to describe gene function. ... the most recent scientific views were rarely referred to ... Hybrid models were used frequently, i.e. most of the models in the textbooks consisted of a number of components of several historical models. Since the various historical models were developed as part of different scientific frameworks, hybrid models exhibit conceptual incoherence, ... (p. 605)

The context that Gerick and Hagberg present for this study is determined by history, the philosophy of science (p. 606) and previous research on the use of models in science education, yet they make no explicit reference to value-related aspects of science education. It should be mentioned, however, that they do refer to literature that has more explicit references to ideologies, one example being Knain (2001).

Lastly, Dos Santos et al.'s study on Hybrid deterministic views about genes in biology textbooks (2012) concludes by saying that the textbooks convey hybrid views about genes in ways that reinforce genetic deterministic discourses (p. 543). An important observation is ... a more general problem of school science knowledge, namely, the lack of a historically and philosophically informed approach” (p. 573). They exemplify this by referring to instrumentalism/ pragmatism vs. realism, and idealistic vs. naturalistic views on models. In sum, their study is about the lack of scientific correctness in textbooks. Their focus on philosophy and the history of biology does not include value aspects. We therefore classify their work as oriented towards Strategy 1. Our own conclusion is strengthened by their conclusion, which underlines the need for “a broader perspective on genes” (p. 573), yet without making reference to socio-scientific perspectives or values.

4.2.3 Four studies of grade 10-12 level textbooks

Martinez-Gracia et al. (2003) write about how genetic engineering is addressed in Spanish secondary school textbooks:

In most cases it [genetic engineering] was poorly defined, without a clear explanation of all the relevant processes involved. ... Some books emphasized applications such as the human genome project without describing DNA sequencing. All books included possible repercussions, but in most cases only fashionable topics such as human cloning. There was an excess of information that was not always well founded and hence was unsuitable to provide a meaningful understanding of DNA technology required for citizens in the twenty-first century. (p. 1,147)

Their final conclusion exemplifies more of what is lacking in the textbooks:
Secondary school textbooks should be critically revised with an emphasis on the message that needs to be transmitted to facilitate understanding of relevant scientific literacy items of twenty-first-century citizens:

- Introduction of a logical content sequence including the fundamental steps that lead to the concept of genetic engineering, …

- The use of genetic engineering terms meaningfully connected with other genetic and basic aspects. …

- Applications and repercussions should be also restricted to those that illustrate the comprehension of concepts, encourage learning and have a meaningful connection with maturity and instruction of high school students. (Martinez-Gracia, Gil-Quilez, & Osada, 2003, p. 1161f)

It is obvious that these authors’ analysis of science and technology is framed by an awareness of the ethical and political aspects of gene technology (e.g., the human genome project). They say that one of the major theoretical considerations in the development of the Spanish curriculum has been the issue of social responsibility of science to inform citizens. The citizens should be able to take on the responsibility of problems related to science … Controversial social topics and their definitions are socially important and need to be summarized and analysed. (2003, p. 1150)

They refer to several ethical, ideological and value-related aspects, for example the ethical and religious implications of misunderstandings about transferring genes from animals to plants (p. 1,157); "ethical, moral, social and health risks issues" of genetic engineering (p. 1,158); ethical and moral issues about using gene therapy in germinal cells, using human embryos as experimental tools, eugenics, the cloning of human beings, the manipulation of living beings and the role of society and bioethical committees (p. 1,159). We can therefore say that Martinez-Gracia et al. (2003) clearly focus on value-related dimensions and questions, but that they do not try to provide perspectives which might point to substantial deliberations in these issues. It seems reasonable, then, to classify their focus as falling under Strategy 2, although one might add that in practice, such a strong focus on value-related aspects probably would lead to a Strategy 3-orientation.

These same authors’ 2006 article, Analysis of molecular genetics content in Spanish secondary school textbooks, uses the same sources but with a different approach (Martinez-Gracia, Gil-Quilez, & Osada, 2006). They heavily criticize the textbooks they have studied:

In conclusion, our data showed the need to improve text books by placing a greater emphasis on the understanding of basic concepts, rather than concentrating on factual detail, and by placing molecular biology in a broader context of cell and whole-organism biology. (p. 53)

Their scientific approach is also combined with an awareness of the broader ethical and societal context:

Molecular genetics is widely recognized as being fundamental to an understanding of modern biology, genetics, and, in particular, genetic engineering. … The general public too
need a better understanding of molecular genetics in order to make informed decisions about the socially and ethically controversial issues which surround developments in genetic screening, stem cell research and the production of genetically modified organisms. (p. 53)

They conclude by saying that “… many books lack a critical evaluation of what is required to be presented at these educational levels, in order to facilitate the understanding of social and ethical issues considered relevant for secondary students from a public understanding of science point of view” (2006, p. 58). However, they do not make any connection to other disciplines or fields of study other than those representing the natural sciences, and they do not indicate anything concrete about the ethical and controversial aspects in the school subject. It seems therefore reasonable to classify this article as a Strategy 2-oriented study as well.

Forissier and Clément’s article Teaching “biological identity” as genome/environment interactions (2003) illustrates a strong interest in studying genetic determinism vs. epigenetic approaches in textbooks and teachers’ thinking. The researchers conclude that the textbooks they have studied predominantly focus on “the genetic determination of the phenotype, and on the idea of the ‘genetic code’” (p. 85).

Keywords illustrating their interests are “genetics and ideology” (p. 86), “genetic determinism” or “determinist ideology” (p. 85), “biological identity” (pp. 86-87), and the “Cartesian dualism” of body and mind (pp. 88, 90). While they have no explicit focus on ideologies in value-related terms, their interest for philosophy does open up to some interdisciplinarity. Their main model of the interaction between biology and environment/culture (Fig. 2) may clarify the relationships between genotype, environment and phenotype.

Figure 2. Levels of interactions (adapted from Forissier & Clement, 2003, p. 86)

Forissier and Clement conclude that “[t]he tension between biology (body, genes) and culture (mind, soul, psychological features) remains a recurrent problem, as if people’s cultural identity did not have any biological support in their cerebral networks. … Cartesian dualism between body and soul still persists” (p. 90). This broad conclusion seems nevertheless to emanate from the perspective of biology rather than from the perspective of values. Their thinking should therefore be classified as most similar to Strategy 1.
Textbook analysis is just one part of Puig and Jiménez-Aleixandre’s article on “genes, environment, and human performances” (Puig & Jiménez-Aleixandre, 2011). Their focus is largely on genetic determinism and related problems of scientific and ideological character. In particular, they have studied teaching in five different classrooms from the perspective of “didactical transposition”, that is, to transform scientists’ knowledge (“reference knowledge”) into taught knowledge. Textbooks represent an important step in this process. They understand reference knowledge as “(1) [g]enetics, in particular the model of gene expression and gene-environment interactions, … and (2) [s]cientific practices …” in this field (2011, p. 208). They concede that when a teacher elaborates on the knowledge to be taught, it “necessarily goes beyond disciplinary goals”. They therefore launch three goals: “(1) to be able to apply the model of gene expression to real life contexts; (2) to develop the competency of using evidence and building arguments; and (3) to be able to develop a critical stance toward biological determinism” (p. 209).

In the introductory parts of the paper they introduce a socio-scientific and critical perspective on genetics, claiming that “[b]iological determinism … has social relevance because deterministic views have been used, and still are used, to support political agendas challenging the notion that all humans are equal” (p. 201). “Biological determinism is the view that genes entirely determine all individual traits and performances, including intelligence, criminality or academic achievements” (p. 203). They exemplify this by referring to racist and sexist opinions as possible consequences of biological determinism, which they call a “reductionist view on human beings” (p. 204). Such determinism thus may be related to racism (p. 211). In the article there are no references to disciplines or fields of knowledge outside the natural sciences. Interdisciplinarity is therefore not seen as a means for establishing “reference knowledge”.

This article can be classified as oriented towards Strategy 2 or 3. Yet the explicit focus on aspects of ideology and value (e.g., racism and sexism as consequences of genetic determinism), the example about races as “hierarchical categories” (p. 212) and the focus on the active role of the student in the classroom (p. 209) indicate a stronger orientation towards Strategy 3.

4.2.4 Three studies that follow Strategies 3 and/or 4

Castéra, Bruguière & Clémet’s 2008 study on “[g]enetic diseases and genetic determinism models in French secondary school biology textbooks” offers an interesting example of combining inputs from the natural sciences with perspectives on different conceptions of genetics, didactics and education in general. Their focus is on the role of genetic determinism to explain diseases. Two examples from their article may illustrate this focus. First: “Downs syndrome is a special case: only one text … makes reference to environmental factors capable of influencing the disease, by clearly indicating that an adapted education may allow a better social integration of Downs syndrome patients.” (2008, p. 56) The second example is from their conclusion, where they clearly show an interest in a
value-oriented and interdisciplinary perspective:

[An] oversimplified hereditarianist conception ... promotes a certain fatalism ...: if we are healthy and successful in life, it is because of our good genes and if we are not, how could we overcome our genetic destiny? In addition, this simplistic conception directs medical research toward tracking down the unique genetic cause of a given disease. This, in turn, reinforces support for a biomedical model of health and leaves no room for the model of health promotion promoted by the WHO. In the WHO model, health is a multidimensional concept and the promotion of health requires taking all of these dimensions into consideration. The origins of these aspects of health are just as much psychological, social, economic and environmental as they are biological, if not more so. ...

In practice, they could therefore avoid limiting the teaching of human genetics to a simplistic conception in which the genotype provides the unique explanation for the pathological phenotype. This reductionist model generally cites examples such as cystic fibrosis or Duchenne muscular dystrophy, even though the expression of all genetic diseases also depends on environmental influences. ... Our objective is not to purge the genetics curriculum of any hint of determinism, ...

. But secondary school textbooks cannot limit themselves to such simple examples and mechanisms. Otherwise, they risk introducing implicit ideologies which go beyond the boundaries of scientific discourse. Such ideologies threaten the values and practices associated with responsible citizenship, which is also an essential objective of biology education. (Castéra, Bruguière, et al., 2008, p. 58f)

The authors thus clearly underline the interaction between scientific knowledge, value systems and social practices (See Figure 2).

Figure 3 (see below) illustrates that conceptions in the context of science education should be understood and developed through the interaction between disciplinary knowledge, value ‘systems’ (that require input from other disciplines and fields of knowledge) and social practices (outside and inside the school system). Reflecting on these interactions will help to avoid implicit ideologies. We therefore classify this model as oriented somewhere between Strategies 3 and 4. It would not qualify as being entirely oriented towards Strategy 4 as it does not sufficiently reflect on value systems and their related processes because of the hierarchical structure of the model.

Figure 3. Conceptions (C) as interactions between knowledge, values and practices (adapted from Castéra, Bruguière & Clément, 2008, p. 54)
These authors have expressed much of the same thinking in another report (Castéra, Clément, et al., 2008). Here they argue that genetic determinism may be linked to reductionism, hereditarianism, eugenism, fatalism, social conservatism and atomism (pp. 164-166, 168). The background is that all ‘conceptions’ (C in Figure 3) should be understood in context:

Conceptions can be considered as the results of interactions among three poles: scientific knowledge (K), social practices (P), and values (V) ... K stands for scientific knowledge, as it is published by the scientific community. V stands for value systems in the widest definition, including opinions, faiths, ideologies, philosophical and moral positions. And, finally P stands for social practices, including not only professional practices (in this case, those of the textbook authors and publishers, as well as those of the other actors involved), but also influential social practices, whether civic, religious, ethical, or other. (Castéra, Clément, et al., 2008, p. 166)

They argue that the idea of a genetic program, which is especially common in textbooks from the 1980s and ‘90s, contains some implicit ideology. Genetic determinism is one such ideological consequence. Within this view, human traits are not relevantly explained according to the new epigenetics, which expresses a more dynamic and interactional view of the nature-nurture interaction (environment, culture, and the individual’s choices etc., in interaction with the biological equipment). Their model of the development of conceptions (Figure 3) is connected to the idea of “didactical transposition”, which denotes the process of moving from scientific literature, its popularization, curricula, syllabuses and textbooks to what is taught and learnt (pp. 166-167). They mention some historical examples of the ideologies in this area: the Lysenko and Mitchourine affair (pp. 174, 176), the control of textbooks from Moscow (p. 174), and the Nazi period and genetics (pp. 163, 173, 176).

Their conclusion is that “the contents of textbooks are not just scientific knowledge but could convey some implicit messages related to values (innatism, hereditarianism)” (p. 177). Castéra, Clément, et al. are clearly value- and ideology-oriented in their textbook research (2008). What is more unclear is what they think about science and knowledge. It seems as though they are treating these concepts as exclusively related to the natural sciences. However, their strong focus on values, ideologies and societal contexts must lead into inputs from the social sciences and humanities. On this background, we classify their work as situated somewhere between Strategies 3 and 4.

deJong-Lambert’s study is the most striking report we have included in our review. He focuses on biology education in Poland, which was influenced by Lysenkoism after the Second World War. Lysenko is today known for his condemnation of ‘traditional’ genetics, and for his acceptance of the idea of adaptation to the external environment as the moving force of the evolutionary process (Vucinich, 2002). This idea was used in a scandalous project to increase food production and transform agricultural practice in the Soviet Union:
... evolution [Lysenko thought] took place as living organisms developed in direct response to environmental conditions, and [the view that] the characteristics they acquired were inherited by their descendants. .... Lysenko’s authority in Soviet biology was a product of the Cold War and Stalin's desire to differentiate Soviet from Western science. The campaign against genetics which resulted had a devastating impact upon research and education in biology throughout the Eastern Bloc, and the losses to Soviet agriculture alone have been calculated in the billions of rubles. (deJong-Lambert, 2009, p. 404)

dejong-lambert’s study presents the context of the “eugenics and genetics” association during the interwar period and Lysenko’s efforts “to portray genetics as ‘racist’, ‘fascist’ science, formulated to prove the inherent inferiority of the working class” (p. 404). This Lysenkoism, which was inspired by Lamarckism and Marxism, had an influence in Polish textbooks as late as in the mid-60s:

Postwar Poland provides an important case study for examining the implications of Lysenkoism for biology education because not only was Poland the largest and most populous country in the “communist bloc”, but it was also where the Nazi eugenics programme was for the most part carried out. (p. 404)

