

Exploring the relationship between Greek teachers'
beliefs regarding nature and nurture, and their
self-efficacy: a mixed methods investigation.

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Abstract: In the last twenty years we have seen growing evidence from behavioural genetics that most, if not all, educational outcomes have a significant genetic component. Moreover, the question of how teachers perceive the nature-nurture question has been looked at in a variety of populations, but not within a Greek context.

The present mixed methods investigation attempts to make a contribution to our understanding of Greek teachers' and trainee teachers' beliefs regarding genetic influences on educationally-relevant behaviour. Moreover, it looks at the relationship between such beliefs and teacher self-efficacy (TSE), a metric that has consistently been positively linked with student attainment. Finally we look at teachers Openness to Genetics Research in Education (OGRE), as well as the link between teaching experience and the aforementioned characteristics.

223 teachers and trainee teachers at a Greek University provided data on their perceptions of the extent to which genes explain variance in six domains of behaviour. For the six domains that were examined the proportion of teachers who reported that genetics were as, or more important than environment were: for personality 39.6%, for intelligence 72.7%, for behaviour 25.3%, for learning difficulties 87.1%, for mental health 44.2% and finally for happiness 17.1%. No significant relationship was found between teachers' nature-nurture beliefs and their self-efficacy. A significant difference ($p=.006$) was found between the mean TSE of the two groups studied, namely trainee teachers ($M=6.41$, $SD=.87$) and in-service teachers ($M=6.8$, $SD=.78$). The effect size (Cohen's $d=.46$) was moderate. This is in line with the literature on TSE. Moreover, a significant correlation ($r=.31$, $p=.000$) was found between self-efficacy beliefs and OGRE. These results are discussed and implications for future research as well as potential changes in teacher education are made.

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

Literature Review

Our beliefs are powerful. Research has shown that our beliefs about the biological causes of an illness/characteristic can affect the way we look and behave towards that person (Read & Harre, 2001; Kvaale, Gottdiener & Haslam, 2013). Moreover, essentialist beliefs with regards to genetics are further linked with several cognitive biases (Dar-Nimrod & Heine, 2011).

Teachers are not immune to these biases (Castera & Clement, 2014). Furthermore, we know that teacher beliefs are correlated not only with the ways that teachers behave towards students (Klehm, 2014; Wieman and Welsh, 2015), but also with student achievement itself (Raudenbusch, 1984).

As our knowledge of genetics and genomics grows, popular beliefs about the genetic causes of several characteristics can change too (Reydon, Kampourakis, Patrinos, 2012). This study attempts to explore teacher beliefs about genetics and whether they are correlated with one of the predictors for student achievement, teacher self-efficacy (Ashton & Webb, 1986; Caprara, Barbaranelli, Steca, & Malone, 2006).

Our knowledge of genes and their expression has been steadily growing since the sequencing of the human genome in 2003. Equally, the general public's understanding has been changing, and attitudes towards the science of genetics transforming. For example, a Dutch study on public attitudes towards genetics found that the general public's awareness of the uses of genetics remained stable between 2002 and 2010 but that attitudes became more positive, especially with regards to medical genetics, over that time (Henneman et al, 2013). The report, based on data collected by a Dutch consumer panel from a sample of 1,308 adults, makes proposals for educational programmes on genetic innovations, taking into account the public's pre-existing knowledge, views and expectations.

And yet, the way that genetic science is often communicated to the public can not only be confusing, but can also breed misconceptions. For example, such news reports in the popular press can often perpetuate notions of genetic determinism, the belief that genes determine, *to the exclusion of environmental factors*, the way an organism turns out (Reydon, Kampourakis, Patrinos, 2012). Moreover, although there is an increasing need for a genetics-literate public, genetics education in schools is still in its infancy. Genetic literacy

amongst non-science graduates is very low, as reported by a 2008 study and this low level was not much improved by attendance at an introductory biology course (Bowling et al, 2008). Bowling et al. (2008) advocate more research on the effect of teaching methods on achieving genetics literacy.

Our understanding of behavioural genetics, as a distinct area within genetics research, has been growing too. Behavioural genetics has traditionally used family, twin and adoption studies to build up evidence on the relative roles of genes and environment, and the interplay between them, in explaining and predicting human behaviour. More recently behavioural geneticists have also measured genetic variants and their associations with specific phenotypes, for example the warrior or “psycho gene” (Hunter, 2010).

The field of behavioural genetics can be full of controversy, especially when traits like intelligence are involved (Tabery, 2015). In an article aiming to shed some light on the reasons why studying the behavioural genetics of intelligence, can lead to such controversy, Tabery explains that “they are [also] controversial because they are interpreted to support a fatalistic acceptance of the IQ gap as an immutable biological reality” (Tabery, 2015, S11). This belief about the role of genes as the sole dictators of one’s destiny will be explored in this research project, which also asks about the extent to which such a belief might affect teachers’ sense of agency or self-efficacy.

Such controversy, whatever its roots, is most likely further linked to the fact that despite growth in understanding of the influence of genes in learning processes, and the interaction between our DNA and our environment, no educational policy to date has taken these advances on board. Moreover, when such suggestions are made, as they were in a 2013 article in the UK popular press that reported views attributed to a special advisor to the UK Secretary of State for Education on genetics and education, they generate a lot of heated public discussion (Crosswaite & Asbury, 2016).

Genetics and education

As things stand, it has been argued that “the entire education system is predicated on the belief that children are ‘blank slates’. Behavioural genetics tells us that this is wrong” (Asbury

& Plomin, 2013). Policy implications of findings in behavioural genetics, as well as implications for teacher training and professional development, have not at this stage been fully explored. Furthermore, the effects that teachers' beliefs about and understanding of genetic influence, and gene-environment interplay, have on their teaching have not been fully explored either, bearing in mind that most teachers receive no training in genetics during their Initial Teacher Education (ITE). Previous research on teacher expectancy effects lead us to hypothesise that teacher beliefs may be important considerations here, though their effect seems to be small and rarely cumulative (Jussim & Harber, 2005).

In a rapidly changing environment, when it comes to genetics, and with increased popular interest in genetic influences on behaviour and disease (Bubela & Caulfield, 2004), there is a growing need to disentangle the effects of such beliefs on our behaviour. Especially when it comes to professionals, such as teachers, whose views on such issues might affect their behaviour towards students, understanding of genetics and perhaps even the teaching of it as part of a teacher training curriculum could be crucial.

Teacher beliefs in general have been found to have implications for teaching behaviour, and for pupil achievement. Teacher beliefs, as they relate to student ability and influence student achievement, have been studied extensively since the late 1960s and the famous Pygmalion effect study (Rosenthal and Jacobson, 1968). The study found that when teachers are led to expect higher performance from certain pupils, those particular pupils' achievement was subsequently better. The teachers were given an IQ test score for each of their pupils. Unbeknownst to the teachers, 20% of the class had been chosen at random and were assigned higher IQ scores. These pupils were then found to test higher in IQ tests at the end of the school year. Manipulating teacher expectations has been studied extensively since then, including with a meta-analytic study that looked at the credibility of expectancy induction (Raudenbusch, 1984). It is generally accepted that teacher beliefs about a child's ability seem to predict child achievement. For example, Klehm (2014) found that teachers' beliefs regarding the ability of students with disability, as well as the amount of teacher training they had received, were predictors of the use of evidence-based practice, as well as ultimately of achievement scores in standardised testing.