In the context of recent epigenetics and the critique of naive genetic determinism, deJong-Lambert’s study is most interesting. One hand, his references to strict genetic determinism are combined with extreme political ideologies, and on the other hand, he points out the consequences of applying the principles of an extreme and naive environmentalism. By referring not only to biologists but also to political ideologies and the societal context and other intellectual inputs, he manages to demonstrate interdisciplinary and value-related perspectives on science education and its textbooks. He explicitly focuses on ideologies. Examples of wording that exemplify the ideologies are “the Nazi eugenic programme”, “genetics as ‘racist’ and ‘fascist’” (p. 404), the ‘outlaw’ of eugenics in the Soviet Union in 1931 (p. 404), Lysenkoism, the Marxist conception of science, dialectical materialism (p. 414), Ivan Pavlov’s thinking (p. 409), and the socialist system in Poland (p. 416). However, he does not demonstrate any explicit meta-theory on science education and the need for focusing on values and interdisciplinarity. Nevertheless, he demonstrates a strong focus on values and the societal contexts into which human beings put genetics. It therefore seems reasonable to classify this paper as situated between Strategies 3 and 4. For summary of the analysis, see the Figure 4.
Figure 4. Educational strategies disclosed in 13 textbook analyses

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To ignore value-related or ideological questions</td>
<td>Aloquibel et al., 2008</td>
</tr>
<tr>
<td>2</td>
<td>The ‘hand-over strategy’: to accept or raise value-related or ideological</td>
<td>Hott et al., 2002</td>
</tr>
<tr>
<td></td>
<td>questions, but hand them over to other contexts to deal with</td>
<td>Puig &amp; Jiménez-Aleixandre, 2011</td>
</tr>
<tr>
<td>3</td>
<td>To encourage value-related or ideological questions in science education</td>
<td>Castéra, Bruguière, et al., 2008</td>
</tr>
<tr>
<td>4</td>
<td>To encourage value-related or ideological questions in science education by</td>
<td>Castéra, Clément, et al., 2008</td>
</tr>
<tr>
<td></td>
<td>systematically involving other disciplines or subjects</td>
<td>Gericke &amp; Hagberg, 2010</td>
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<td></td>
<td></td>
<td>dos Santos et al., 2012</td>
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<td></td>
<td></td>
<td>Forissier &amp; Clément, 2003</td>
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The narrow single academic approach – The interdisciplinary approach

As said above three recent analyses are not included: Aivelo & Uitto, 2015 that probably could be classified into Strategy 2; Hicks, Cline & Trepanier, 2014 into Strategy 1; and Morris, 2014, which seems to fit into no 4.
5. CONCLUSION

Biology textbooks vary with regard to aims. Our review exemplifies that analysts of higher level textbooks have a more discipline-oriented focus than analysts of lower level textbooks. Based on this conclusion we could ask: Are the textbooks for higher education (tertiary level) more narrowly and academically oriented than textbooks for lower levels? However, we have no substantial evidence to draw a conclusion in this direction because we have strongly distinguished between the textbooks and the textbook analysts’ discourses. According to the analyzed sources, there is a variation in the extent to which analysts of textbooks focus on values, ideologies and interdisciplinary. The examples we have given indicate different discourses and therein various possible teaching strategies, cf. Bybee and DeBoer’s conclusion about the history of science education. They say that three major goals – understanding scientific knowledge, understanding and using scientific methods, and promoting personal-social development – have had a profound effect on the curriculum and instructional practice. Moreover, throughout the history of science education, “a balanced program has been difficult to achieve” (1994, p. 385). It is obvious that the “balanced program” Bybee and DeBoer talked about more than 20 years ago is of decisive importance for moral and democratic education, which necessarily requires knowledge acquisition integrated with values education.

1 More recent and elaborated classification systems demonstrate various streams or ideological orientations in science education (Pedretti & Nazir, 2011).

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BRIEF BIO

Jostein Saether is a professor of education at NLA University College in Norway, Bergen. His teaching and research interests include educational psychology and science education.

Solveig M. Reindal is a professor at the education department of NLA University College in Norway, Bergen. Her teaching and research interests include educational theory and special education.

Njål Skrunes is a professor at the NLA University College in Norway, Bergen. His teaching and research interests include theology, religion and philosophy.

Geir Olav Toft is a professor at the science department of NLA University College in Norway, Bergen. His teaching and research interests include zoology and evolutionary biology.
TEACHERS’ DISCOURSES FOR INTEGRATING MORAL ISSUES IN THEIR INSTRUCTION

Catherine Dimitriadou
University of Western Macedonia, Department of Primary Education, Professor
dimmitriadou@uowm.gr

Dora Psoma
Language and History teacher, Msc
psomadora@gmail.com

Dimitris Pnevmatikos
University of Western Macedonia, Department of Primary Education, Professor
dpnevma@uowm.gr

ABSTRACT
Based on the assumption that the school curriculum should integrate issues of moral and democratic education concerning contemporary challenges to humanity, this paper examines whether Greek teachers would be willing to integrate issues of food security, such as bio-fuels, in their teaching practices. Following the ethnographic approach, 98 pre-service and in-service primary and secondary school teachers, divided into 14 focus groups, were examined. The quantitative and qualitative data revealed a series of documented, comprehensive statements that concern the modern teachers’ perception of their role, the double assignment of school, as well as the preconditions of their education, so that they can fulfill the requirements of their role.

Keywords: moral and democratic education, values, double assignment of school, bio-fuels

1. INTRODUCTION
Morality as an educational aim first appeared in the Platonic dialogue Protagoras (Plato [319a]), the first testimony on this issue within Western civilization. It illustrates the human concern about moral development in the democratic standards of his era in the city of Athens (Mustakova-Possardt, 2004). Nowadays, concern about the negotiation of democracy-related moral issues has culminated due to the transition to a global civilization and due to the need to understand the moral values of people coming from different cultures (Edwards & Usher, 2000; Georgi, 2008; Latzko, 2012; Veugelers, 2011).

In the field of education the pupils are particularly overwhelmed by information: on a daily basis, they listen to contradictory issues and are concerned about moral dilemmas (Oser, 1991). Beyond learning at a level of knowledge, skills and competencies, they have to develop their reasoning and judgment about issues related to morality and democracy, so that they can act for the benefit of humankind. Schools have to provide learners with knowledge not only related to the various subject matters, but also with value-related issues, thus contributing to their moral and democratic education. This procedure refers to the so-called ‘double assignment of schools’ (Patry, 2012; Tapola & Fritzen, 2010: 154-156),
which entails that ‘teachers need to teach not only the subject matter itself, but they need to teach in a way that complies with a set of overarching value-related goals as well (Tapola & Fritzen, 2010: 155).

The notion of double assignment is in congruence with the timeless social demand that school must provide education for social cohesion, valuing democracy, moral behavior, sustainability, and concern for the welfare of others. In addition, it is widely accepted that schools should be able to cultivate in students the eagerness to articulate reasons for valuing, to promote values such as freedom, autonomy and self-realization, to build their own value system and to make personal choices (Mihalakopoulou, 2007). These value-related goals are associated with notions such as moral education, value education, citizenship education or democratic education (Tapola & Fritzen, 2010: 155), while they are connected both with formal documents (e.g., teacher education curricula, school curricula, government documents related to education curricula) and the teaching practice itself (Weyringer et al., 2012).

In recent years, moral considerations in education have stimulated the interest of educational researchers to a great extent (Veugelers, 2011). Reference to the double assignment of schools particularly could be associated with aspects of morality (behavior, motivation, and judgment) which originate in the Cognitive Theories of moral development, first advanced by Jean Piaget (1977) and later by Lawrence Kohlberg (1981). Provided that Cognitive Theories consider development as a result of cognitive conflict Nunner-Winkler (1996), in his research on moral growth, Kohlberg attempted to chart developmental patterns of morality in terms of Piaget’s theory of cognitive development (Piaget, 1997)1. The heavily quantitative ‘Kohlberian’ research paradigm measured the growth of moral thinking by charting students’ responses to irresolvable moral dilemmas on a six-grade developmental scale. Later, he implied a more reliable ground for moral education by situating students in ‘just communities’ (Alexander, 2003; Power, Higgins & Kohlberg, 1989). Alexander (2003), however, claimed that what Kohlberg’s research as a standpoint has actually shown is not the psychological structure of individual moral growth but rather the tendency of rational communities to adopt a context of discourse and reject the hegemonic dominance of others. Thus, children from different cultures seem that follow different developmental trajectories in their moral development reflecting their prominent cultural values (Pnevmatikos, 2010), as these have been crystallized in specific patterns of behaviour like individualism and collectivism (Pnevmatikos & Papadopoulou, 2012).

The belief that the overall objective of education should be to produce self-determining adults is not a new idea (Woods & Barrow, 1975). In the early twentieth century, John Dewey, among democratic educational philosophers, wrote of the importance of education in the formation of a democratic community. He first held that ‘in

1 In his first moral educational program, Kohlberg introduced hypothetical moral dilemmas into classroom discussion, aiming at enhancing students’ moral reasoning. Kohlberg’s broader concern with education for justice led to the development of the ‘Just Community’ approach, his way of creating moral schools as contexts within which personal moral development can be enhanced (Higgins 1991: 111).
order to have a large number of values in common, all members of the group must have an equitable opportunity to receive and take from others' (Dewey, 1966).

Dewey's concept of democracy in education implies that students should become accustomed to openness, reflection, and dialogue. In this sense, educators should be considered cultural workers engaged in the production of ideologies and social practices, while both parts, teachers and students, have universal access to culture as a collection of shared meanings. Schools thus have a significant role in the ongoing process of educating people to be active and critical citizens, capable of fighting for reconstructing democratic public life (Giroux, 1992). On the other hand, Dewey's concept of democracy in education is opposed to certain aspects of moral education which overemphasize convention and tradition limiting morals to a list of definitely established acts.

According to the above, the responsibility of modern school is (a) to undertake a commitment to social justice through the application of social integration approaches, (b) to help to alleviate conflicts between students (Lithoxoidou & Dimitriadou, 2017), (c) to assert the students' resilience (Vrantsi & Dimitriadou, 2017) and (d) to integrate citizenship education in the curriculum (Dimitriadou, 2016: 27-28). The integration of moral issues in instruction should also be among its priorities, including issues related to the physical and manmade environment. However, priority to technically useful knowledge and vocational rehabilitation encases education in a dry and instrumental knowledge, which corresponds to the "technical human interest" (Habermas, 1972 [1968]: 301-317) and does not support the students' moral development (Dimitriadou, 2016: 98).

It is worth drawing a clear distinction regarding what morality as opposed to ethics is. Morality is a dimension and possibility of human life, while it concerns 'the aspect of human thought, feeling and action that pertains to the distinction between 'right' and 'wrong' (Biesta, 2004). Ethics, on the other hand, refers to the codification of what counts as moral action, relegating to rules, codes and norms. As a rule, they have been determined in partisan or authoritarian terms by a particular group of people – the elders, the priests, the parents, the housemasters etc (Wilson et al., 1969). The idea of ethics thus implies that it is possible to articulate universal laws and also expresses a particular belief regarding what it means to lead a moral life, which is a life of compliance with the moral norms. This view goes beyond the belief that moral life is a life of choice between right and wrong, while it is the shadow of the Right which gives precedence to the Good (Alexander, 2003).

A condition of crucial importance for such a choice is that 'there must be a large variety of shared perceptions and experiences' (Dewey, 1966) instead of the guidance— and subsequent reassurance— of norms, codes and laws (Willinsky, 2002).

This concept of morality also appears in the case of challenges pertaining to threats to the environment and human life, such as farming and natural resource management, fresh water supply and sustainability, as well as energy supply and management. These issues should be integrated in the daily school practice, not just as part of the formal curriculum, but also as matters to be raised
every time an opportunity arises. For their integration, the main person responsible is the teacher, who should not just be a mere observer, but also the moral educator who addresses current social affairs (Alt & Reingold, 2012; Klaassen & Maslovaty, 2010). Hence, teachers should have a set of skills they need in order to work and make the informed judgments that participation in a democratic society requires. These skills correspond to the teacher’s literacy (Gee, 2005; Dimitriadou, 2008), a notion of social responsibility which draws from classical times, when both the Greeks and the Romans saw literacy as a condition of full civic participation and, hence, of citizenship itself (Holme 2004: 13). Since then, the notion of literacy has grown, including structural ways of thinking for the interpretation of the various images of the world, resulting in its treatment as a set of competencies (coding, semantic, pragmatic, critical) which presuppose a discourse grounded on either its functional or its critical dimension (Holme 2004: 11-62).

Our study concerns the importance of the dynamic interaction between social and individual values that teachers adopt with regard to their profession. Moreover, it concerns values regarding communication and dialogue as well as how individual and social actions might be linked. We could therefore maintain that it falls into the broad model of critical reflection, which is underpinned by theoretical traditions such as the reflective approach to theory and practice (Schön, 1983), reflexivity and reconstruction and critical social theory (Fook & Gardner, 2007: 23-39).

2. TEACHERS AS CRITICAL EDUCATION AGENTS

At this point we should concisely refer to the fundamental ontological and epistemological assumptions we endorsed in our study concerning the role of teachers at school.

Society should be perceived as an arena of the conflict among the various personal values and interests of people, which are shaped by the ideologies and cultural assumptions of the historical context. Within a framework of pedagogical approach, these assumptions illustrate the role of teachers in society, as professionals having to be accountable for their jobs to the public (Cochran-Smith, 2003). And what is the role of the teacher who realises that school has to respond to double assignment? In what way does the teacher perceive this role? And most important, on what conditions can the teacher meet the requirements for the double assignment of school?

According to Cochran-Smith (2003:4), ‘many current policies and policy recommendations share narrow — and some would say impoverished — notions of teaching and learning that do not account for the complexities that are at the heart of the educational enterprise in a democratic society’. On the other hand, teachers encounter many of the pressures and demands existing in a fast-changing society and endeavour to cope, which could be attained in view of their enhanced role, professional autonomy and professional emancipation. Their education, therefore, has to be seen as related not only to the classroom or the curriculum, but also to the identity of learners and the various
socio-economic and cultural contexts (Campbell, 1997).

Admittedly, the teachers are required to be qualified in order to nurture democratic virtues in future generations. They should promote knowledge about their subject matters as well as to support the learners’ development as democratic citizens, responding to the double assignment of schools. They should therefore perceive their role as critical education agents. This also depends, among other things, on the teachers’ personal values and understanding of their role pertaining to moral and democratic requirements. It also depends on the teachers’ moral reflection, which involves a critical examination of their experiences from a moral point of view (Ransome, 2009: 116). In accord with Aristotle’s practical wisdom (phronesis), moral reflection is closely related with the calculation of the most effective means to present and future success in light of the present and future requirements for human flourishing (eudaimonia) (Ransome, 2009: 114). Within this theoretical context, the modern teacher should develop the sense of responsibility and professionalism necessary for the discussion in the classroom of moral issues related with the common good (Klaassen, 2012). In short, they must have the so called ‘teacher’s ethos’ (Latzko, 2012).