It is also accepted that most teachers will hold the view that student achievement is affected by a variety of factors, including school influences, family and student factors (Patterson,

Kravchenko, Chen-Bouck & Kelley, 2016). However, individual teachers will place different weight on the influence of each of these factors. These differences in attribution have been found to affect the teaching methods used by the instructor (Wieman & Welsh, 2015), as well as emotional responses and teacher-student relationships (Georgiou, 2008). More specifically, college instructors who attributed student failure as something that was internal to students (e.g. low ability, lack of interest) have been found to use less effective methods of instruction (Wieman et al, 2015). In another study teacher attribution styles were measured in relation to pupil achievement in a primary mathematics context (Gallimore, Ermeling, Saunders & Goldenberg, 2009). The study used a semi-experimental protocol to see the effects of an inquiry-based learning programme on teacher attribution and pupil achievement. The researchers report that there was a shift in teacher attribution styles, and as they changed from external factors, to internal (like quality of own teaching) further linked to visible improvement in the academic achievements of their pupils. The mechanism underpinning this link is further discussed in this paper, with the authors suggesting that the process of sustained inquiry used by the teachers was a mediating factor in the changing of attribution patterns. They further explain that “this form of learning ramifies beyond the particular problem because it shifts teachers’ focus away from what they can’t control, to what they can” (Gallimore et al., 2009, p.544). To add to these, a review of research on the field of teacher beliefs and instructional practices concludes that the relationship between teacher beliefs and practices is a complex one, and highlights several issues within the theoretical frameworks that underlie teacher beliefs and instructional practices research (Fang, 1996).

A study that is of interest, partly due to its similar cultural context to the present research project (Greek-Cypriot population), is a 2008 piece of research that surveyed in-service teachers with different numbers of years of experience (Georgiou, 2008). Georgiou (2008) found that more experienced teachers were more likely to attribute achievement to hereditary and biologically determined characteristics perceived as being out of the control of the child (e.g. intellectual ability, gender). By contrast, newly qualified teachers believed less in the above factors, and more in controllable factors, like teacher effort. These findings can add further depth into the current investigation, as teacher beliefs may be differentiated according to their years of experience. There is a possibility that this particular research study will try to investigate further, that teacher who are new to the profession have higher self-efficacy. As teachers gain experience they may become increasingly disillusioned and

start attributing student success to external factors. Furthermore, more evidence will be reported later, showing that self-efficacy measures also differ between more and less experienced teachers. It is interesting to consider whether teacher attribution beliefs may be a mediator in this relationship between the experience a teacher has and their self-efficacy.

More generally, our beliefs about the heritability of characteristics have been found to affect our attitudes towards them in a variety of contexts. For example, in one New Zealand study, biological and genetic explanations of mental illness were found to be correlated with negative attitudes towards mental health patients, increasing stigma (Read & Harre, 2001). This was further supported by a later study, based in New Zealand, where the 'medical model' of psychiatric illness was linked to with significantly higher perceptions of danger and unpredictability (Walker & Read, 2002). A meta-analysis of studies of the relationship between biogenetic explanations and stigma, undertaken in 2013, reports that laypeople who hold biological or genetic explanations for mental disorders such as schizophrenia tend to direct less blame towards the sufferer but are also more likely to perceive them as dangerous ($r = -0.19$) (Kvaale, Gottdiener & Haslam, 2013). Moreover, the relationship between genetic/biological attribution for mental illness and stigma has been found to be a rather complex one, including when it comes to the possibility of improvement. For example, one small study ($n=56$) found that those who believe there is a strong genetic influence on the development of schizophrenia are likely to believe that the person affected by the disorder has done nothing to cause the problem but also to hold stronger beliefs about what the person can do to improve their situation (Phelan, Cruz-Rojas & Reiff, 2002). This further links with the idea that a genetic explanation for a disease can lead people to believe that they have diminished control over the appearance, progression or a cure for it. Applying the same logic to educationally relevant traits raises many questions.

We know that our understanding of human characteristics other than mental illness can also be affected by our beliefs about their genetic aetiology. Beliefs about the origins of homosexuality, for example, have been examined in a, once again rather small, 2007 study. This study of 86 Americans found that a belief in genetic influences on homosexuality were linked to reduced stigma and blame and increased societal and personal acceptance (Sheldon, Pfeffer, Jayaratne, Feldbaum, & Petty, 2007). It is, however, interesting to note that such beliefs in genetic origins of homosexuality can occasionally be used to support extreme positions, such as a negative eugenics agenda (Sheldon, Pfeffer, Jayaratne,

Feldbaum, & Petty, 2007). There is a mixed picture regarding whether a belief in genetic influence on human behaviour is likely to be a force for good or for harm in society. This picture needs close attention within education, as scientists are increasingly hunting for genes linked with educational achievement and some have been successful. More notably a large-scale genome wide association study published in 2013 found genetic variants that were associated with educational attainment (Rietveld, et al., 2013). The effect sizes were small but significant. Moreover, an even more recent study found 74 loci associated with educational attainment (Okbay, 2016). In light of these recent scientific findings it is important for us to explore teacher beliefs, but also equally important to explore the effects of those beliefs, whether they are correct or incorrect.

Genetic Essentialism and its effects

Dar-Nimrod and Heine (2011) described cognitive biases that people have with regards to traits they believe to have a genetic basis. They proposed that “people’s understanding of genetics in relation to life outcomes is shaped by their psychological essentialist biases – a process termed genetic essentialism – and this leads to particular consequences when people consider the relations between genes and human outcomes.” (p. 1)

These beliefs, the authors suggested, are further encouraged by the way in which genetics is presented in public discourse, and the way people understand such communication. They suggest that in cases of genetic essentialism, laypeople use genes as a ‘place holder’ to define the *essence* that defines the traits of a group of people. They discuss the psychological effects (biases) created by the belief that certain traits are biologically determined. Moreover, they look at how such genetic attribution biases can worsen stereotypes, especially regarding certain characteristics, such as race, gender, sexual orientation, criminality, mental illness, and obesity (Dar-Nimrod & Heine, 2011). Genetic essentialism might be of some consequence when we consider that teachers’ behaviour towards certain groups may be associated with increased stereotypical attitudes (Haslam & Levy, 2006).

Furthermore the authors of this piece analyse four components of genetic essentialism that contribute to the universality of this psychological phenomenon. One of them is the belief that people can often perceive a trait that is linked with a particular gene as unchangeable.

This can be seen, in part, in studies such as one mentioned above (Phelan, Cruz-Rojas & Reiff, 2002) and perhaps even in the perceived limits that genes might confer, as understood by teachers in a study of genetic attributions for educational outcomes in East China teachers reported later (Pei, Howard-Jones, Zhang, Liu & Jin, 2015).

Research on the genetic beliefs of teachers regarding nature and nurture

Some previous research has been undertaken with regards to the beliefs teachers hold about the genetic basis of several traits and behaviours. The most notable example was a large scale study of UK primary school teachers ($n=667$) (Walker & Plomin, 2005). This study found that most teachers believe that genes are at least as important as environmental influences on the following aspects of human behaviour (the number in brackets indicates the percentage of teachers who indicated that genes are as (or more) important than environmental influences: personality (87.1%), intelligence (94.1%), behaviour problems (42.6%), learning difficulties (93.9%) and mental illness (91.3%) (Walker and Plomin, 2005). Interestingly, but not surprisingly, 80% of the practicing teachers in this study reported no formal genetics training during their teacher training. The relatively lower percentage of the perceived effect of genes on behavioural problems is noteworthy as the only exception to a pattern that is broadly in line with the empirical evidence. Moreover, Walker and Plomin (2005) wrote: "... the specific implications of teacher and parent perceptions for teaching and learning have never been studied empirically, and this is an important direction for future research". This research project aims to address at least some of the related issues that arise.

A little more recently UK researchers conducted two surveys on teacher trainees' beliefs with regard to genetic influence on educational processes (Howard Jones, Franey, Mashmoushi & Liao, 2009). The main survey formed part of a broader neuroscience questionnaire ($n=158$) and a follow-up survey ($n=166$). Both had similar results, with the first reporting a mean perceived percentage contribution for genes (25.5), home environment (36.4) and education (36.9). The trainees who responded 'other', named environmental factors, such as 'social status' or 'community' as important influences on achievement.

A second, follow-up, survey, which aimed to look more closely at whether constructs related

to development might be linked to the trainees' sense of agency, showed similar findings but researchers also looked more closely at the 8% of trainees who believed genetics to be as or more important than environmental influences (home and school). Equal numbers of this small sample ($n=12$) agreed ($n=4$, 33%), disagreed ($n=4$, 33%), and were undecided ($n=4$, 33%), about the ability of education to remedy learning problems associated with developmental differences in brain function. In contrast, in the initial survey group only 6% agreed with the statement - meaning that trainee teachers who believed that genetics are a larger influence than environment were also more likely to agree with the statement that education can remedy learning problems. We are thus not seeing, in this small sample, trainee teachers who believe in (or accept) the effect of genetics having a reduced sense of agency. The sample was, however, very small ($n=12$) and as it is difficult to draw useful conclusions, the question certainly merits further exploration.

The question of whether teachers' beliefs about a genetic explanation for intelligence, mathematical ability or learning disorders might affect their attitudes and consequently possibly their practices towards their pupils has yet to be studied in depth. Moreover, how does the marked difference in teachers' beliefs that behaviour is not as heritable as the above affect their sense of agency in this aspect? Walker and Plomin's (2005) survey of teachers could shed some light here. To the statement: "Knowing that a child has a genetically influenced learning difficulty would affect my method of tracking and instructing the child", an overwhelming majority (82%) indicated in the affirmative (Certainly True and Somewhat True). Additional comments from respondent teachers indicated that "they would ultimately do their best to help pupils with learning difficulties regardless of whether the difficulties were genetically influenced or not." (Walker & Plomin, 2005, p. 515). It is certainly not clear if the belief of heritability of traits affects teachers' attitudes or instructional strategies, and this research will attempt to explore if there is a correlation between the two.

Asking the same question in a different cultural context is an interesting way to explore whether there are cultural differences in the beliefs of teachers when it comes to genetic influences on behaviour and other characteristics. Therefore, a newer study looking at the beliefs of teachers in East China, using the same methodology as Howard-Jones et al, (2009) presents an interest in the similarity of the findings to the original, UK-based, study (Pei, Howard-Jones, Zhang, Liu & Jin, 2015). In this Chinese study the mean percentage of educational outcomes that were attributed to genetics by the teachers in this study was 28

(SD= 16) (compared to 25.5% in the UK study), while home environment accounted for 36% (SD=14) and school environment 35% (SD=15). Of particular interest are the differences in genetic attributions, between people who agreed ($n=140$) or disagreed ($n=23$) with the statement: "There is a biological limit to what some individuals can achieve in their education". The means in their beliefs of the percentage of genetic attribution for people who agreed with the statement were 29% (SD 16%), and 22% (SD 12%) for those who disagreed. The researchers used an independent samples t-test on the data, which revealed this difference to be statistically significant in spite of being relatively small ($t(161)=1.84$, $p=0.033$)).

Another interesting aspect can be seen in the mean percentage of achievement attributed to genetics in participants who agreed with the statement "There is no biological limit to what any individual can achieve in their education". The 62 teachers who agreed had a mean percentage of genetic attribution to educational outcomes at 23% (SD 11%) while those who disagreed with the statement ($n=110$) had a mean percentage of 30% (SD 16%). It therefore seems that teachers who believe that there are no limits, set by biology, on achievement, have a lower mean percentage of genetic attribution than those who disagree - it seems that there is a relationship between genetic attribution of educational outcomes and whether a teacher perceives there are biologically set limits to what a child can achieve.

Using these results one could deduce that teachers who place greater influence on genetic influences on educational outcomes are more likely to perceive limits to each individual's achievement. This in turn could potentially influence their behaviour towards certain individuals. More research on this aspect of the interplay between genetic attribution beliefs and behaviour towards students would be useful. It will also be useful to continue to explore these questions in a range of contexts to enhance understanding of cross-cultural similarities and differences.

It is important to mention that there has been a more recent study, identical in design to the two described above, that presents teacher beliefs with regards to genetics for teachers in Greece, also the focus of the study to be presented in this thesis (Deligiannidi & Howard-Jones, 2015). The results were very similar to those for trainee teachers in the UK mentioned above (Howard Jones, Franey, Mashmoushi & Liao, 2009) and of in-service teachers in East China (Pei, Howard-Jones, Zhang, Liu & Jin, 2015), in that the mean

percentage of educational outcome attributed to genes, home and school environments were reported to be 27 (SD= 13.2), 33 (SD=14.4) and 36 (SD=13.6) respectively. Again mirroring the East China teachers' results, there was a similar percentage of teachers who agreed and disagreed with the statement: "There is a biological limit to what some individuals can achieve in their education", (n=131 agreed, and n=29 disagreed) Looking at whether there was a significant difference in each group's percentage of genetic attribution as it related to education outcomes, an independent samples one-tailed t-test showed the difference to be significant. In this sense, it seems that once more teachers with stronger genetic attributions are more likely to feel that there is a set-limit to achievement attributed to biological factors. The present study should further explore the relationship between genetic attribution and the extent to which teachers (and teacher trainees) feel they can be effective in teaching individual students, as well as their general self-efficacy.

A similar conclusion can be drawn from the reverse statement, that "There is no biological limit to what any individual can achieve in their education" as again there was a significant ($t(158)=1.79$, $p=0.038$) difference between those who agreed having a lower mean percentage of genetic attribution.

In terms of cultural differences across the three studies, it is remarkable to see that the mean percentages are rather uniform (presented in table 1.1). It should be noted, however, that the UK sample was concerned with teacher trainees, while the East China and Greek samples were in-service teachers. The current study will gather data from both trainee and in-service teachers in Greece.

Table 1.1 *Percentages of teachers and trainees attributing educational outcome to genes or environment in different countries.*

	<i>Genetics</i>	<i>Home Environment</i>	<i>School Environment</i>
<i>UK (teacher trainees)</i>	25.5%	36.4%	36.9%
<i>East China (teachers)</i>	28%	36%	35%
<i>Greece (teachers)</i>	27%	33%	36%

(sources: Deligiannidi & Howard-Jones, 2015; Howard Jones, Franey, Mashmoushi & Liao, 2009; Pei,

From the above findings of the three studies there seems to be a rather similar distribution of beliefs amongst teachers. It seems to be the case, on the basis of these studies, that teachers who attribute greater weight to genetic factors are also more likely to feel that there is a biological limit to individual achievement. As discussed above, such teachers' beliefs could potentially have implications not only for teachers' behaviour and the educational outcome of their students, but also, for their sense of agency. Believing in the diminished malleability of their students, due to a greater genetic contribution in educational outcomes, could lead teachers to feel less able to help such students to achieve. In the study presented in the current thesis, teacher self-efficacy, one measure of a teacher's belief in their own agency will be explored and linked to their genetic beliefs.

Teacher Self-efficacy

Self-efficacy is a person's belief in their own ability to do certain things successfully (Bandura, 1994). It is based on the theoretical framework of social cognitive theory, with an emphasis placed on the exercise of human agency (Bandura, 2006). It is also closely related to the construct of Locus of Control, as developed by Rotter (1966), with a higher internal locus of control being linked to higher self-efficacy.