This study attempts to gain understanding of teachers’ perceptions about their role as critical educational agents when societies face moral issues pertaining to challenges to humanity. This role of the teachers originates in the principles of Critical Pedagogy aiming at the cultural enhancement of pupils and the cultivation of a critical, interactive, pluralistic school culture (McLaren, 2003). Rather than requiring the transmission and absorption of ‘ready-made’ knowledge packs, it relies on educational innovation and the adoption of new forms of open professionalism. These features ensure the pedagogical autonomy and scientific emancipation, essential in order for teachers to fulfil the double assignment of school (Campbell, 1997; Patry, 2012; Tapola & Fritzen, 2010: 154-156).

3. WHY BIOFUELS?

As mentioned above, school ought to promote knowledge about subject matters, as well as to support the learners’ development as democratic citizens. In this context, it must integrate issues of moral and democratic education arising in relation with the contemporary challenges to humanity, as being of ‘emancipatory knowledge interest’ (Tapola & Fritzen, 2010) and giving rise to controversies framed on moral grounds (Näpflin et al., 2012).

Such challenges are the issues related to food security, as associated with humanity and human living conditions in a bizarre, contradictory way: they bring promises of a prosperous future for humanity, while applications of these knowledge areas give rise to new concerns (Dimitriadou et al., 2012; Gutzwiller-Helfenfinger, 2012). These concerns are related with the human nature or human life, involve constructions of synthetic life-forms or the cloning of DNA and provide arguments for and against genetic enhancement (Sandel, 2007). The significance of these issues lies in the fact
that the applications of food security, modern genetics and gene technology are being explored by global programmes of major importance: the United Nations Millennium Development Goals\(^2\) and the UNESCO-supported programme ‘Education for All’. Both aim at achieving goals of international interest and importance by 2015 (Tapola, 2012).

One of the basic constraints in the integration of food security issues within teaching practices might be the teachers’ reluctance to discuss the consequences a given topic may have for the humanity and the importance of the values behind the topic. There is evidence that a number of pre- and in-service teachers do not feel responsible for moral education, claiming that this is the responsibility of other curricula, such as the moral education or religious education or ethics (Latzko, 2010).

To our knowledge, so far there has not been conceived an instrument that could be easily used to map the teachers’ regarding incorporating a topic with moral consequences in their teaching. Yet, we assume that there should be some preconditions for teachers to address issues related to food security. Based on this assumption, we focused on the issue of bio-fuels as a vehicle of investigation of the Greek teachers’ willingness to include value-related issues with regard to this concept in their daily practice.

It is worth stressing the fact that the use of bio-fuels is a great challenge regarding supplying the planet with fuel, since it entails important economic and ecological advantages (Palmer, 2009; Woess-Gallasch et al., 2011; Zegada-Lizarazu & Monti, 2011). However, their use may be turned into a gigantic threat to humanity and human living conditions, given the rise in the world population and, hence, the increasing human need for food (Merkley, 2012). It is therefore evident that land abuse for the sake of bio-fuels, which could generate biomass and potentially produce bio-energy, could have painful consequences for global justice, equity, equality, and social justice. Here lies the origin of the issues of morality and democracy related with the bio-fuels as a subject of educational negotiation in schools, covered as such in this paper.

4. AIMS OF THE STUDY

The aim of this study was to examine the ways and the degree to which Greek teachers would be willing to integrate issues of food security in their teaching practices, especially regarding bio-fuels. This presumptive willingness of teachers can be considered as a precondition that highlights the teachers’ eagerness to respond – at least regarding the specific issue – to the double assignment of school (Patry, 2012; Tapola & Fritzén, 2010).

The study addressed Greek pre-service teachers and in-service teachers of primary and secondary schools in order to map their views about the necessary

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\(^2\) The Millennium Development Goals set time-bound targets by which progress in reducing income poverty, hunger, disease, lack of adequate shelter and exclusion —while promoting gender equality, health, education and environmental sustainability— can be measured. They also embody basic human rights —the rights of each person on the planet to health, education, shelter and security. The Goals are ambitious but feasible and, together with the comprehensive United Nations development agenda, set the course for the world’s efforts to alleviate extreme poverty by 2015.

conditions that would make them eager to bring the issues of morality and democracy pertaining to the bio-fuel use into the classroom. In this way, detailed reports may be made, analysing not only their eagerness and scientific competence to integrate such an issue in their instruction, but also the preconditions within primary and secondary teacher education programmes for addressing issues of this nature. The results are expected to set a framework for the submission of suggestions on teacher education to the direction of their professional competence and ethos, so that the teachers can meet the requirements of the double assignment of school (Oser, 1991; Latzko, 2012).

It is worth mentioning that the purpose of our research is not merely to report on and interpret the teachers’ views about a concrete social situation, namely the integration of the bio-fuel issue in everyday school practice, but to lay down the preconditions for a critical negotiation in real terms and hence a critical discourse on knowledge and value education (Latzko, 2012). Bearing in mind that, based on the expected results our study can make recommendations for the common good, we are entitled to assume that the theoretical basis of our study lies in critical theory (Basit, 2010: 15; Freire, 1973; McLaren, 2003; Mustakova-Possardt, 2004).

4.1. Research questions

The research was based on the assumption that the teachers can affect the students in adopting moral and democratic attitudes when faced with challenges against humanity. These challenges refer to matters of food security in relation to production, availability and the use of bio-fuels and overall energy policy. The research questions were posed as follows:

- To what extent and in what way do the teachers take into account the necessity of negotiating issues concerning food security – with regard to the management of bio-fuels – in the classroom, even if the latter are not included in the curriculum?

- To what extent do the teachers stand willing and competent to integrate issues of moral and democratic education pertaining to food security (bio-fuels) in their teaching practices?

- What are the preconditions within teacher education that would allow teachers to respond effectively to the ‘double assignment’ of schools as far as issues of morality and democracy pertaining to food security is concerned?

5. RESEARCH PROCESS

The research process applied in our study follows the pattern of the explanatory paradigm (Basit, 2010: 14-15), focusing on the exhaustive analysis of the teachers’ views and conduct and detecting similarities and dissimilarities. Thus, it attempts to explain social reality as illustrated by researchers, in order to build a generating theory inductively deriving from the process of data collection and analysis which has been carried out in a systematic way (Patton, 2002).
Our methodology follows the ethnographic approach, while it aims to catch the subjective meanings attributed to concrete situations by the participants. It is concerned with description, induction, generation of theory, construction and subjectivities rather than objective knowledge, enumeration, verification of theory, deduction or prediction (Basit, 2010: 22).

A data analysis was carried out, after the data had been categorized and then the occurrence frequency of the various categories was compared. The participants’ replies were analysed into specific semantic items which were then classified into semantic categories. These categories are structured around the central notions of the questions given to participants, aiming at forming an overall picture of their views on the issues discussed in the questionnaire.

At the same time, in the participants’ texts, the methods of Discourse Analysis, which originates in the Speech Act Theory of Austin (Austin, 1962), Ethnomethodology of Garfinkel (1967) and Semiotics (Hodge & Kress, 1988) were applied. The language analysis methods are guided by the common belief that language may and can be studied independently and systematically as a ‘social practice’ that silently dictates, forbids, commands, forms and legalizes the human relationship with oneself and one’s social environment, either in an active, or in a performative way (Gee, 2005). It is the so-called action/function orientation of language, which is founded on the assumption that ‘texts of all sorts construct our world’ (Gill, 2008). We thus approached the language of the participants as discourse forms that contribute in a performative mode to the production and re-production of meaningful relations, identities and knowledge/authority systems, within given historical and social contexts.

5.1. Context

The research was conducted by means of the focus group and produced both quantitative and qualitative data. A qualitative data collection method was selected as the most suitable for the exploration of issues related to the function of institutions (namely education) as well as their production and implementation framework (Morgan, 1998; Patton, 2002: 385-391). It is a form of qualitative research appropriate for highlighting the complexity and diversity of our research framework, which was strongly characterized by individual action and group interaction among the participants. Questions were posed in the context of an interactive group scheme, where the participants had the opportunity to discuss with the rest of the group members.

The value of this method lies in providing a context in which the teachers as group members had the opportunity to express their views and attitudes towards a clearly specified matter: the issue of integration of bio-fuels in the daily teaching practice. Moreover, this method held as a condition for the direct interaction and organized discussion among the participants, as a means to acquire highly valid qualitative results.
5.2. Participants

Pre-service and in-service teachers of Greek primary (n=49) and secondary (n=49) education of various disciplines participated in the study (N = 98). According to the Greek educational system primary school teachers teach a wide range of subjects, while the secondary school teachers are specialized to teach specific subjects. Participants were divided into and participated in 14 focus groups of six to eight participants; six groups of pre-service and eight groups of in-service primary and secondary education teachers.

5.3. Data collection procedure

The data has been collected by means of a tool comprising three sections: (a) a pre-test questionnaire, (b) an Environmental Awareness Test and (c) a focus group participants' sheet (Pnevmatikos et al., 2012). This study is focused only on the data referring to the third section.

In order to measure the teachers’ value related dispositions towards integrating topics with moral-consequences in their instruction, the research instrument included specific statements posed both in a positive and a negative form. This procedure was expected to facilitate the participants in order to take a perspective for or against certain possible values (Galinsky & Mussweiler: 2001) and invoke the appropriate arguments to support either a positive or a negative stance to them. Accordingly, in this context the teachers were invited to develop arguments revealing either their tendency to take the responsibility to integrate the aforementioned issues in their instruction (positive answers) or their reluctance to undertake it (negative answers). The teachers attributed their negative stance to a variety of reasons related to systemic problems with the school, the inappropriate curricula, the lack of students' readiness and also pragmatic characteristics related to the topic of biofuels. It is worth mentioning that the negative answers provided feedback to the researchers in order to map the reasons, the excuses or the real inhibitions of teachers when they are expected to integrate moral and democratic issues in their instruction. The very gist of the questions posed within the ‘focus group’ would be revealed when teachers had to answer as if they were opposed to the integration, because their inner hesitations would be freely expressed in a justified context.

After the topic of bio-fuels had been introduced and arguments had been expressed against or in favour of using bio-fuels, the participants were asked to argue whether they would integrate the issue of bio-fuels in the classroom. The participants were asked to raise up to five arguments in favour and up to five arguments against this tentative integration. Namely, the data consisted of both position statements and arguments of the individual teachers, as recorded within the framework of the focus groups settings (Patton, 2002: 385-391). The teachers were then asked to address issues associated with three questions focused on the following key concepts:

**Question 1:** The teachers’ views about the bio-fuel issue being integrated in their instruction in the classroom. Teachers were asked, ‘Do you believe that the issue so far discussed is a subject that could be integrated in your classroom?’. Teachers expressed up to five positive arguments and
up to five negative arguments starting with the sentence: 'The issue could/ could not be integrated in my classroom, due to the fact that…'. The question structure only involved the subject in the first part (do you believe), while the use of passive voice (a subject that could be integrated) only involved the respondent indirectly.

**Question 2:** The teachers’ possible initiatives to discuss the bio-fuels issue in their classroom. Teachers were asked, 'Do you believe you could take the initiative to discuss the issue in your classroom, even if it is not included in the school curriculum?'. Teachers expressed up to five positive arguments and up to five negative arguments starting with the sentence: 'I would/would not take the initiative to discuss the issue in my classroom, due to the fact that…'. This time the question structure aimed at a higher degree of subject involvement (Do you believe you could take… in your classroom).

**Question 3:** The teachers’ views about the bio-fuels issue as a matter appropriate for discussion in their classroom. Teachers were asked, 'Do you consider the so far discussed issue as an appropriate discussion topic in the classroom?'. Teachers expressed up to five positive arguments and up to five negative arguments starting with the sentence: 'The issue could/ could not be an appropriate discussion topic in the classroom, due to the fact that…'. In this case, the involvement degree of the respondents is similar to the one in Question 3.

In all questions, the teachers stated their beliefs on the basis of a 5-point Likert type scale (1: I don't think so to 5: Yes, I think so).

6. **RESULTS**

The content analysis applied in the respondents' replies mainly emphasizes their views as far as the negative questions are concerned ('The issue could not be integrated in my classroom…', 'I would/would not take the initiative…', ‘The issue could not be an appropriate discussion topic'), as we intended to detect the motives that could possibly prevent the teachers from assuming responsibility for the integration of the bio-fuel issue in their teaching. Thus, we could make assumptions concerning the shortfalls in their education and put forward suggestions regarding the teachers' education.

Regarding the discourse analysis, we examined the subjects' expression in order to explore whether their discourse had a performative or a declaratory function, whether it referred to idea units, formed relations of logical information or referred to the implied intentions of the respondents. Furthermore, we tried to find out whether the respondents involved themselves in suggestions about taking action (personal references) or appeared detached in this respect.

**Regarding question 1,** the highest percentage of the participants (86%) answered affirmatively that the bio-fuel issue is one that could be addressed in the classroom (4 & 5 on the Likert scale). Namely, grade 5 of the five-point Likert scale summed to 44% of the total answers and grade 4 to 42%.

Of the most positive arguments developed by teachers, the most common ones (65%) were those related to raising the pupils' environmental awareness. Nevertheless, the discourse analysis
revealed another dimension of the results: the arguments concerning the relation between the bio-fuel issue and the raising of environmental awareness often made a personal reference to the pupils and not the teachers themselves, thus downgrading their responsibility. An illustrative example: ‘The pupils must be aware of the environmental developments, must develop environmental awareness and must know what is going on in the world’.

On the other hand, the textual relations in the arguments’ discourse were just rational information relations (what is said) and did not reveal intentional relations (implied intentions). In addition, there were also simplistic topic formulations, put forward even by participants who showed a clear intent to bring the bio-fuel issue into the classroom: ‘It concerns the environment’, ‘It is important to integrate the module in education, as it will help the children think ecologically’.

In the second part of the argumentation, the participants were asked to present negative arguments, even if they had shown their strong intent to teach the issue. Therefore, they provided a large variety of answers, of which 54% characterized the bio-fuel issue as ‘inappropriate’, as conflictual (e.g., ‘It is a complex issue that may cause confusion in pupils and provoke conflicting, controversial answers’). The rest of the questions were related to theme axes such as the unreadiness on the part of the teachers, of the pupils and of the system as a whole, the rigidness of the school curriculum, the teacher role that is not consistent with this issue and the negative correlation with entrepreneurship and the profit motive (Fig. 1).