Self-efficacy is widely accepted as a positive construct, predictive of other positive outcomes such as motivation and goal setting (Schunk, 1990), positive health behaviours (Conner & Norman, 2005) and academic performance and persistence (Lent, Brown & Larkin, 1986; Multon, Brown & Lent, 1991). In that sense, self-efficacy can be viewed as a construct that can have an effect on behaviours (Schunk & Meece, 2006). Moreover, the link between self-efficacy and human agency has been stated very strongly by Albert Bandura (1982). Bandura makes the point that self-efficacy perceptions are not simply "inert estimates of future action" (Bandura, 1982, p. 122). Instead he suggests that they serve as proximal determinants of people's behaviour. This has a bearing on this research, as we examine teacher self-efficacy beliefs and their link to genetic beliefs.

Teacher self-efficacy is defined as an individual teacher's belief in his capabilities to affect

desired outcomes of student engagement and learning, including in pupils who are 'difficult' or unmotivated (Tschannen-Moran & Woolfolk Hoy, 2001). Although many models have been used to conceptualise and measure teacher self-efficacy, the Tschannen-Moran & Woolfolk Hoy one will be used for this study as it seems to align several facets of teacher self-efficacy, by "considering both social cognitive theory in terms of sourcing, processing, and assessment of personal capabilities, and locus of control theory in terms of the analysis of the task and its context" (Labone, 2004).

Teacher self-efficacy (TSE) has been linked to several positive pupil outcomes, such as achievement (Ashton & Webb, 1986; Caprara, Barbaranelli, Steca, & Malone, 2006). A study undertaken in Italian schools, with a large sample of ($n = 2000$) teachers found that, even after controlling for previous levels of achievement, teachers' self-efficacy was predictive of students' academic attainment (Caprara, Barbaranelli, Steca, & Malone, 2006). This raises a question about the potential mechanisms whereby TSE might affect pupil attainment. One proposed mechanism was the tendency of teachers with high self-efficacy to use innovative instructional methods (Guskey, 1988), thus further linking teacher beliefs and practices. Other proposed mechanisms are increased student motivation (Midgley, Feldlaufer & Eccles, 1989), while TSE is also linked to students' own self-efficacy, which has been identified as an important factor in school improvement (Dembo & Gibson, 1985). In fact, Ashton (1984) suggests that teacher self-efficacy is the single characteristic that has consistently demonstrated a relationship to student achievement.

TSE as a positive and desired characteristic is further related to teachers' sense of control (Woolfolk & Hoy, 1990), commitment to their teaching role (Coladarci, 2010) and their job satisfaction (Caprara, Barbaranelli, Steca, & Malone, 2006; Klassen & Chiu, 2010). Teachers with lower levels of efficacy, on the other hand, have been found to have higher levels of job-related stress (Betoret, 2006) and higher rates of teacher burnout (Brouwers & Tomic, 2000; Skaalvik & Skaalvik, 2007).

With teacher burnout and the related drop-out rates reaching alarming rates in various cultural contexts, including North America, with 40-50% of new teachers leaving the profession within their first three years of teaching (Ingersoll & Smith, 2003; Steinhardt, Jaggars, Faulk & Gloria, 2011), the link between self-efficacy as a buffer of teacher burn-out could be important. The problem is similar in the UK where a third of new teachers have left

the profession within their first five years in schools (National Union of Teachers, 2016). More specifically, of the 21,400 teachers recruited in English state schools in 2010, 6,400 (30%) had left by 2015 (The Guardian, 2015).

On the other hand, several positive teacher behaviours have been linked with higher teacher self-efficacy (Tschannen-Moran & Woolfolk-Hoy, 2001). Effective classroom behaviour management is certainly one of the positive correlates of higher TSE, although the direction of the relationship is not always clear (Aloe, Amo & Shanahan, 2014). TSE can further affect the effort teachers put into their planning and organisation (Allinder, 1994) while higher self-efficacy levels have been linked to openness to new ideas (Berman, McLaughlin, Bass, Pauly & Zellman, 1977, cited in Tschannen-Moran & Woolfolk Hoy, 2001). This final characteristic might indeed have a bearing on the current study in which we measure 'openness to genetics'.

Apart from the positive outcomes linked to teacher self-efficacy beliefs, as mentioned above, it is of interest to this study to see the potential sources of such beliefs and the processes by which they come to be developed (Labone, 2004). Such processes have potential implications for the current study, as it seems reasonable to hypothesise that they may be associated with beliefs about the aetiology of educational outcomes.

It is, therefore, useful to take a step-back and assess the antecedents of self-efficacy beliefs. Social cognitive theory proposes the following four sources of a person's self-efficacy: mastery experiences, vicarious experiences, verbal persuasion and finally physiological arousal (Bandura, 1986). Of these four sources, the theory proposes that the first one, namely mastery experiences, meaning a sense of satisfaction with one's previous experiences within a particular field, is the strongest of them all. In this sense, successful previous teaching experience is likely to have a positive effect on teachers' self-efficacy. On the other hand, in our investigation, lack of such first-hand experience from which to draw upon might mean that other factors (like, for example, trainee teachers' beliefs) might play a larger role in determining the trainees' sense of self-efficacy. On the other hand, another study showed more experienced teachers in Cyprus to be more likely to attribute student success to external factors (Georgiou, 2008). The present study will add to the literature by further exploring the relationship between years of teaching experience, genetic attributions to educational outcomes and teacher's own sense of self-efficacy.

According to social cognitive theory, teacher effort is linked with teacher beliefs. More specifically, believing that they might not be successful with certain students, teachers are “more likely to put forth less effort in preparation and delivery of instruction, and to give up easily at the first sign of difficulty, even if they actually know of strategies that could assist these students if applied. Self-efficacy beliefs can therefore become self-fulfilling prophecies, validating beliefs either of capability or of incapacity.” (Tschannen-Moran & Woolfolk Hoy, 2007, p. 3) Such statements support the importance of asking whether a belief in the importance of genetics could affect self-efficacy, effort and therefore pupils’ experiences and outcomes.

Finally it should be noted that TSE has been found to relate to years in practice (Hoy & Spero, 2005), as well as mastery experiences (Tschannen-Moran & Woolfolk Hoy, 2007) which may mean that we see a difference between our novice and trainee teachers, and our more experienced teachers in this study. More notably, the study reports that teacher’s self-efficacy increases during their study year, while there seems to be a decline in TSE in the first year of teaching (induction year). It should further be noted here, that for Greek teachers there is no such thing as a formal induction period, and once trained they enter the workforce without any further mentoring or training. It could perhaps be assumed here that such a lack of support in the start of one’s teaching career might further accelerate the decrease of self-efficacy once teachers enter the classroom.

Teacher self-efficacy and beliefs about genetics

The literature reviewed in this chapter supports the idea that teacher beliefs about their pupils may be associated with their classroom practice and therefore, with student attainment (Rosenthal and Jacobson, 1968; Wigfield, Galper, Denton & Seefeldt, 1999; Love & Krueger, 2005; Klehm, 2014). This chapter has examined the role that beliefs about the genetic origins of various traits, including disease, disability, mental health (Dar-Nimrod & Heine, 2011; Phelan, Cruz-Rojas & Reiff, 2002) and even sexual orientation (Sheldon, Pfeffer, Jayaratne, Feldbaum, & Petty, 2007) can have on how we all interpret the nature of such traits, as well as the deterministic way in which we often view genetic attribution (Reydon, Kampourakis, Patrinos, 2012). Although those studies were conducted amongst the general population, there is reason to believe that teachers and teacher trainees may

have a similar point of view when it comes to genetics, as they don't typically receive any training in genetics as part of Initial Teacher Education. Current sources of information in relation to genetic findings, such as the popular press, are likely to further distort teachers' and trainee teachers' understanding of genetics research and its implications (Brechman, Lee & Cappella, 2011), often leaving the effect of environmental factors in the shadow. Articles with titles such as such as this one in the Daily Mail: "First Dyslexia Gene Found" (Daily Mail, n.d.) or this one from the Mirror: "Scientists find 'gay gene' that can help predict your sexuality" (Gregory, 2015) can massively overplay the effect of single genes, leading lay people, and teachers amongst them, to perhaps overestimate the genetic contribution to certain disabilities or traits, or the underestimation of environmental factors. The evidence is clear that complex human behaviours are influenced by many genes of small effect rather than one or two genes of large effect (Knopik, Neiderhiser, DeFries & Plomin, 2017)

Given the gaps in the literature on the impact that teachers' and trainee teachers' genetics beliefs might have on their sense of agency, and the relationship between these belief, including genetic essentialism (Dar-Nimrod & Heine, 2011) and reduced sense of human agency reported above, several questions arise. Beliefs about malleability, linked to a genetic attribution of a trait, could be related to teachers' sense of self-efficacy. Therefore this study aims to explore the relationship between trainee teacher and teacher self-efficacy, openness to genetics and beliefs about the heritability of educationally-relevant behaviours.

Taking into account findings from the few existing studies of teachers' beliefs about the effects of genes (Walker and Plomin, 2005), their stance on the nature/nurture debate (Howard Jones, Franey, Mashmoushi & Liao, 2009; Deligiannidi & Howard-Jones, 2015; Pei, Howard-Jones, Zhang, Liu & Jin, 2015) and the link between such beliefs and teachers' sense of agency, the present study will attempt to analyse the specific relationship between trainee teachers' and teachers' beliefs about genetics and their sense of self-efficacy. Moreover, given the effect that teaching experience has been found to have on the attribution of certain traits to biological or environmental factors (Georgiou, 2008), the teaching experience/practice of teachers and teacher trainees will also be taken into account, as it relates to both attribution, as well as self-efficacy.

The following research questions will be investigated in a sample of trainee and in-service teachers in Greece:

- 1) Are there certain traits that are seen as more influenced by genetics than by the environment?
- 2) Do teachers' and trainee teachers' beliefs about the genetic and environmental origins of learning behaviour correlate with their self-efficacy as teachers?
- 3) Does Openness to Genetics in Education correlate with teacher self-efficacy?
- 4) Does teaching experience correlate with trainee teachers' beliefs about genetics?
- 5) Does thinking about genetics affect trainee teachers' self-efficacy?

Methodology

Study 1: Quantitative

Participants

A total of $n=223$ participants took part in this study. Two groups of participants were recruited. The first group was made up of $n=175$ undergraduate trainee teachers from a Greek University. The second involved a smaller sample of $n=48$ postgraduate students, who were also practising teachers, and were enrolled on the MA in Education programme at the same university.

Of the total number of participants ($n=223$) 88.8% were female ($n=198$), and one participant did not provide this information. The mean age of all participants was 23.5 years, with a minimum of 19 years and a maximum of 53. For undergraduates the mean age was 21.5 years (minimum 19 and maximum 53) while for the postgraduates it was 30.2 (minimum 23 and maximum 47). There were 11 participants who did not state their age (7 undergraduates and 4 postgraduates).

Measures

Data were gathered using a pencil-and-paper questionnaire. This approach was chosen mainly due to practical concerns about access to participants. The researcher was warned that Greek university students do not tend to rely on email for communication with the university, and might therefore not respond well to an online survey. Some literature supports pen-and-paper measures as slightly more reliable than online methods (Naquin, Kurtzberg & Belkin, 2010). Other studies, however, have found that the two measures do not

differ significantly (Riva, Teruzzi & Anolli, 2003). In some cases better response rates have been observed when a questionnaire was administered online, versus through the post (Lonsdale, Hodge & Rose, 2006). The context appears to matter and this was certainly the case for the current study. The pen and paper questionnaires were delivered in person by the researcher, or the students' lecturer before class, and participation was almost universal among those invited in this way. A web-based version of the questionnaire was also developed and circulated but had a very minimal response (3.6% i.e. 3 out of 83), supporting the original intuition that a pen-and-paper measure would have better uptake among the target sample.

Three main variables were operationalized for the current study: perceptions of nature vs nurture; openness to genetics and teacher self-efficacy beliefs. In addition, a series of demographic questions were asked including sex, age, academic course currently enrolled in and year of study, as well as teaching experience. The latter question had a multiple choice response format of 'none', '1-3 terms', '2-5 years' and 'more than five years'. The question also included a clarification, permitting participants to include teaching experience gained during school placements that were part of their teacher training.

Perceptions of nature vs nurture

A measure was adapted from Walker and Plomin (2005). Participants were asked to what extent they think that environment (nurture) or genes (nature) influence six traits: personality, academic potential, behaviour, learning difficulties, mental health and subjective well-being. Answers were given using a 5 point scale, with 1 being 'all genes', 2 'more genes than environment', 3 'genes and environment having an equal influence', 4 'environment larger influence than genes' and finally 5 representing 'all environment' as an influence of the above traits. The first four traits (personality, academic potential, behaviour and learning difficulties) represented an exact replication of the work by Walker and Plomin (2005), while the remaining two, mental health and happiness (subjective well-being), were new additions, included for the current study. They were chosen because of the researcher's personal interest in these areas, as well as recent evidence that there might be a strong genetic basis for these two traits (Okbay et al., 2016; Uher, 2014; Bigos et al., 2010) .

There was also be a follow-up item, as in Walker and Plomin (2005) asking teachers

whether knowing that a child has a genetically-influenced learning difficulty might affect their method of instruction. Again a 5-point scale was used, with possible responses ranging from 1 (certainly true) to 5 (not at all). An open ended question sought further clarification from participants on this item.

Openness to Genetics in Education

The Openness to Genetics in Education (OGRE) scale (Crosswaite, unpublished) was used. The scale is made up of 5 items, 2 of which are reverse scored. Items ask about teachers' willingness to learn more about genetics ("I would like to know more about behavioural genetics and its implications for child development") and how useful they feel findings from behavioural genetics could be for teachers ("Research that explains genetic influences on cognitive ability could be useful to teachers"). Responses are provided on a 5 point scale which ranges from Strongly Disagree to Strongly Agree. Internal consistency for this data set was measured using Cronbach's alpha ($\alpha=.73$).

Teacher Sense of Efficacy Scale (TSES)

The Teacher Sense of Efficacy Scale (TSES) measure was also used (Tschannen-Moran & Hoy, 2001). Although, the long form rather than the short form is suggested for use in pre-service teachers (Tschannen-Moran & Hoy, 2001), it was decided that the short form, containing 12 (rather than 24) items should be used, cutting down the overall length of the questionnaire to three pages only for the current study. Moreover it was deemed useful to have the same measures used by both pre-service, as well as more experienced teachers. The short form of the TSES contains 12 items, measuring three separate factors: instructional strategies, student engagement and classroom management (Tschannen-Moran & Hoy, 2001). Each factor has four items for each of the three categories. Questions are answered using a 9 point response scale, ranging from '1' for nothing through to '9' for a great deal. The questions are related to teacher tasks, such as "How much can you do to get through to the most difficult students?" and "How much can you do to improve the understanding of a student who is failing?". Overall the scale reliability has a mean of 7.1 (SD .94) and Cronbach's alpha of $\alpha=.94$ (Tschannen-Moran & Hoy, 2001). The Cronbach's alpha for the TSES in the current dataset was $\alpha=.85$, confirming good internal reliability.