Moreover, the content analysis initially revealed that the main reason teachers do not believe that the bio-fuel issue could be integrated into their teaching was their own incompetence, as well as the unreadiness of the educational system as a whole: ‘The
Greek school does not enhance free thinking’, ‘The curriculum is restrictive’.

The discourse analysis revealed that, even in this case, the text of most answers did not include the teacher as a personal reference (subject), while, on the contrary, the pupils, the school, the system or the bio-fuel issue were highlighted: ‘The pupils of primary school are too young for such discussions, they will find it extremely difficult’. The teachers’ reluctance to become involved in the issue was ascertained by the fact that, in their arguments concerning the lack of readiness, the declaratory function of speech prevailed: ‘It is quite specialized and complex for young pupils’. Regarding the content, the answers also reflected a tendency to disclaimer and scaremongering (‘It may cause the wrong impressions due to lack of information’), but also to underestimating the issue importance: ‘There are more important things to be integrated in the biology material’ (according to a biology teacher). Additionally, the argumentation language mainly had a declaratory, rather than a performative function: ‘The children and their parents have zero awareness and are reluctant to be informed, they are totally indifferent and would not participate in the lesson’.

Regarding question 2, 67% of the participants appeared to be positive in regard to taking the initiative to teach the bio-fuel issue, regardless of the fact that it was not included in the curriculum. In the positive arguments they presented, they characterized the issue as interesting, contemporary, important and useful (at 53%) and believed that it enhances the cognitive development of the pupils: ‘They should listen to various arguments; this would be a fruitful activity of critical thinking’.

The discourse analysis, however, did not reveal a strong desire to take this initiative. The replies provided by the participants started with the first person singular, which – at a first level – highlighted the need for personal initiative and taking responsibility. However, there were only few personal references identified with the teachers themselves as acting individuals. On the other hand, the significant ethical dimensions of the issue were not raised by the teachers. Lastly, their arguments included logical, rather than additive information. Namely, the teachers perceived the broad significance of the issue but did not show any intention of taking action in order to change it towards the right direction.

All the above were further highlighted in the analysis of the negative arguments presented in question 2. Of the teachers, 40% admitted that they would not take the initiative to teach the bio-fuel issue, because it is an inappropriate subject (‘the pupils are immature’, ‘the issue is complex/difficult’). A remarkably high percentage of answers (23%) presented the lack of the necessary cognitive background on the part of the teachers who would raise this issue in the classroom as a deterrent: ‘It does not fit in the curriculum, I’m not trained for this’, ‘I would have to collect a lot of information in order to organize the teaching’, ‘I am not an expert in this issue, I have no sufficient data’. Moreover, 22% invoked the rigidity and inflexibility of the curriculum: ‘The teaching time is precious, we wouldn’t like to waste it’, ‘I wouldn’t have the time to do it’. The distribution of the responses is illustrated in Fig. 2.
The discourse analysis provides data in support of the above-mentioned data. Concerning the ‘subject inappropriateness’, the teachers use as personal reference either the pupils (e.g., ‘It is difficult for the children to fully understand the underlying interests and the strengths and weaknesses of our choice’) or the bio-fuel issue itself (e.g., ‘the bio-fuels are still highly experimental’). Thus, they evade their responsibilities, despite the fact that the question concerned their own initiative to integrate the issue in their teaching. More specifically, by making reference in most of their replies to the ‘children-pupils’, they shirk their actual responsibility and ignore the question structure (e.g., ‘the pupils cannot present arguments regarding the bio-fuels, they are too young for this’). On the other hand, the replies related to the ‘inappropriateness’ of the bio-fuel issue itself are dominated by logical information relations. The teachers describe and evaluate a situation, without acknowledging it as a problem to be solved (e.g., ‘the bio-fuels are still highly experimental’, ‘the benefit from bio-fuels is not clear’, ‘it is an issue that could be of interest to the pupils in my area’, ‘the pupils cannot present arguments regarding the bio-fuels, they are too young for this’, ‘It is difficult for the children to fully understand the underlying interests and the strengths and weaknesses of our choice’).

The discourse analysis of the replies concerning the teacher’s role is also of great interest. In these, the teachers make personal reference to themselves, assuming their responsibilities from the outset. Regarding the rhetorical relations, the declaratory discourse function prevails, while the textual relations are mainly logical assumption relations (e.g., ‘It doesn’t fit the
Regarding the negative arguments put forward by the participants in the same question, they were structured on the basis of specific notions which attributed to the bio-fuel issue properties such as inappropriate or irrelevant to the curriculum (46%), as well as incompatible with the children’s maturity or the teacher’s eagerness (26% of the answers): ‘I cannot fit it in the curriculum’, ‘It is complex’, ‘The children of low grades are not aware of these notions’, ‘I will not be able to cover the teaching material, the teacher gets bored and is scared to start such discussion’.

The distribution of items included in the negative arguments appears in Fig. 3.

curriculum, I am not trained’, ‘I should have to collect lots of information in order to organize my teaching’, ‘I am not specialized in this matter, I have no sufficient data’, ‘I do not have the necessary knowledge and information’, ‘I wouldn’t be understood by the children, I do not have the necessary time’.

Lastly, regarding question 3, 76% of the participants agreed on the appropriateness of the bio-fuel issue as a discussion subject in the classroom. The content analysis showed that the positive argumentation lay at 43% of the total in acknowledging it as a ‘wide, current and interesting issue, related with survival’, while 38% related it to raising environmental awareness in pupils: ‘Interesting for the children’s judgment on the current issue, dealing with the environment’. ‘Yes, it helps the pupils to develop ecological awareness and concerns everybody, let alone the youngsters’.

The discourse analysis in the teachers’ replies regarding their views on the subject appropriateness revealed an interest and a positive attitude. Idea units prevailed in their references (e.g., notions such as environmental awareness). Moreover, teachers used general –and abstract– terms: ‘The pupils must be informed about environmental issues’. Personal references varied in their identification with acting individuals: ‘I care about stimulating the children’s brain with current issues’. ‘It is vital that the pupils know we are part of nature and not separate from it’. Furthermore, the wider responsibility of organisations other than school was highlighted: ‘The mass media tackle this issue often –there is a wealth of information’.
The discourse analysis of the negative answers in the third question revealed that the reasons presented by the participants were not rich in argumentation. The teachers ‘regurgitated’ the same excuse, presenting the difficult nature of the subject or the pupils' immaturity as the cause. In their final opinion, the bio-fuel issue could not be regarded as an appropriate discussion subject, due to its high degree of difficulty (declaratory discourse function), without their being able to suggest any solution: ‘The lower grades may not perceive the issue properly’ (1st and 2nd grade of primary school) if their parents work in a factory producing genetically modified products or on a farm, using fertilizers or pesticides’. The textual relations here were rhetorical, namely describing a situation and assessing it, but not providing solutions: ‘It may be of no interest to children, thus causing unrest in the classroom’. The answers also showed relations of logical information, which means that the participants had a high degree of awareness of the meaning of their words: ‘It involves scientific terms that are not easily perceived by young children’. However, the value of logical information was undermined by the subjectivity in which the teachers themselves put forward their ideas (‘I cannot fit it in the curriculum’, ‘It is not part of the examination syllabus and is out of my teaching object’).

7. DISCUSSION AND CONCLUSION

The research results provide first and foremost a quantitative indication of the general tendency in the participants’ replies concerning their views and intent to integrate
the bio-fuel issue into their teaching practice. The majority of participants (over 75%) seem to be in favour of the possible integration of the bio-fuel issue in the subject matters discussed in the classroom; they consider it to be an issue worth teaching, even if such integration took place outside framework of the official curriculum. It is worth mentioning that, in the total of the positive attitude quantitative answers of the teachers, the values of the means are higher in the in-service than in the pre-service teachers. This may be due to the fact that the former, being more experienced, feel more at ease with the management of new or contradictory issues and can integrate them more easily in their instruction.

Results drawn from the qualitative content analysis and the teachers’ discourse analysis shed light onto the essential approach and exploration of the issue in question. Namely, it was the discourse analysis as a reciprocal and cyclical process which examined the situated meanings the participants’ language attempted to build about the world, identities, and relationships (Gee, 2005: 83). In that sense, the results can lead to a series of documented, comprehensive statements that also concern major issues examined by the research: the modern teacher’s perception of their role, the double assignment of school, as well as the preconditions of their education, so that they can fulfil the requirements of their role.

At first, the content analysis revealed that the positive attitude of the teachers to the issue of integration of the bio-fuels is mainly due to the fact that it will contribute to giving pupils a general idea (e.g., The students must know what happens in the world), emphasizing its educational value in relation to the interdisciplinary approaches that can be applied (e.g., it gives opportunities for interdisciplinary approaches). They also referred to issues concerning raising environmental awareness, while there is a lack of references on the moral dimension of the use of biofuels. Thus, there are no references to the impact of the biofuel use in the food field (e.g., the pupils must be aware of the environmental developments). On the other hand, the negative arguments they presented stressed the complexity of the subject, especially for young children (e.g., the issue is complex/difficult to be negotiated by young children), its inappropriateness in relation with the Greek educational reality (e.g., the school system is restrictive), as well as the teachers’ own incompetence due to the lack of training and instruction (e.g., First I should be globally informed on the issue). At that point, they referred repeatedly to the curriculum’s rigidity.

The discourse analysis also provided more essential information on the issue. Although in the discourse analysis the teachers seem to agree that the biofuel issue should be integrated in the curriculum, they appear detached as far as their personal involvement is concerned. This is evident in the following characteristics of their discourses:

a) They often use the passive voice in their statements.

b) When they use a personal reference, the subject of their statements is their pupils.

c) They adopt a ‘deontic modality’ for their judgment regarding the issue introduction to their teaching.

d) They use general terms in relation with the pupils’ information about the
environment, without involving themselves in any negotiation about the issue.

The conclusion reached suggests that most teachers do not seem willing to take the initiative and integrate the issue in their instruction, while their answers are characterised by an oversimplified way of thinking (e.g., ‘It is important for children to be aware of environmental developments’). This means that, on the one hand, they may acknowledge the positive effect of students’ knowledge about bio-fuels and their consequences on the environment, but, on the other hand, they do not take into consideration the impact on the food field and the need to discuss the food policy of the various countries around the world. Moreover, they do not appear eager to take action and reflect on their responsibility for bringing these issues into the classroom. The participants do not provide particularly sound documentation of their views, which shows that they had not been previously concerned about the issue, nor is it part of their experience. However, they claim that they should be trained on the issue under consideration, in order to integrate it in their instruction.

All the above lead to the conclusion that concerning the first and the second research questions, the teachers acknowledge the need to introduce the subject of food security and the bio-fuel issue in teaching, although this is not included in the school curriculum. Nevertheless, they acknowledge the demanding, complex nature of the issue, which, in combination with their own lack of readiness, makes it inappropriate for teaching. They realize that one of the factors preventing them from dealing with the issue is exogenous, related to the rigidity of the school curriculum, but they admit that another serious deterrent is their own lack of background and readiness. In any case, they acknowledge the moral implications of the issue, without further analysing this aspect. Often they see it as a ‘taboo issue’, a challenge that has to be dealt with through ideologies and moral dilemmas or an issue on which they have to take a stand. Yet, they seem to avoid any responsible engagement in a critical approach to literacy, justifying their attitude on the grounds of the challenging, oppressive social and political relations (Lee, 2009).

The teachers that have to fulfill this engagement beyond knowing their subject matter and the methodology must have political clarity (Freire, 2006: 255), that is, awareness of the connection between the sociocultural structures and the school education. This can enable them to work in order to transform the sociocultural reality at a classroom and school level, by evening out the macro-level disparities (McLaren, 2003). Teachers with political clarity can examine the practices applied with epistemology of practice, which leads them to personal transformation processes and the cultivation of important professional skills (flexibility in dealing with the changing conditions, decision-making abilities, creativity, critical thinking, and others). In this way, they respond to the reflective teacher-practitioner, characterized by awareness of their role, responsibility, self-improvement and autonomy as well as the critical analysis and self-assessment of their instruction.

The result analysis is more exhaustive in relation to the third question, which aims at illustrating the conditions that have to be
taken into account in the teachers' instruction, so that the latter are more eager and competent to handle issues of moral development and democracy. In this light, the negative replies in the teachers' argumentation were the ones that provided the most illuminating information on the issue. The discourse analysis concerning these replies proved that teachers do not understand or do not admit the extent of their responsibilities. On the contrary, they shift their duty to third parties, waiving their double role as political and social activists, as described by Paulo Freire (Freire, 1973 & 1985). On the other hand, they often invoke exogenous factors that prevent them from integrating the bio-fuel issue into their instruction, such as the lack of time and the rigidity of the Greek school curriculum as well as the unreadiness of Greek education and society in general. They acknowledge the importance of the issue and consider it to be 'interesting', although they do not assume responsibility for its integration into the instruction, as part of the school curriculum or beyond it. Our study results agree with the results obtained by other researchers, which showed that the requirement for the double assignment is hardly ever met and that the teachers are faced with important obstacles in their compliance with this requirement (Patry, 2012).

In fact, all the above lead to the conclusion that the teachers may not hold themselves responsible for the integration of the bio-fuel issue in their instruction. They therefore appear to be insecure about the issue in question. We can assume that this uncertainty generates a sense of powerlessness combined with a lack of personal responsibility. A process of critical reflection could function as an antidote in this case, allowing them to implement their values of high quality instruction to students and start seeking ways to bring about change (Fook & Gardner, 2007: 3-8).

In addition, the moral dimensions of the matter are not thoroughly analysed in the teachers’ reports. The oversimplified formulation of their otherwise positive replies seems essentially to reveal a great degree of embarrassment concerning bringing the issue into the classroom. Similar findings were provided by the research of Näpflin et al. (2012), where the teachers claimed that the current curricula usually do not allow them to participate in interdisciplinary projects concerning the students' moral beliefs about genetic manipulation of plants. However, the teachers seem to acknowledge the problem, without, however, suggesting any viable solution. This may be some kind of proof of their distancing themselves from this moral issue related to democracy in human societies, in an era when all teachers must be held accountable for their work. In addition, the measures of this work cannot be determined by narrow conceptions of teaching quality and student learning that focus exclusively on test scores and ignore the incredible complexity of teaching and learning (Cochran-Smith, 2003; Dimitriadou, 2016; Weyringer et al., 2012).