Translation of study Measures

A good translation does not merely translate the words of an item, but the meaning (Harkness, 2011). However, cross-cultural research has shown that there are often concepts that might be present and meaningful in one culture but not applicable or relevant in another (Triandis, 1972). Translating measures from English into Greek therefore represented an important challenge for the current study.

Several techniques were considered, including an *ad hoc* translation by the researcher, and a translation and back-translation procedure. The former was dismissed as not rigorous enough. The latter was examined as a more rigorous way to produce a close and clear translation. However, upon closer examination this method was also dismissed as “Comparisons of an original source text and a back-translated source text provide only limited and potentially misleading insight into the quality of the target language text” (Harkness, 2011, VIII p. 2).

In the end the researcher concluded that the most effective way to translate the survey questionnaires in order to preserve their meaning as well as possible was a version of the process of team translation as outlined in Harkness (2011). The team translation process, also called TRAPD (Translation, Review, Adjudication, Pretesting, and Documentation) involves a translation being drafted, then reviewed by a team of at least two, discussed and then pre-tested.

The questionnaires which were originally in English and had to be translated into Greek were initially translated by the researcher, who is bilingual and proficient in both English and Greek. Following the initial translation it was offered to a committee of two academics who work within educational psychology and with teacher trainees in order to ensure agreement on the translation terms. The translated version was initially looked at independently by each academic, with notes taken. The advantage of having two people looking at the translation in parallel is that it can avoid the bias of one person working on it alone (Vallerand, 1989 cited in Banville, Desrosiers, & Genet-Volet, 2000). The corrections were then discussed by the two committee members and a consensus was reached. The pre-testing step of the process

took place in the feasibility study (described below), after which further refinements were made.

Feasibility Study

The feasibility study's main aim was also to ascertain whether the consent form and questionnaire were comprehensible and easy to use. Several issues arose from feedback received during the feasibility study and will be discussed below.

The questionnaire, together with information sheet and consent forms, were administered to three undergraduates, enrolled on the BA in Early Childhood Studies at a smaller FE College in Athens, the researcher's employing institution at the time. The students were given the relevant information from the researcher, and were asked to complete the questionnaires, noting any issues as they arose. The notes were further discussed in an informal focus group, whereby the researcher directly asked for feedback on how to improve clarity and presentation.

Several changes were made to the consent form, following the pilot. The main changes related to making the information easier to understand, as well as clarifying items that needed to be consented to individually by placing tick-boxes next to them. The lay-out of the consent form was consequently changed to include several tick-boxes, resulting in a clearer design.

In terms of the questionnaire, there were several comments with regards to the phrasing of the translated questions in the TSE measure. Different phraseology was chosen, in consultation with the students. For example, it was suggested that the questionnaire was written in the second person singular, rather than the more formal second person plural, being the polite form. It was suggested that the more polite form somehow denoted distance between the researcher and the participants, and all three students agreed that it should be changed.

Moreover, further changes were made to some of the terms in the 'Effect of Genes vs Environment' questionnaire. It was suggested that an explanation be placed in brackets, for clarification purposes. The items, therefore, took this final form: " Σε ποιο βαθμό πιστεύεις ότι η

XX ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);” which literally translates to: ‘To what degree do you believe that the X of a child is affected by genetic factors (genes) or by environmental factors (nurture)?’. This was felt by all to be both an accurate translation of the original instrument, as well as being very clear in its meaning.

Finally, a comment was made about adding a request for a phone number, as well as an email address in the first section of the questionnaire (to follow up with participants who expressed a willingness to be interviewed. The thinking behind the suggestion related to the fact that a lot of young people in Greece still don’t have regular access to email and do not use it on a regular basis for communication. The researcher incorporated that into the final version.

All changes that were brought up in the feasibility study were later presented to the initial translating committee and were further discussed. All were accepted and incorporated into the final versions of the questionnaires and consent forms. [Appendices 1 and 2]

Procedure

Data were collected before lectures/seminars in most cases. There were, in total, 3 waves of data collection that each took place at the beginning of a lecture or planned seminar. The questionnaires were handed out by the researcher herself on two occasions, while on the third occasion they were delivered by a lecturer at the University. On all occasions consent forms were filled in first, as per the University of York’s ethical codes.

Initially only two collections had been planned: one at an undergraduate lecture and a second one at a postgraduate afternoon seminar. The initial data collection, which was undertaken by the researcher, was at the first undergraduate lecture and yielded data from 66 participants although it should be mentioned here that 3 forms which were returned but had less than a third filled in and were erroneously discarded by the researcher (this will be further discussed in the limitations). The postgraduate seminar collection, conducted by a lecturer at the University, yielded a further 48 responses. The researcher sought to attend further undergraduate lectures, in order to collect data from a larger and therefore more

powerful sample. For the final collection the researcher attended an undergraduate seminar and collected a further 109 undergraduate responses.

Between collection 2 and 3 and as the initial data collection did not provide the researcher with a large enough dataset from each of the two groups (Undergraduates and Postgraduates) the researcher sought permission to send out further questionnaires by email to undergraduates from the same course and University. An initial email was sent out, that included a link to an electronic version of the questionnaire. A week later a reminder email was sent out. Unfortunately of the 83 undergraduates that were invited to participate in this way, only three took part in the study by filling in the online form, reinforcing the original decision to use pencil-and-paper questionnaires rather than on-line measures. These were, in the end, not used as part of the data, due to differences in procedure.

The questionnaires came in two forms, in order to be able to address hypothesis 5, which related to whether thinking about genetics affected teacher self-efficacy, using a basic experimental design. Form A presented the participants with the TSES and Openness to Genetics measures first, followed by the Effect of Genes vs Environment questionnaire, as adapted from Walker and Plomin (2005). Form B was the opposite, with the Effect of Genes vs Environment question first, followed by the TSES and finally the Openness to Genetics measure at the end. The two types of questionnaires were marked discreetly and did not appear to differ in content. They were also mixed before they were handed out - in an effort to randomise recruitment to each group. All participants had an equal chance of receiving either a Form A or Form B questionnaire during all data collection sessions. The percentage of students who received Form A ('TSES first') was 50.2, compared to 49.8% who received Form B ('Genetics first').

Analysis

Basic descriptive statistics were calculated for all study variables.

They were also further analysed to answer each of the research questions in turn.

Pearson's *r* correlations were calculated between teachers' beliefs about the aetiology of the six traits included in the survey and their self-efficacy beliefs (TSES score). A correlation was also calculated for the combined mean beliefs. Moreover, Pearson's *r* was also calculated for Openness to Genetics and TSES mean scores.

To answer research question 3 a one-way between subjects ANOVA was used to calculate the effect of teaching experience on beliefs about the aetiology of behaviour (using a combined average for beliefs about all six traits). Finally, for the experimental condition relating to research question 4, an independent samples t-test was performed, between the two conditions, as described above.