Our analysis reveals some cultural assumptions that are inconsistent with the accountability policies and the theories of continuous improvement and organisational learning. This could be due to the fact that the existing values behind the participant teachers’ statements refer to environmental awareness, interdisciplinarity in facing problems which militate against humans’
wellbeing, and also the school curriculum and teacher-training curriculum enrichment regarding moral issues concerning the environment. The teachers’ answers are related to values concerning sustainability, flexible school curricula, teacher-education curricula and teaching practices. These values have important consequences for the teachers’ self-perception, their job as educators and their professional role. We therefore realize that the teacher-education programs ought to have a humanitarian orientation, an ethical character that would enhance the discussion of moral dilemmas associated with the challenges humanity faces.

Given the results of our study, we maintain that teachers ought to: a) be sensitive to issues of morality and democracy pertaining to matters of global interest; b) realize the importance of their role with respect to the moral and democratic attitudes and habits of students; and c) be more effective in their ways of teaching issues of morality and democracy in the classroom. A condition for this is that they themselves reflect on their role and make decisions about the integration of such issues in their teaching. Identifying these needs is related to the respective preconditions in teacher education.

According to Weyringer et al. (2012), the patterns of traditional teaching are quite deeply-rooted in the teachers’ subjective theories and attitudes as well as their responding habits and routines. Following a ‘managerial’ way of working in school organisations, teachers are usually expected to work in regulated ways in order to maximize efficiency and ensure uniform and measurable outcomes. Thus, they neglect issues of moral and democratic education that should be integrated and discussed in the classroom by means of approaches to new literacies (Dimitriadou, 2016 & 2008), especially in an era of drastic changes. The development of the notion of the ‘learning organisation’ may in this case have a compensatory function, since, through the process of lifelong learning, teachers are offered opportunities to name current stresses, to explore how they fit to core values and to identify implications in practice. To attain this, the teachers should develop critical reflection skills that would provide them with a way of ‘standing back’ and identifying what they have assumed about how things are and how they could be. Through the critical reflection process, the teachers can articulate the value of knowledge derived from their own experience as professionals as well as knowledge gained from formal or informal training, validate a theory-building of their own and provide a process that can be used in practice (Fook & Gardner, 2007; Schon, 1983).

In this way, teachers can enrich their instruction with more creative, satisfying and effective practice. They can therefore form a new context for their teaching, which would involve moral development and democracy issues even about matters out of their specialty, thus taking steps towards professional learning and emancipation (Oser, 1991; Timperley, 2011). In addition, in discussing the issue of the genetic technology, Tapola and Fritzen (2010: 169) suggest that ‘it is not always necessary for the citizen to understand the subject on a detailed level in order to be able to discuss the societal consequences of gene
technology use’.

In conclusion, it is worth making reference to how the above research-results could be connected with teacher education. Society should first pose a philosophical question about the kind of teacher we need. The answer to this question can offer an overarching picture of the structures in which teachers need to be engaged. Subject matter studies in teacher education should not have a purely academic orientation but rather be integrated within an ‘educational’ and value approach (Campbell, 1997).

We assume that integrative approaches could break the traditional boundaries between the subject matters and moral and democratic education and, potentially, could face the teachers’ inherent reluctance to innovate (Wagner, 2001; Pnevmatikos et al., 2012). Furthermore, the teachers have to adopt certain epistemological and ontological positions that would allow them to promote the Bildung, emancipatory knowledge interests, and the double assignment of schools, rather than separating the general didactic from the subject-related didactic (Tapola and Fritzen, 2010: 171). The issue of teacher education on this matter is of major interest for teachers, teacher-educators, curriculum designers, educational policy makers and, of course, the teacher-education institutes and the governments.

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TEACHERS’ DISCOURSES FOR INTEGRATING MORAL ISSUES IN THEIR INSTRUCTION

Catherine Dimitriadou, Dora Psoma, Dimitris Pnevmatikos


**BRIEF BIO**

**Catherine Dimitriadou** is a Professor of Teaching Methodology in the Department of Primary Education, University of Western Macedonia, Greece. Her teaching and research interests focus on teacher’s training regarding differentiated instruction, intercultural education, values and moral education, visual literacy, and non-formal education. She has been member of the Board of intercultural scientific associations and research networks, and also coordinator of national and international projects.

**Dora Psoma** is a Modern Greek and History teacher in private schools in Thessaloniki, Greece. She holds a Bachelor Degree in History from the Aristotle University of Thessaloniki and a Masters Degree in Pedagogy from the University of Western Macedonia. Currently she is an undergraduate student of English Language and Literature in AUTH. Her CELTA Degree from the University of Cambridge led to a teaching position in a private school for Chinese speakers in London. She also designs teacher training programmes for E-Learning courses of the University of Piraeus.

**Dimitris Pnevmatikos** is a Professor of Developmental Psychology at the Department of Primary Education, University of Western Macedonia, Greece. His teaching and research interests include moral development and education.
VaKE: COMPLEMENTARY DOUBLE ASSIGNMENT IN TEACHER EDUCATION

Martina Nussbaumer
Department of Education, University of Salzburg, Austria
nussbaumer.m@me.com

Jean-Luc Patry
Department of Education, University of Salzburg, Austria
Jean-luc.patry@sbg.ac.at

Sieglinde Weyringer
Department of Education, University of Salzburg, Austria
Sieglinde.weyringer@sbg.ac.at

Alfred Weinberger
College of Education of the Diocese of Linz, Austria
alfred.weinberger@ph-linz.at

ABSTRACT
Values education and the moral development of teachers are usually required of teacher education institutions, but they are barely anchored in the curriculum and neglected in practice (e.g. Boon, 2011; Maxwell et al., 2016; Schwartz, 2008). Thus teachers are not able to fulfil the demands of the double assignment which requires them to promote knowledge about subject matters, as well as to foster the learners’ moral development and their democratic competence. The double assignment also entails that teachers need not only to teach the subject matter itself but to do so in a way that complies with a set of overarching goals addressing the learners’ or students’ value-related dispositions as well without seeing them as separate endeavours, rather in a complementary way. However, given the teachers’ lack of preparation to fulfil the requirements of the double assignment the question arises what can be done to foster them doing so? It is suggested to focus on the preconditions of the double assignment because there are ways for teachers to integrate both, teaching subject matter and fostering the moral development and democratic competence. In this article the VaKE (Values and Knowledge Education) approach is presented as one possible means to achieve the double assignment in teacher education, the preconditions for performing it are analysed, and it is shown that if these preconditions are met, it is possible to integrate the requirements of the double assignment successfully.

Keywords: double assignment, VaKE, teacher education, values education

1. THE DOUBLE ASSIGNMENT IN TEACHER EDUCATION

In the present section, we clarify what we understand by the double assignment in teacher education. Then, we summarise and justify why teachers must not limit themselves to teaching content but are required to teach values and citizenship education as well. Further, some general preconditions for practising the double assignment are presented.

The term double assignment refers to one of the supposedly crucial obligations of
all formal education, namely, to promote knowledge about subject matters, as well as to support the learners’ development as democratic citizens (Tapola & Fritzén, 2010; Weinberger et al., 2016). The double assignment means that there is an obligation for teachers not only to convey knowledge to the students but to foster their moral development as well. This requirement is written in the school curricula of most countries, although often only in a superficial form and with little binding force. Research also shows that the school authorities rarely enforce this claim (e.g., Gruber, 2009; Thornberg, 2008), except schools with a declared values orientation, such as with a religious background (Willems, Denessen, Hermans & Vermer, 2010).

These requirements are sometimes mentioned in the particular parts of the curriculum devoted to the different subjects or disciplines; in any case, they are presented in the prefaces which are relevant for all disciplines. This means that there is agreement among the curriculum deciders that moral and values education must not be taken out of the different subjects and disciplines and put in a particular subject like ethics or religion; rather it must be integrated into the teaching of all subjects and disciplines. Although the curriculum writers might not have thought about this intensively, it is likely that the intention is not to have a teaching unit in which content is taught, followed by a distinctive unit in which moral education is practised, and then again followed by a phase of knowledge acquisition. Instead, they might have thought that content-oriented teaching and values-oriented education should be complementary and combined. This is what the double assignment means: To teach the subject matter and to practice values education, but not as separate, clearly distinct activities, instead of as an integrative endeavour. The double assignment also refers to teacher education which follows two purposes (Sackett, 2008): Preservice teachers should be prepared for their moral work of teaching (Sanger & Osguthorpe, 2013) which encompasses teaching morally and teaching morality, and they should gain professional knowledge. Research shows that the moral dimension is almost totally neglected in teacher education (see the article of Weinberger, this issue). Given the teachers’ lack of preparation to fulfil the requirements of the double assignment the research question is, how teachers can be prepared to perform the double assignment in their teaching.

To answer this question, the conditions teacher education must meet for enabling such integration to take place has to be examined. First, a theory of values education is needed. Most prominently, three classical methods used in values education have been used: (1) The romantic approach is an attempt to help the learners to find their own values (e.g. values clarification; Simon, Howe, & Kirschenbaum, 1972). (2) The values transmission or indoctrination approach roughly consists in conveying values to the learners (this is the traditional concept, e.g. by the church). (3) And the so-called structure-genetic approach in the tradition of Kohlberg (1981, 1984) focusses on the development of moral judgment. While obviously the curriculum constructors discussed above seem to have the traditional method of values education in mind, in our view Kohlberg’s concept is the most appropriate because it does not address the values directly, rather it deals...
with the persons’ argumentation in favour and against some moral decisions. Therefore, the problem that certain values are preferred over other ones is not a question of taste or of following an authority, but it is a justified decision of the individual. Moreover, research showed that Kohlberg’s concept is more effective than other approaches (Berkowitz & Bier, 2007).

Secondly, it is necessary to provide a theory that integrates the two domains of knowledge acquisition and values development – two domains that are often seen as separate, unrelated (Patry & Weyringer, in press). From the non-naturalistic meta-ethical standpoint (see Morscher, in press), the fact (content; descriptive statements: “x is the case”) and the values domains (normative or prescriptive statements: “x must be done”) are indeed separate. Non-naturalism means that normative statements cannot be reduced to descriptive ones, or in other words, one cannot deduce values from facts – this would be what is called the naturalistic fallacy. Normative statements need another type of justification than descriptive ones: While observations of some kind support the latter, norms can only be argued for by using at least one super-ordinate norm.

This does not mean that values judgment cannot be made in science, however. As has been argued extensively elsewhere (Patry, 2006), it is even impossible to avoid values judgments in research in education; this is the more the case when one is dealing with values education. However, the arguments in favour of values must be different from those used to support facts (Zecha, 1984).

In school and universities, too, values and contents are inevitably linked. Teachers and teacher educators cannot avoid that their teaching involves values. One can mention at least three arguments (Patry, 2002, pp. 10-11):

- First, teaching is always conveying values, whether the teacher acknowledges it or not. This has become particularly clear, for instance, in the discussion of the hidden curriculum (Halstead & Xiao, 2010).
- Second, the very choice of the subject, in science and other subject matters, involves some values decisions, which will be recognized by the learners.
- Third, the way to teach, the emphasis put on different issues and the like will also communicate values to the learners.

To perform the double assignment, it is necessary to have a method that allows an integration of the realm of curricular facts and the realm of values. For this, it is not sufficient to acknowledge the role of values in teaching content, and it is not sufficient to have a valid theory of values education, as provided by Kohlberg; rather it is necessary that the teaching method deals with both realms within one framework. Otherwise, the teaching of the two realms becomes additive (once this, once that) instead of integrative. Such a framework will be provided below.

It is imperative that teachers be aware of these issues before practising the double assignment themselves. This means that the teachers must meet the following preconditions to the double assignment:

- Awareness of the values-ladenness of content teaching in school;
- Acquaintance with the meta-ethical background (non-naturalism);
• Familiarity with the underlying principles of values education;
• Competence in the method that is being used.

In the terminology of Patry (1991) the reasons for not fulfilling the double assignment also refers to “confrontation” of values and knowledge education (argument: “no time for values education”) or “coexistence” (argument: “there are special lessons for this, like ethics or religion”). In contrast, we argued that the double assignment should be seen as an integrative concept (“complementarity”), and that the method to be used should satisfy this condition. VaKE (Values and Knowledge Education) provides such a framework because this concept is an integrative one that deals with knowledge construction and values education simultaneously. Hence, VaKE can be seen as one possible form to achieve the double assignment, but it is not necessarily the only one.

2. VAKE AS A MEANS TO ACHIEVE THE DOUBLE ASSIGNMENT IN TEACHER EDUCATION

VaKE is the acronym for Values and Knowledge Education and refers to a constructivist teaching method that combines moral and values education with knowledge construction (Patry, 2007; Patry, Weinberger, Weyringer & Nussbaumer, 2013).

2.1 Underlying theory

The background theories for VaKE (see figure 1) are the principles of constructivism (Kohlberg, 1984; Piaget, 1976) both for values education (Blatt & Kohlberg, 1975) and for knowledge construction (Scardamalia & Bereiter, 1989; Glasersfeld, 1980). This concept also includes the theory of social interaction and the zone of proximal development (Vygotsky, 1978).

Figure 1: Background theories and their interaction for the development of VaKE (Patry et al., 2013)
In this concept, there also can be a variety of additional theories added (e.g., critical thinking, Paul, 1993; problem-solving, Osborn, 1963; creativity, Csikszentmihalyi, 1996). A prototypical VaKE course consists of eleven steps with a preceded preparation and clarification step 0 (see table 1). In the first four steps, a discussion of a value conflict (dilemma discussion) takes place alternatively in class and small groups. The moral conflict (the dilemma) contains a problem by which one chooses between two possible options. It is designed in a way that requires learners to obtain additional knowledge to come to a satisfactory solution. Learners review their knowledge for viability and make so-called viability-checks. The learners construct the additional knowledge by themselves in the steps 5 and 6, before the second dilemma discussion is carried out (steps 7 and 8). If the learners need more information for their argumentations, it is possible to repeat one or multiple phases of knowledge construction and argumentation (step 9). The presentation of the findings and the application of the learned knowledge (steps 10 and 11) conclude the VaKE unit.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Social form</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Preparation/Clarification</td>
<td>Understanding of values, competences and working methods</td>
<td>class</td>
</tr>
<tr>
<td>1</td>
<td>Introduce dilemma</td>
<td>Understand dilemma and values at stake</td>
<td>class</td>
</tr>
<tr>
<td>2</td>
<td>First decision</td>
<td>Who is in favour, who against?</td>
<td>class</td>
</tr>
<tr>
<td>3</td>
<td>First arguments (dilemma discussion)</td>
<td>Why are you in favour, why against? Do we agree with each other?</td>
<td>group</td>
</tr>
<tr>
<td>4</td>
<td>Exchange experience and missing information</td>
<td>Exchange of arguments; what do I need to know further to be able to argue?</td>
<td>class</td>
</tr>
<tr>
<td>5</td>
<td>Looking for evidence</td>
<td>Get the information, using any source available!</td>
<td>group</td>
</tr>
<tr>
<td>6</td>
<td>Exchange information</td>
<td>Inform the other students about your constructions; is the information sufficient?</td>
<td>class</td>
</tr>
<tr>
<td>7</td>
<td>Second decision Second arguments (dilemma discussion)</td>
<td>Why are you in favour, why against?</td>
<td>group</td>
</tr>
</tbody>
</table>
Since in the present chapter we use VaKE as a prototype for implementing the double assignment in teacher education, it is not necessary to go into detail in the practical use of it; such information can be found elsewhere (e.g., Patry, 2007; Patry, Weyringer & Weinberger, 2007; Patry et al., 2013).

3. PRECONDITIONS FOR VAKE IN TEACHER EDUCATION

As preconditions for VaKE as a means to achieve the double assignment, the teacher educators must satisfy the following conditions: awareness of teacher roles, departing from traditional role concepts; planning of lessons; unexpected learning results; implementing a relationship between teacher educator and learner based on mutual trust; and conventional assessment.

3.1 Teacher educator roles in VaKE

Being able to manage the roles in VaKE is a precondition to practising it. In the implementation studies, this has turned out to be a key factor. Therefore, for teacher training, it is necessary to know about these roles, about the obstacles, and about how to overcome them.

If teachers and teacher educators do not know the underlying theory, many problems may occur when performing VaKE in class. Knowing the theory is also a precondition for the teachers for really standing behind the method; otherwise, VaKE will not be effective in class, regardless of whether it is implemented in school or teacher education. The learners will quickly recognise the teachers’ doubts and therefore are not highly motivated to do this open kind of teaching, and they are not willing to construct their knowledge by themselves. The learners’ learning is then not sufficient, and consequently, the teacher educator (or the teacher) might blame this on the method and refrains from using the double assignment any longer.

One of the main difficulties teachers have in doing VaKE (and probably similarly with other methods of the double assignment) deals with the different teacher
roles. Therefore, these roles are looked at more in detail, first for constructivist teaching in general, then specifically for VaKE.

3.1.1 Roles in constructivist learning

In a constructivist learning setting the teacher is not the transmitter of knowledge or values. Instead, he or she challenges the learners’ experiences, thinking and judgments (Patry, 2016). Learning in that way means modification or clearance and not matching. Teachers are critical companions of the learning process. They provide learning opportunities by setting a situation (e.g. a dilemma, but maybe not even this is necessary) and possibly contribute certain topics, but they are not determining the impact on the learners – what the learners is their responsibility after all. Instead, teachers challenge the learners by

- asking them questions (“What are the consequences of your decision?, “Which ethical principles are at stake?”)
- showing alternatives (“What do you think about this argument?”, “What would you think about this way?”);
- expressing doubts (“Does this also work, if...?”, “Your friend has a different solution.”).
  (Brügelmann, 1997)

In general, the teacher holds a restrained role, and the learners are in the foreground. This does not mean that the teacher is passive; rather he or she follows the discussions among the learners very attentively and is ready to intervene when necessary. This means the teacher educator shifts over the responsibility for the learning to the learners without giving up his or her own responsibility for teaching; in particular, it is his or her responsibility to apply the theory appropriately, which, as shown above, can be quite a demanding task.

3.1.2 Roles specifically relevant when performing VaKE

While the roles discussed in the last sections apply for (almost) all constructivist teaching situations, there are some roles that are particularly relevant in practising VaKE. In particular, it focuses on values education. This means that teachers must be able to address values issues, and they must be ready for discussing values issues with the learners. Discussing, here, does not mean to impose the own point of view, as many teachers and teacher educators perceive it (this would be indoctrination), but to provide arguments for or against certain standpoints, just like the learners. Actually, in these discussions, the teacher’s task is threefold (Oser, Patry, Zutavern, Reichenbach, Klaghofer, & Rothbucher, 1991):

- He or she must organise the discussion, i.e., initiate the discussion, make sure that the learners who want to express themselves can do so, and enforce the discussion rules. Learners with experience with the respective method will assume these functions by themselves, so this role is critical primarily in the introductory phases.
- Secondly, he or she must support learners, particularly those who cannot express themselves easily, who might be slower than the others, or who have a point to make but do not know exactly how to say it. The teacher’s or teacher educator’s task is then to try to understand what the learner wants to say, to provide help
in formulating (without being intrusive) and to provide a time slot in which the learner gets the opportunity to present his or her argument. Again, experienced learners will take responsibility for this as well.

- Thirdly, the teacher has his or her own opinion that he or she might want to put on the table. We have often made the experience that the learners focused on specific arguments and forgot completely about other ones that might have been important as well. It is then the teacher’s or teacher educator’s task to provide insinuations or even blatant arguments, but not in the sense of “the right answer” (this would be indoctrination, which we reject), rather as a suggestion to think about. This is perhaps the teacher’s or teacher educator’s most delicate role because it must be evident to him- or herself as well as to the learners that this argument has the same power as the learners’. The teacher or teacher educator must formulate the argument in a way that the learners can understand it, taking into account their stage of moral development. Maybe he or she will present arguments opposite to his or her own conviction (the devil’s advocate) to foster the discussion. Again, the more experienced the learners are, the less are such arguments necessary. However, one never knows whether the discussion runs into a dead-end, and he or she would have to put it on the right track again.

These three roles in the dilemma discussion refer to the values issues as well as to the content issues, but in our experience with VaKE, the values issues are more difficult to deal with. Moreover, for all three roles, one aim of the teacher’s activity in the long run is to make him- or herself superfluous. This is actually a general aim of education, but for a teacher educator, it is sometimes painful to learn that the learners are not interested in his or her point of view even if, indeed, he or she would have something to say.

Another issue is that dealing with values necessitates having an appropriate meta-ethic position (see above, section 1): Non-naturalism (Morscher, in press). It means not only to have a sound familiarity with this meta-ethic standpoint but also to convey it to the learners who would not apply it spontaneously in all cases (Nussbaumer, 2009). This is not to mean that the teacher should intervene whenever the naturalistic fallacy is committed; rather he or she might address the question whether the argument is straightforward or whether there is a hidden assumption behind it (see above, section 2.3.1: the challenging questions). Often these hidden assumptions about something being valuable are seen as self-evident, but the learners must learn, as part of their developmental process, to provide as detailed argumentative strings as possible, and particularly that there must not be any empty spot in the argumentation chain. Moreover, for a syllogism to be complete, according to the non-naturalistic concept, if the conclusion contains a values judgment, it is necessary that the premises contain at least one values judgment from which, in conjuncture with the other (often descriptive) premises, the conclusion can be deduced.
3.1.3 Teacher roles in VaKE

In constructivist teaching methods, teachers have different roles compared to a traditional class (Patry, 2016). Due to the different steps in VaKE, the teacher has to change his or her role because of the special activity within them, and in some cases, he or she also has to change the role within one step. In general, the teacher’s roles in VaKE are as follows (Weyringer, Patry, & Weinberger, 2011):

- The teacher is organiser and initiator of the learning situation.
- He or she is a learning guide, manager, observer and coordinator of the learning situation.
- He or she acts as an expert in certain steps (but not constantly, as in traditional teaching!)
- He or she is also a learner.

The roles the teacher has to play depend on the step within a VaKE process. Hence it is demanded that the teacher knows which step of VaKE he or she is in at any given time, and he or she must know the appropriate role(s) within the respective steps. It is also necessary that the teacher or teacher educator demonstrates his or her role adequately to the learners. If these requirements are not met, the teacher educator is not able to appropriately fulfil the challenges of the double assignment. Thus, knowing the different teacher roles and when to act accordingly is a precondition for fulfilling the double assignment in school and teacher education. As one can see the teacher educator’s roles in a VaKE class is very different from the traditional one as a conveyor of knowledge.

3.2 Acquiring teacher roles in teacher education and its obstacles

As said above, to properly apply the double assignment (for instance VaKE), a teacher educator must know the underlying theory and above all be aware of is or her roles. The following accounts result from our experience from in-service training provided in Austria to get primary and secondary teachers acquainted with VaKE from in-service training (see Weyringer, Patry & Weinberger, 2011), and from pre-service teacher education in Higher Education Institutions (e.g., Weinberger, 2016). Further, in Greece, 150 in-service primary school teachers have been familiarised with VaKE and have organised VaKE-based dilemmas during their studies at the School of Education, University of Western Macedonia (Chatzichristou et al., 2011). Finally, the experiences by Haara and Smith (2012) are taken into account.

Departing from traditional role concepts. Since teachers have a long experience in traditional learning and teaching (pre-service teachers at least as learners and students), it is likely that they have internalised the traditional roles, both of the teachers and of the learners. The latter are often seen as mainly passive receivers of knowledge and values, whereas teachers are used to be in an active role and impart knowledge and values. In contrast learners in a VaKE-lesson are active learners, and the teacher holds a restrained role and supports the learners by creating situations and arranging an atmosphere, which is conducive to learning. This role change from a traditional setting to a VaKE-setting is problematic for teacher educators and teachers at the beginning. It has to be adapted by
introducing the method step by step. For example, the teacher educators learn to suspend their judgments during a dilemma discussion and stimulate the learners’ moral argument by using “why” questions, thus pushing the learners to deepen their argumentation. They offer different sources of relevant knowledge to the learners and suggest different possibilities of learning products. Teacher education has to provide possibilities for teachers to change this internalised understanding of one’s role, for instance by sitting in on VaKE-classes, reflecting the teacher’s role in VaKE and to try out VaKE in their own teaching practice.

Planning of lessons. In comparison with traditional lessons, constructivist learning cannot be planned in detail because the learners conceive most of their learning process themselves. For example, they express their learning goals, decide about which product should be the result of a unit, and organise their own learning breaks. Pre-service teachers usually learn in detail how to plan a lesson. This detailed planning offers them security because it reduces unforeseen situations in the classroom. However, a detailed planning is not useful in constructivist learning. The pre-service teacher’s training for this has to include a variety of methods how to deal with disciplinary and didactical problems during a unit.

Unexpected learning results. In traditional settings, the learning focuses on tasks, which are characterised by one solution, which is “right”. In contrast, constructivist learning focuses on problems, which are characterised by a variety of possible approaches and viable solutions. A VaKE dilemma is a typical problem because the learners are asked to express a variety of moral arguments, which even can be on the contrary to the teacher educator’s opinion. Moreover, the same applies for knowledge acquisition: According to our experience often the learners know more at the end of a VaKE unit than the teacher knew at the beginning. To get familiarised with this problem based learning a teacher training for VaKE offers opportunities to the teacher educators and the teachers to learn how to check the learning process of the learner continuously so that the teacher is informed about the learning progress and can check the viability of the approaches and the proposed solution.

Establishing a learning climate based on mutual trust. Trust is an essential precondition in performing VaKE. Preservice teachers, as well as learners in school, want to give “right” answers to get a good grade. However, in a VaKE-setting authentic judgment is essential to foster moral development; therefore the teacher educator has to establish a learning climate, in which the learners feel free to utter their own opinion even if this opinion is contradictory to the opinion of the teacher educator. From our experience establishing such a climate takes time and requires that the teacher educator put his or her emphasis not only on content but also on the relationship to the learners (Weinberger, Patry & Weyringer, 2016).

Conventional assessment. Conventional assessment procedures are based on tasks and questions, which offer only two solutions: right and false. These assessment procedures are inadequate for a VaKE unit. On the one hand, solutions to a moral dilemma cannot be categorised according to a true-false scheme, but rather their structure is on a more or less highly
developed level according to Kohlberg. If categorised on a true-false scheme, the learners also would try to find arguments which the teacher would like to hear because they have learned that “wrong” answers bring bad marks. On the other hand, the learners construct individual knowledge, which cannot be assessed through an assessment method consisting of preconceived tasks since one does not know beforehand what will be learned – and maybe different learners learn different things in the same VaKE unit. Teachers have to be familiarised with innovative assessment methods, which focus on the individual constructed knowledge.

Obviously, on the one hand, it is not easy to apply VaKE even if good introduction and supervision are provided. On the other hand, experiences in different countries besides Austria, including Egypt, Norway, Spain, Greece, and Germany, have shown that VaKE can be used across borders and in different settings. Actually, the success of the Platon Youth Forum as an international multilingual summer camp (Weyringer, 2008) shows that VaKE is a possibility to overcome the language limits as well as the different background cultures of the learners from different countries (see also Patry, Weyringer, & Weinberger, 2010; Patry, Weyringer, Aichinger & Weinberger, 2016).

4. THE DOUBLE ASSIGNMENT IN TEACHER EDUCATION

VaKE proved to be effective in schools with learners of different ages (Weinberger, 2006; Weinberger & Gastager, 2009; Weyringer, 2008) and teacher education (Weinberger, Gastager & Patry, 2011a; Weinberger et al., 2016). This shows that it is possible to provide values education without neglecting knowledge education. In other words: The double assignment is not an impossible utopia, but a real option. Whether other approaches than VaKE are successful remains to be seen. For this, it is necessary to educate the teachers appropriately. One way to do this education is doing it by using the double assignment in teacher education itself. The present section aims to make some theoretical deliberations when using VaKE in teacher education.

To practice the double assignment in teacher education has at least three reasons. First, if the double assignment is indeed justified, as we have tried to show above, and if the method is effective, it would be inappropriate not to use it. Secondly, since the teachers are supposed to practice the double assignment in school, it makes sense that they learn this method not only in theory but that they experience it in their own learning biography. Thirdly, like any subject, education and teaching (the disciplines of teacher education) are values-laden, but more complexly than most subjects. Indeed, education and teaching are always activities aiming at influencing other people (the learners), and the goals of education and teaching need to be justified. In most school subjects the values are hidden, and people are usually not aware of them, while in teaching and education they are explicitly addressed (although often the teachers are not aware of this, see for instance Hofmann & Patry, 1999).