STUDY 2 - Qualitative data

Study 2 was a qualitative study of a sub-group of the participants in Study 1. It was used to more closely explore the opinions and beliefs of trainee and practicing teachers as they relate to genetics and to their self-efficacy. Within psychology qualitative methods are used when a researcher wishes to “investigate the person’s grasp of the world in detail” (Smith, 2007, p. 5). In this particular instance the qualitative part of the research project was seen as complementary to the quantitative methods employed. Moreover, mixed method investigations can “draw from the strengths and minimize the weaknesses of both in single research studies” (Johnson & Onwuegbuzie, 2004). the holistic combination of quantitative and qualitative methods within the same investigation can offer a measure of triangulation, and therefore higher overall validation of the findings (Jick, 1979). In this particular investigation it was felt that the qualitative data would help add validity and clarity to the quantitative data. It was felt that such an approach would offer a more comprehensive view of the issues, as well as adding depth to the exploration of some of the issues arising (Morse, 1991). Furthermore, a sequential approach was used, with the quantitative data being gathered first, followed by the interviews. However, as the analysis of the questionnaire data did not happen until after the interviews were finished, this approach did not yield the desired effects in this instance: this is further discussed in the discussion, as a limitation of the study. It was felt, by the researcher, that the complementarity of this research approach was compromised by the timing of data collections and analyses.

Participants

For the qualitative part of the research 9 participants were interviewed. Of those 6 were female. A balance of postgraduate and undergraduate students was sought. Therefore, four

of the interviewees had attended the postgraduate seminar, and were active in the classroom, while five were undergraduates and had limited classroom experience, most of which had been of classroom observations. Of the participants who took part in Study 1 (n=233) 65 provided some sort of contact information on the questionnaire itself. 29 provided only their email address, 22 provided a phone number and 14 provided both. The researcher initially decided to recruit potential participants via email. This had the advantage of being able to offer more information than over the phone, as well as giving potential participants a chance to think over whether they wanted to take part in the study or not, without the pressure of a researcher waiting on the other end of the line. Emails were sent out to all Study 1 participants who had provided an email address, reminding them of the purpose of the study, as well as asking for their participation in the project. Of the 43 emails that were sent out, only four were responded to, further reinforcing the observation that students at Greek universities do not use email as often as expected. After initial contact was made by email, a time and place was arranged in order to conduct the interviews with these four participants.

A further four participants who had provided a phone number but no email address were contacted by phone, but all declined to participate in the interview. In order to recruit more participants for Study 2, the researcher directly approached students after the final data collection (data collection 5) which took part before a lecture and personally asked for their contact details. This approach appeared to be more effective, and a further five participants were thus recruited. It should be noted here that all of these were undergraduates, as the final data collection took place before an undergraduate lecture, at a big Greek University.

Measures

For the qualitative element of the investigation the researcher chose to use interviews. Interviews are defined as a managed verbal exchange (Ritchie, Lewis, Nicholls & Ormston, 2013). As a research instrument interviews have a long tradition in psychological and social science research. The main aim of an interview is for the interviewer to be able to understand how participants construct the world around them (Kvale, 2008). Moreover, interviews can offer rich insight. As in this particular investigation, interviews were used as a follow-up to questionnaires, further investigating the responses of individual participants (McNamara, 1999). Interview types vary between structured and unstructured. In essence any particular interview will lie somewhere along the continuum of structured to unstructured,

depending on the number of standardised questions the interviewer asks (Brinkmann, 2014).

The interview that was constructed for the current study mainly aimed to try to enrich the data that the researcher had already gathered in Study 1, giving further insight into the understanding of the teachers and trainee teachers of genetics, and their influence upon the educational process. Moreover, the researcher aimed to understand how the interviewees felt genetics might affect their own work with children in the classroom, especially as it related to self-efficacy and agency.

The interview schedule consisted of seven open-ended questions, such as “How important is a teacher’s contribution to educational outcomes?”. The questions were designed around themes that arose in the quantitative study, namely nature and nurture in educational processes, genetics and teacher agency/self-efficacy and openness to genetics. All questions were open ended and the researcher made an effort to encourage participants to elaborate as and when they wanted to. A sample interview can be seen in Appendix 3.

It should be noted that after the first 4 interviews had been completed (1 postgraduate and 3 undergraduate) the researcher added an extra question, in relation to sources of information with regards to genetics. It was felt that this was an area worth exploring, as it had emerged from the initial interviews.

Procedure

All interviews were conducted face-to-face. Telephone interviews have been used traditionally for shorter, and structured interviews (Harvey, 1998; Fontana & Frey, 1994) or in cases where safety or cost might be of concern. As none of the above were relevant to this investigation, face-to-face interviews were chosen as being the most suitable. Moreover, a face-to-face interview as a data collection tool has certain characteristics that might make it an effective means of gauging responses, including informal and non-verbal communication (Creswell & Poth, 2017).

The interviewees had given consent for the interview at the initial data collection, but were reminded of the process. Consent was further obtained in order for the interview to be

recorded. All interviews were recorded using the researcher's phone recorder. The recordings were then transcribed into Greek, and then translated into English by the researcher. Both languages have been included in the results, as well as a sample interview in both languages (side-by-side) in Appendix 3.

Translation

Qualitative research is at its centre about giving voice to people (Denzin & Lincoln, 1994). Moreover, qualitative techniques aim to study and present meaning from the experiences and beliefs of people (Van Nes, Johnson & Deeg, 2010). However, the process of translation, itself an interpretation of meaning, can pose certain methodological implications. Consequences for the validity of qualitative research that has been translated have been raised (Squires, 2009) and discussed at length, while recommendations have also been made (Van Nes, Johnson & Deeg, 2010). One of the recommendations made by Van Nes et al. (2010) is the use of a professional translator. For reasons of cost this was not possible in this current study. Moreover, the fact that the researcher is bi-lingual and has worked in the translation of similar qualitative data in the past, as an independent translator, deemed the translation of the interviews by the researcher a reasonable practice.

Transcription itself is a "time consuming, messy, and imperfect process that constructs a textual version of the original interaction" (Nikander, 2008; p. 226). Translation can compound the methodological difficulties of rendering true meaning, and it is often recommended that a detailed account of the process is provided, so that reviewers and colleagues have a clear idea of any pitfalls or difficulties (Nikander, 2008; Van Nes, Johnson & Deeg, 2010). Moreover, presentation of the final transcript is also important, and side-by-side was felt to be the best way to present the whole interview. In terms of the excerpts chosen to illustrate points in the analysis both languages have been presented, with the original first and the translation following.

Analysis

Thematic analysis was used in order to analyse the qualitative data that were gathered during Study 2 interviews. Thematic analysis was chosen as it has been suggested as the

first qualitative method for researchers to learn, “as it provides core skills that will be useful for conducting many other forms of qualitative analysis” (Braun & Clarke, 2006; p.4). Moreover, the method is described as a very flexible and useful research tool, that can be used to provide a rich and detailed account of the data. Finally, thematic analysis is recommended in cases where qualitative methods, such as open-ended measures or other forms of information collection are incorporated into otherwise quantitative studies, such as in these two studies (Boyatzis, 1998).

The process that takes place in thematic analysis, as is described in Braun and Clarke (2006) should be clearly documented, to achieve clarity around the process. It is reported that often the details given in describing the method have been insufficient (Attride-Stirling, 2001). The process will therefore be outlined in detail here.

The initial step, also called Phase 1 by Braun and Clarke (2006) is the process whereby the researcher familiarises herself with the data. In this case this was achieved through the process of transcription and translation. The data were looked over and worked on at least three times per interview. Following that, a fresh reading of all the collected, transcribed and translated data was undertaken. At this stage, Phase 2 began, whereby the researcher generated initial codes. These codes identify features of the data that appear to be of interest to the researcher and to this particular investigation. This process of coding is vital for the analysis, and is in fact a distinct part of the analysis itself. It should be noted here that codes and themes differ in that themes are usually broader than the codes generated in this phase.