In principle, the same conditions apply for using the double assignment in teacher education as for other learners. However, in addition to this, one must consider that the pre-service teachers (and the in-service teachers participating in such an education)
are adults hence issues of adult education play an essential role (Pnevmatikos et al., 2016). In particular, self-determination in learning is essential, and while the learners in school usually need to be confronted with dilemmas the teacher has conceived, it is possible in teacher training to let the students choose themselves which dilemma they want to discuss or even construct such a dilemma themselves. This kind of self-determination can be seen as a precondition for teacher education. This was examined in several studies, which showed that VaKE has positive effects for example on empathy and cognitive complexity (Weinberger, Patry & Weyringer, 2017), on moral judgement (Weinberger, 2016) and socio-scientific argumentation (Weinberger, 2017).

5. DISCUSSION

The double assignment means to teach the subject matter and to practice values education, but not as separate, clearly distinct activities, rather as an integrative endeavour. Therefore, teachers must develop and integrate this circumstance in their professional ethos already in their teacher education. However, is this professional ethos addressed in teacher education? Do teachers satisfy the conditions for fulfilling the double assignment in their practice? As said above teachers have many difficulties in properly applying the double assignment in practice. Teachers have problems in departing from the traditional role concept, in the planning of lessons, with unexpected learning results and with the conventional assessment. One key issue for the teachers is also establishing a learning culture based on mutual trust.

In the discussion, we are dealing with problems about the double assignment and we are also referring to research results from different studies of VaKE and to the limitations of these studies. The discussion is completed with conclusions and further studies.

5.1 Problems

An important precondition for using the double assignment in class is to know which age and learner groups it works and for which adaptations must be made. In our attempts to implement VaKE we were not successful with learners in special education: Obviously, adaptations for VaKE focused on this target group are necessary. Among others, the learners may understand the values conflicts, but only with difficulties. Argumentation taking the discussion partner’s statements into account seems very difficult, but we could see progress from the first to the second discussion. The learners were not able to collect information by themselves, but they could apply the knowledge they had acquired with help. The question is then, whether it is appropriate to use VaKE in teacher education for special education teachers. We think that indeed this is the case. Although the teachers will be able to apply VaKE in their classes only to a very limited degree and in an adapted form, we think that what they learn when practising VaKE is quite substantial. In particular, dealing with special education learners raises many practical questions, most of which are highly values-laden. It is crucial, then, that the special education teachers can deal with these values questions adequately, and VaKE might be one means to foster this.
Pre-schoolers and primary learners can practice VaKE provided that there be specific adaptations compared to the prototypical approach, particularly concerning the information retrieving phases to take into account the children's limited information proceeding capacity. This needs to be conveyed to the teachers as well (e.g., Demetri, 2015). Other problems that we have encountered are that in teacher education the in-service teachers pretend that they already use the double assignment and therefore do not need specific training. Further discussions, however, then reveal that they believe they are doing constructivist teaching but usually without much system if they do it at all. Further, in most cases, values play no role, so although the teachers are convinced that they practice the double assignment, they actually do not do so. A corollary experience can be made with some teachers (pre-service and in-service trainees) pretending to implement VaKE after the training, but a careful look at it shows that the values play a very small role if any (an example has been mentioned above; Haara & Smith, 2012). It seems difficult for the teachers to depart from their role as teaching uniquely content. A precondition for the double assignment in teacher education, hence, is that the trainer explicitly points to the fact that the principles are followed and that values issues are addressed; it seems necessary, then, that the implementation is closely supervised.

Overall, however, we were surprised to see how well VaKE was accepted and could be implemented by the teachers after trainings following the principles addressed above and how successful it was in school and in extracurricular endeavours.

5.2 Limitations of these studies

Nevertheless, the studies so far have their limits. First, the studies focused on the feasibility in practical contexts, whereas details of the effect mechanism (what in VaKE causes what in the learners) have been of secondary importance. Such studies are necessary to differentiate the theory which, as shown above, is an important prerequisite for the implementation of the double assignment; although the general theoretical background is known, there are crucial details that need to be analysed. One of the few studies which were done in this regard was about the importance of requiring the weaker learner to check the viability of their arguments (Weinberger, 2006). This is an important information because the teachers need to know how to deal with different learner groups (e.g., weaker vs stronger learners).

Further, long-term effects have not been tested systematically; follow-up testing occurred not later than a few months after the respective VaKE units. Anecdotic hints seem to indicate that the acquired knowledge is remembered for quite some time. Another limit is that although there is a prototypical procedure suggested to the teachers, no two VaKE units resemble each other: One cannot speak of a standardised procedure. This is, of course, a hindrance for research, but on the other hand, it was important to us to leave the teachers as much freedom as possible while sticking to the essential principles. However, teachers can do so only if they know the underlying theory very well: Only the person who has a solid theoretical fundament can depart from the schema and still hope for the benefits of implementing VaKE.
5.3 Conclusions and future studies

VaKE seems to be quite promising both in teaching and in teacher education, for fulfilling the double assignment. However, there are still many questions open. First, it has turned out that the theoretical fundament based on constructivism (see figure 1) is too narrow; for this reason, we have added a field “additional theories”. We have not yet investigated all these theories within VaKE, but some of them may come into account for further research.

It is not trivial to build theories from entirely different backgrounds into one systematical framework; for this, a meta-theoretical work that permits integration of different theories has been developed (Patry, 2012a). This theoretical framework needs to be continued and refined. It is hoped that then our research on VaKE can provide insight into other theories as well.

This might have consequences for teacher education. The question will be how much theory will be necessary for the teachers to learn. On the one hand, of course, we would aim at as much theory as possible. On the other hand, one has to acknowledge that humans have a limited working memory capacity and cannot acquire unlimited knowledge of theories. It will be necessary, hence, to find the optimum amount (and contents) of theories to be acquired in teacher education. The question will then also be whether knowing more about theory indeed contributes to improving teaching. This requires that the theories be formulated and presented in a way that fosters the application (Patry, 2012b) – and we believe that VaKE is an appropriate approach to do so.

Research should also focus more than until now on the working mechanism. In particular different variations of VaKE with variance concerning specific, theoretically relevant issues should be done to optimise VaKE and possibly knowing better why certain things work and others do not.

Further, and possibly most importantly in the context of the present volume, more should be known about the preconditions for VaKE. This would mean to follow the full procedure of a teacher, from teacher education about and through VaKE (whether in-service or pre-service) to whether and how teachers practice VaKE in their internship (and whether they are permitted to do so by the respective authorities), to whether and how they practice it in regular teaching (and what obstacles they encounter there), and to the reception by the learners.

Finally, it must be underlined that the studies reported here about the double assignment have been done with VaKE. It is not self-evident that these experiences can be generalised to other methods to realise the double assignment. Depending on the theoretical underpinning and the methodical concepts to be implemented, the experiences might be completely different. For instance, the teacher roles discussed above are specific for the steps in VaKE; for other approaches, one can assume that the teacher roles are important and sensitive as well, but the differential analysis of the roles must be made for each method separately. Similarly, dealing with values will be an essential issue for all attempts to practice the double assignment, yet depending on the meta-ethical standpoint or the values education concept utilised the details will be different. We see the analyses above, first, as a catalogue of topics that should be
addressed for any double assignment, and only secondly, the concrete issue of VaKE is seen as crucial.

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**BRIEF BIO**

**Martina Nussbaumer** is in an Phd program and was working as scientific assistant in a research project about VaKE at the University of Salzburg; teaches now research methods at the Paracelsus Medical University (PMU), Salzburg.

**Jean-Luc Patry** is full professor emeritus at the University of Salzburg, Department of Education; his domains of interest are values education, constructivism, social interaction, methodology, etc.; he has been and is leading several research projects about VaKE.

**Sieglinde Weyringer** is Senior Lecturer at University of Salzburg, Austria, Department of Education; she was teacher in Primary schools for many years; her research interests are on VaKE – Values and Knowledge Education, democratic citizenship education, education of (highly) gifted children and development of creativity.

**Alfred Weinberger** was a secondary school teacher; obtained his Phd at the University of Salzburg; teaches moral education and research methods at the Private University of Education of the diocese of Linz.
FOOD SECURITY AS A DOMAIN OF TEACHERS’ PROFESSIONAL ETHOS?!

Brigitte Latzko  
University of Leipzig, Department of Educational Psychology, Germany  
latzko@uni-leipzig.de

Eveline Gutzwiller-Helfenfinger  
University of Duisburg-Essen, Interdisciplinary Centre for Integration and Migration Research, Germany  
Eveline.gutzwiller-helfenfinger@uni-due.de

Anne-Cathrin Päßler  
University of Leipzig, Department of Educational Psychology, Germany  
anne-cathrin.paessler@uni-leipzig.de

Ingrid Hesse  
University of Leipzig, Department of Educational Psychology, Germany  
ihesse@uni-leipzig.de

ABSTRACT

Within the context of challenges against humanity this research projects focus on the question how to ensure food security for all. We argue that teacher education is a promising way forward in meeting the challenges, because teachers are of key significance in educating responsible future generations. In terms of the double assignment, which means combining the education of values and of knowledge, we need teachers who will be able to perform the double assignment in order to contributing to the moral/ethical upbringing of the learners. Against this background this paper aims at contributing to food security by investigating, and educating, teacher’s professional ethos which includes food security as a domain of teachers’ professional ethos. By investigating new dimensions of teachers’ professional ethos with respect to successfully addressing issues of food security, our research project emphasises a) the need to integrate moral and democratic aspects into subject matters as conceptualized by the double assignment; and b) the need to “revisit” the concept of teachers’ ethos in order to include actual contents, namely food security.

Keywords: teachers’ professional ethos, double assignment, teacher training, food security

1. INTRODUCTION

Our contemporary world is confronted with huge challenges against humanity and human living conditions: Issues of climate change and the fact that the world’s population will soon exceed seven billion are only some examples. Within the context of these challenges the lack of food security for all humans constitutes one major threat against human living conditions (see Fritzén & Tapola, 2009). Developments like rapidly
and dramatically rising food prices, food riots just a few years ago (Vidal, 2007; Walt, 2008), reports on skyrocketing prices on basic foodstuffs such as wheat and rice (Bloomberg News, 2010; FAO, 2010; UN News Centre, 2010), and a lack of clean drinking water characterize this alarming situation and underline the importance of addressing issues of food security. Eradication of extreme poverty and hunger was also the cardinal UN Millennium Development Goal (2011), which was meant to be reached by 2015. This goal is closely linked to Education for All – a global movement lead by the UNESCO (2000). The basic argument is that learners who do not have access to wholesome foodstuffs will not be successful in their studies. On the other hand, sufficient supplies of basic nutritious food will not be realised without relevant educational efforts, precisely because links between global problems and individual attitudes and behavior can evidently be identified (Pachauri & Reisinger, 2008). Thus, education is of immense importance in order to make our globalized world food sources secure. The fact that target 1.C – halving, between 1990 and 2015, the proportion of people who suffer from hunger – of the cardinal UN Millennium Development Goal was not fully reached by 2015 bears evidence that more efforts, also on the educational level, are necessary to make the world food secure (United Nations, 2015 - MDG Gap Task Force Report). There are already a few studies revealing that investment in education has the potential to contribute to food security (e.g., Mutisya, Ngware, Kabiru, & Kandala, 2016). Thus, food security is both a precondition for successful teaching and learning and an outcome of teaching and learning processes. Still, all formal education relies on professional teachers. Teacher education (including teacher further education) is a promising way for addressing issues of food security because teachers are of key significance in educating responsible future generations. But in order to cultivate pupils who care for food security, we need teachers who themselves feel responsible for it (see Narvaez, 2006), that is, responsible for integrating food security into their teaching. Sensitivity and responsibility for issues of food security needs to be part of their developing professional ethos, since ethos will be the foundation of their daily interaction with pupils. Accordingly, the question arises whether pre-service teachers who undergo current teacher training are already sensitized and feel responsible to incorporate issues of food security into their daily practice. If this is true, then no specific, additional efforts to promote this sensitivity and sense of responsibility are necessary. However, if pre-service teachers do not display the respective sensitivity and sense of responsibility, then teacher training curricula must be improved to offer learning opportunities to students that foster the development of their professional ethos in the domain of food security.

1.1 Teachers’ Professional Ethos

Teachers’ ethos as well as its conceptualization and measurement have been the object of long-standing theoretical and empirical scrutiny. Past and current educational debates and paradigms have influenced the way teachers’ ethos has been defined and understood. Conceptions of teachers’ ethos have been inextricably linked
to the idea(l) of the “good teacher” (see e.g., Harder, 2014 for an in-depth analysis). As teaching has been increasingly viewed as a profession (as distinct from a mere occupation or “job”) especially in the German pedagogical tradition (see e.g., Tenorth, 2006; Terhart, 2011), we refer to teachers’ ethos as teachers’ professional ethos, acknowledging that this ethos relates to both teachers’ professional role, their competencies, and their professional action.

In line with Hansen (2001) we conceptualize teachers’ professional ethos as encompassing moral sensibility, that is, an orientation of attentiveness towards both students and the teaching profession that underlies teachers’ thoughts and actions. This notion of teachers’ professional ethos moves beyond the idea of conceptions or of individual belief systems as described by Pratt (1992). Second, teachers’ professional ethos also includes more than the professional knowledge deemed necessary in the fields of learning, instruction, and subject matter. Teachers’ professional ethos is inextricably linked to their professional moral and ethical beliefs as well as to the knowledge and skills they need a) to form their professional judgments; b) to guide their relations with students in a professional manner; c) to prepare their lessons; and d) to cooperate with colleagues and experts within both their local school and the larger educational system (headmasters, parents, school psychologists, etc.). In line with this view, the teaching profession can be understood as moral in its nature. Accordingly, moral education can be conceived as a continuous feature of teachers’ daily work in classrooms (Klafki, 1991; 2002). This, in turn, means that in order to have teachers who are able to promote learners’ moral development in the domain of food security, it is necessary to promote the development of these teachers’ professional ethos regarding food security in the first place.

One way to promote teachers’ professional ethos regarding food security is to give them an understanding of the double assignment they face (see Oser, 1994). The double assignment refers to teachers’ task to both communicate knowledge about subject matter and contribute to the moral and democratic upbringing of learners. Hence, the double assignment entails teachers not only to teach subject matter itself, but they need to teach in a way that complies with a set of overarching value-related goals (Fritzén & Gustafsson, 2004). These goals are, for example, stated in the curricula and other regulatory documents. Such overarching value-related goals are linked to what is sometimes called ‘moral education’, ‘values education’, ‘citizenship education’, ‘character education’, ‘civic education’, ‘democratic education’ etc. (e.g., Veugelers & Vedder, 2003) and thereby address the value-related dispositions of the learners (here: preservice-teachers). In the context of the present research project these values relate to “responsibility for food security”. A first step in this direction includes investigating pre-service teachers’ professional ethos with in the domain of food security, which is the focus of the present paper. In a next step, we will then need to more closely investigate teachers’ opportunities to learn about the double assignment and study in depth the relationship between these opportunities and their developing professional ethos.
2. RESEARCH AIM AND QUESTIONS

Even though various conceptualisations of teachers’ professional ethos embrace the same basic idea in different ways, there is no doubt that the core of teachers’ ethos addresses professional identity, professional procedural morality, professional responsibility and care, moral judgement as well as moral attitudes. In addition to characteristics regarding its structure, the content of teachers’ ethos needs also to be considered (see Berge, 2003, 2012), especially, as socio-cultural developments influence the demands society pose on education. Thus, studies on the content of teachers’ ethos need to be conducted continuously to ensure teachers’ education which cultivates teachers’ ethos reflecting and acting upon societies’ current demands (see Latzko & Päßler, 2017).

Against this background the goal of this research project is to contribute to food security for all human beings by investigating food security as one content domain of teachers’ professional ethos. Accordingly, our research project emphasizes a) the need to integrate moral and democratic aspects into subject matters and vice versa, as conceptualized by the double assignment; and b) the need to revisit the concept of teachers’ ethos by exploring it within a new content domain. So far, the double assignment related to issues of food security is not sufficiently covered in contemporary literature. Therefore, we aim at bridging the gap between knowledge and moral education and education for sustainability by addressing the issue of food security as a “new” domain of teachers’ ethos.

Based on the concept of teachers’ ethos as the foundation of teachers’ awareness, sensibility, and their sense of responsibility towards issues related to food security, our general research question is: How do pre-service teachers respond to stimulus materials related to food security? More specifically:

1. Are they sensitive to issues of food security in the sense of identifying them?
2. Do they relate to themselves and their professional role as future teachers?
3. Do they feel responsible for integrating issues of food security into their teaching?

3. GENERAL METHODOLOGY

To investigate pre-service teachers’ ethos as conceptualized above, we developed a qualitative instrument suited for the exploration of pre-service teachers’ beliefs, thoughts, attitudes, and experiences in an anonymous, standardized setting. The general methodological approach involved the presentation of natural (i.e., already available) stimulus materials to participants while asking them to write us a letter including their thoughts and reflections. In line with narrative approaches to sociomoral functioning, we assumed that pre-service teachers would mention what was subjectively meaningful to them in their letters, that is, construct interpretations referring to those elements that were both relevant and salient to them (cf. Gutzwiller-Helfenfinger, Gasser, & Malti, 2010).

We constructed a slideshow¹ containing

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¹ The data collection procedure was developed in collaboration with Anna Tapola (see Gutzwiller-Heiferfinger, Latzko, & Tapola, 2013).
pictures available on Wikimedia commons (commons.wikimedia.org), an internet platform offering pictorial materials for free under the condition that the actual licensing terms were kept. Asking pre-service teachers to respond to a slide show by writing a personal letter allowed us to find out if and how teacher feel responsible for issues of food security while at the same time having a low likelihood of triggering social desirability. This procedure gave participants the opportunity to voice their subjective perspectives and explanations without being guided by researchers and thus to construct their own meaning of the pictures they saw. We briefly describe two piloting studies that we conducted to test the data collection procedure and to gain first insights into the way pre-service teachers responded to visual stimulus materials (c.f. Patry, 1978) related to food security.

3.1 Pilot Study 1

In the first pilot study, a slideshow on the topic of “water” was assembled. The slideshow included sixteen slides each depicting water in some form, for example a lake or bottled water. Pictures were simple, that is, were not composed of an array of overlaying or combined images. Half of the pictures included people, for example a child drinking from a tap. Each slide was projected for about 30 seconds. The seventeenth slide contained an invitation to viewers to write down their feelings, thoughts and reflections in a letter and send it anonymously to the experimenter. Data collection took place at a German university during a lecture on developmental psychology held by the principal investigator and was voluntary. Of the 200 pre-service teachers present, sixteen decided to send their letter to the experimenter. Participants were aged 20 to 37 years (M_age=24 years), three were male. Participants could take as long as they needed to write their letters.

Letters were content analyzed in two steps. In a first step, passages explicitly referring to school, teaching and learning were marked. In a second step, the marked passages were more closely analyzed using inductive coding as well as coding in Grounded Theory Mode (Breuer, 2010).

3.1.1 Results

All sixteen letters contained references to the pictures, describing what participants had seen (e.g., water in plastic canisters), thematizing water as a resource, referring to water-related knowledge (e.g., the water cycle), discussing problems revolving around water (e.g., lack of clean drinking water), indicating that they were affected on a personal level (e.g., the need to think over one’s own water consumption), or making general appeals that something needs to be done to have enough water for everyone.

On the one hand, I see how there are humans who have scarcely any water, while others have enough. In some parts of the earth there are droughts, in some other parts there are floods. Some even waste water! I think there should be a just distribution of water around the globe because everyone needs water to live. We all need to do something. [Letter 8-f-31-4]

Out of the sixteen letters, only one letter contained explicit references to school, teaching and learning. In that letter, ideas
for lesson units and school projects were briefly sketched to help pupils understand about water, the water cycle, the importance of water as a resource, the lack of water in some countries, etc.:

“In that project week one topic might be that water is a scarce resource in developing countries whereas it is available in any amount to each and anyone in industrial countries. Further, the problematic might be further explored on a local level by referring to the situation of the Elbe river.” [Letter 13-f-24-2, 18-23].

In that letter, one explicit reference was also made to students “Many students would certainly be able to make similar or identical connections between the images in the slide show as I did” [Letter 13-f-24-2, 15-17].

None of the letters contained any explicit references to oneself as a future teacher, one’s future professional role or responsibilities, or any other statements making a connection between the themes revolving around water and their own responsibility of addressing issues around water and water supply in their future teaching.

Our results indicate that pre-service teachers in our sample were basically sensitive towards issues of food security, here operationalized as related to water. All of them went beyond mere descriptions of what was depicted in the slides and mentioned core issues of water-related food security. However, only one pre-service teacher made explicit references to school, teaching and learning, and also referred to students in her letter. And even that student made no direct connection between her role as a future teacher, nor did she in any way indicate that she felt responsible for integrating issues of food security as related to water in her teaching.

One possible explanation might be that German pre-service teachers studying at universities have few practical experiences or internships, as the practical part of their education takes place after their university final exams, namely, during “Referendariat”, which normally includes one year of practical work at school. Accordingly, it might be more difficult for them to see themselves already as future teachers, making them identify primarily as university students studying specific subjects.

Another reason for the lack of references to their future professional role as teachers as well as the lack of feelings of responsibility to include food security into their teaching might lie in the stimulus materials themselves. Possibly, the few simple slides we showed were not stimulating enough for pre-service teachers to move beyond descriptions and generalized appeals.

3.2 Pilot Study 2

To improve the data collection procedure implemented in Pilot study 1 we developed more complex and more stimulating stimulus materials by adding another thirteen pictures to the slideshow. Thus, the final version included twenty nine pictures relating to various aspects of the topic of “water”.

Moreover, in pilot study 2 teachers and teacher educators were included as participants to explore whether the lack of references to their future professional role as teachers in pre-service teachers' letters (see results of pilot study 1) was due to
their status as students and the conditions of their teacher education program.

Teachers and teacher educators from 370 schools were invited via email to contribute to the research project. Those who positively replied to our invitation were sent a link leading them to a questionnaire on background information and a link where they could find the slideshow. In this data collection, participants had the opportunity to watch the slideshow for as long as they wanted. After finishing the slideshow, they were invited to write down their thoughts and reflections in a letter and to upload that letter anonymously on the platform.

Data collection was carried out in the context of a master thesis (Blumauer, 2013). In total, 62 teachers and teacher educators uploaded a letter, 76% of whom were female. 43% of the participants were aged between 21 and 40 years, 57% between 41 and 60 years old. The distribution of school forms was as follows: 31% of participants worked at elementary schools, 34% at grammar schools (Gymnasium), 15% at special-needs schools, and 20% at vocational schools. 31% of participants had been less than 20 years in the teaching profession.

Letters were content analyzed in accordance with the procedure in pilot study 1 (see Mayring, 2008). In order to explore whether in-service-teachers and teacher educators expressed different thoughts, feelings and reflections in their letters, both inductive and deductive coding were used to create a category system for identifying statements in letters referring to their professional role, especially regarding their responsibility for responsible teaching fostering sustainable learning within the subject area of food security.

### 3.2.1 Results

The analysis of the letters with regard to our research question shows that participants can be classified into five different categories, displaying different comments and reflections regarding the area of “water”. The first category was called “not affected at all” because participants did not indicate in their letters that they were affected in any way. Instead, they stuck to a descriptive level describing what they saw. For example “the slides were linked to the topic of water” [Letter 5].

Second, a quarter of participants wrote letters that indicated that they were affected by what they saw. Some of these participants were affected on a personal level, what we call “affected as person”. This category was subdivided into the sub-categories of “affected as a person in general” and “affected as a person self-referentially”. Participants affected as persons in general indicated that they cared about what they had seen in the picture. An example was “The water was wasted, all this rubbish must cause the death of fish and other animals”. [Letter 4]. Participants who where affected as individuals linked their concern to their own self. “There should be clean water for all. I felt angry and had the feeling I have to do something” [Letter 2].

Third, some participants indicated that they were affected as teachers. Their statements could be sub-divided into the sub-categories of “affected as a teacher in general” and “affected as a teacher self-referentially”. Participants affected as teachers in general made direct references to their teaching, like for example “To start a
project, these pictures will be highly effective” [Letter 7]. Participants affected as teachers linking their concern to their self made statements like “Especially we as teachers share a great responsibility and should act accordingly” [Letter 8].

In contrast to our findings in pilot study 1, we identified teachers and teacher educators in study 2 who explicitly felt responsible for food security (here related to water) and sustainability. They also expressed a sense of responsibility for offering education at school that attended to these issues. These findings suggest that food security represents a content domain of teachers’ professional ethos. As we had assumed, we found in-service teachers who actively linked their interpretation of the slides with their professional role and responsibility. This indicates that they actively established a connection with the content they saw, constructing it as educationally relevant content and relating it to their professional role and activity. As we also found in-service teachers who made only personal references (in general or with self-reference), we conclude that the development of teachers’ professional ethos in general and relating to food security in particular needs to be stimulated and promoted in teacher education as well as in teacher further education.

4. DISCUSSION

From the perspective of challenges against humanity and a particular focus on food security, our results indicate that pre-service teachers, despite their general sensitivity towards issues of food security, do not relate this sensitivity specifically to their own professional role and responsibilities as future teachers. In the rare cases where a connection was made at all, it referred to first ideas for lesson plans. This indicates that (at least in our samples) pre-service teachers do not automatically create links to their future professionality as orchestrating teaching-learning processes from a deeper understanding of their overarching goals and responsibilities. One explanation may be that pre-service teachers’ professional ethos is only at the beginning of its development and needs to be actively promoted in teacher education in order to make self-sustaining further development in the course of professional work possible. Another reason lies in the ease, at which pre-service teachers can access their notions of their own professional role and responsibilities without explicit reference or scaffolding. Possibly, both explanations are true and interwoven, leading us to assume that while pre-service teachers’ professional ethos needs to be actively promoted in itself, explicit activation and application of these notions, e.g., by stimulating reflection on their professional self-understanding (cf. Kelchtermans, 2005) must be included in teacher education. However, our first, exploratory and qualitative findings stand in need of corroboration by additional research, involving the use of both qualitative and quantitative measures as well as the inclusion of larger and more diverse samples of pre-service teachers.

In contrast, in study 2 we found in-service teachers (teachers and teacher educators) who not only showed personal concern over what was depicted in the slideshow (i.e., food security relating to water), but also indicated that they saw this content as relevant in and for education and
expressed that they felt responsible to integrate it into their teaching. This suggests that they understood this content domain as part of their professional self-understanding, while the expression of responsibility showed that their professional ethos was also affected. As investment in education has the potential to enhance food security (Mutisya et al., 2016), the promotion of pre-service and in-service teachers’ professional ethos in the domain of food security may be a promising way to do so. The need to further improve food security across the globe has become apparent, especially as the respective Millennium Development Goal was not reached by 2015 (United Nations, 2015 - MDG Gap Task Force Report).

Thus, regarding food security, teachers’ ethos needs to be conceptualized in a new way by introducing it as one relevant content domain, both regarding their professional self-understanding and their daily practice. Keeping in mind that teachers are the actors within education who represent the curriculum in daily interaction, it is evident that we have to take a closer look at their attitudes towards knowledge and value education. In this way, we will be able to develop training programs to educate teachers’ professional ethos. This ethos, in turn, will serve as the very basis of their profession (c.f. Zlatkin-Troitschanskaia, Beck, Sembill, Nickolaus, & Mulder 2009).

And, what is even more important, how can we raise awareness among teacher educators towards teacher education itself as a promising way in meeting the challenges outlined above? It seems reasonable that educational scientists call for “professional ethos” as a tool allowing teachers to fulfill all tasks named above thoroughly, particularly their educational duties, and to educate their pupils accordingly (cf. Brezinka, 2016).

There can be no doubt that teachers’ professional ethos is one of the key dimensions of pedagogical professionalism. In fact, the former could be considered as one of the most central dimensions of the latter. Consequently teacher education curricula need to provide opportunities to train (future) teachers’ professional ethos.

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**ACKNOWLEDGMENTS**

This study was carried out within the framework of The Linnaeus International Project on Integrative Approaches within Teacher Education. We want to express our gratitude for financial support from The Swedish Foundation for International Cooperation in Research and Higher Education (STINT), Riksbankens Jubileumsfond (RJ), and Linnaeus University (Sweden).

**BRIEF BIO**

Brigitte Latzko is full professor for educational psychology at the University of Leipzig. She is engaged in teacher education. Her research interest focus on development of moral emotions and teachers' professional ethos.
Eveline Gutzwiller-Helfenfinger is currently a Guest Professor of Educational Science at the Interdisciplinary Center for Integration and Migration Research University of Duisburg-Essen. Her research interests lie in sociomoral development across the lifespan in connection with teachers’ professional
development. Specific areas include teachers’ professional ethos, teachers’ reflective practice, and school bullying.

Anne-Cathrin Päßler is an English teacher. Actually she is a PhD student at the University of Leipzig focusing on teachers’ professional ethos.

Ingrid Hesse is a former senior lecturer at the University of Leipzig. She is still involved in teacher education. Her domains of interest within teaching and research are learning and instruction.
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