The third phase (Phase 3) of the analysis is the search for themes, followed by the review of the themes (Phase 4). For this phase the researcher read all extracts she had collated and attempted to ascertain whether there was some coherence within them. Once the pattern emerged it was then considered within the context of the entire dataset.

Finally, the penultimate phase (Phase 5) consisted of the definition and naming of themes. A detailed analysis was collated for each individual theme and sub-themes were explored. By the end of this phase, the data was put together and written up (Phase 6). The results are presented and analysed in the following chapter.

Results and Analysis

Study 1 - Quantitative data

Descriptive Statistics

Participants were asked: To what extent is X influenced by genes (nature) or the environment (nurture), where X stood for each of six individual traits: namely personality, intelligence, behaviour, learning difficulties, mental health and subjective well-being. Both undergraduates (trainee teachers) and postgraduates (experienced teachers) provided responses to this question, using a Likert-scale that ranged from 1 to 5. To clarify, a mean of 1 would indicate that the trait was believed to be determined completely by genetics (nature), while a mean of 5 would indicate that participants saw it as being solely influenced by environmental factors (nurture). A Mean of 2.5 would suggest, therefore that, on average, participants saw nature and nurture as equally important influences on the trait in question. Means and Standard Deviations are presented in Table 2.1.

Table 2.1. Descriptive statistics for beliefs about the relative influence of nature and nurture on the traits examined.

	<i>M</i>	<i>N</i>	<i>SD</i>
Personality	3.58	214	.686
Intelligence	3.00	213	.777

Behaviour	3.86	214	.689
Learning Difficulties	2.62	214	.794
Mental Health	3.60	214	.797
Subjective Wellbeing	4.22	214	.785

The highest mean, indicating a belief in greater environmental than genetic influence, can be seen for subjective well-being ($M=4.22$, $SD=.785$) The lowest mean was observed for learning difficulties ($M= 2.62$, $SD=.794$) indicating that participants saw more of a role for genetics here (although they still, on average, erred slightly in favour of environmental influence with a mean score greater than 2.5. In order to illustrate the range of responses in a more fine grained way frequencies are presented in Table 2.2.

Table 2.2. Percentage of overall respondents' responses regarding whether genetic or environmental factors influence a child's traits

	All genes 1	G>E 2	G=E 3	G<E 4	All Environment 5
Personality	.5	5.5	33.6	57.1	2.8
Intelligence	1.4	24.5	46.8	26.4	.9
Behaviour	0.0	3.2	22.1	59.9	13.7
Learning Difficulties	4.6	42.4	40.1	12	.9

Mental Health	0.0	8.3	35.9	44.2	11.5
Subjective Wellbeing	0	2.3	14.7	40.1	42.9
Total:					

Of the total participants (n=223) 217 valid answers were collected for personality. Only one person believed that personality was totally genetic in origin, representing 0.5% of responses. More than half of all participants (57.1%) replied that personality was more influenced by environmental than genetic factors, while one-third believed that genes and environments had equal influence. Finally a very small percentage (2.8%) believed that personality is only influenced by environmental factors.

For the trait of intelligence, 217 valid answers were also collected. Three participants reported believing that intelligence was totally explained by genetic factors, representing 1.4% of the total responses. Almost half of all participants (46.8%) believed that intelligence was more influenced by environmental than genetic factors, while one-quarter (25.9%) believed genes had a stronger influence on intelligence, than environmental factors. Finally, only two participants, representing 0.9% of responses, stated that intelligence is influenced by environmental factors alone.

When it came to behaviour, although only 1% of participants stated that behaviour was influenced mainly by genetic factors, at the other end of the spectrum 14.3% attributed behaviour to environmental factors. It should be noted that there were no responses that attributed behaviour solely to genetics. Most participants (59.9%) expressed the belief that behaviour is mostly influenced by environmental factors (nurture).

Learning difficulties were largely seen as being somewhat more influenced by genes than other traits. 4.6% of participants agreed that learning difficulties are solely genetic in origin, while 42.4% stated that genes play a larger role than experience. Finally, 40.1% of all the 217 valid responses said that environmental and genetic factors play an equal role when it comes to learning difficulties, while only 2 participants (0.9%) stated that learning difficulties

are only influenced by nurture.

With regards to mental health outcomes, none of the 217 respondents thought that those were solely influenced by genetics. However, a minority (8.3%) expressed the belief that genes played a bigger role than environment, while 35.9% attributed mental health outcomes equally to genetic and environmental factors. A relatively large percentage of 11.5%, compared to other traits, attributed mental health outcomes to purely environmental influences.

Of the 217 valid responses collected, a very large proportion of the sample (42.9%) attributed subjective well-being to environmental factors alone, followed by 40.1% who believed that subjective well-being is mostly influenced by environmental factors. Only 14.7% believed that genes and environment have an equal role to play in this respect, while 2.3% give more weight to genes rather than environment. None of the respondents reported the belief that subjective well-being is solely influenced by genetic factors.

Overall, the trait that was perceived as most influenced by genetics was learning difficulties ($M=2.63$, $SD=.684$) while, on the other end of the spectrum, subjective well-being was mostly attributed to environmental factors (mean=4.24, $SD=.785$), where 1 represents the belief that the trait is influenced by genes alone and 5 represents the belief that it is influenced only by environmental factors.

To conclude, for the six behavioural domains that were examined the percentage of teachers and trainee teachers who reported that genetics were equally important as, or more important than, environment were: for personality 39.6%, for intelligence 72.7%, for behaviour 25.3%, for learning difficulties 87.1%, for mental health 44.2% and finally for happiness, operationalised here as subjective wellbeing, 17.1%.

Differences between undergraduates (trainee teachers) and postgraduates (in-service teachers)

Independent samples t-tests were used to assess differences between the views reported by

undergraduate and postgraduate participants. The two domains that showed group differences that were statistically significant, or close to significance, were behaviour and learning difficulties, with postgraduate students (qualified teachers) being more likely to attribute both of these aspects of behaviour to environmental factors. For behaviour $t=-1.946$ and $p=.054$, $df=212$. This near-significant difference represents a small to medium effect size (Cohen's $d=.28$). The difference between undergraduate and postgraduate views about the aetiology of learning difficulties was statistically significant ($t=$ and $p=.012$) and this represents a medium effect size (Cohen's $d= .40$). However, after applying a Bonferroni correction, to remove the risk of significant findings being down to chance, none of these differences retained significance. These group comparison results are presented in Table 4.

Table 2.3. Comparing undergraduate (UG) (n=166) and postgraduate (PG) beliefs about the relative influences of nature and nurture on behaviour.

	Mean	SD	<i>t</i>	<i>p</i>	Bonferro <i>ni</i> adjusted <i>p</i>	<i>Df</i>	Cohen's <i>d</i>
Personal ity							
UG	3.58	.698					.029676
PG	3.56	.649	.202	.841	1	212	
Intellige nce							
UG	3.05	.771					.283499
PG	2.83	.781	1.648	.096	0.576	211	
Behavio ur							
UG	3.82	.741					.283877
PG	4.00	.505	-1.946	.054	.324	212	

**Learning
Difficulties**

UG	2.55	.813						.399322
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PG	2.85	.684	-2.561	.012	0.072	212		
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**Mental
Health**

UG	3.60	.824						.000000
----	------	------	--	--	--	--	--	---------

PG	3.60	.707	-.465	.953	1	212		
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**Subjective
Wellbeing**

UG	4.21	.808						0.07903
----	------	------	--	--	--	--	--	---------

PG	4.27	.707						2
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This table indicates that all group comparisons were non-significant and had very small effect sizes. No significant differences in beliefs about the aetiology of behaviour were

observed between trainee and in-service teachers.

After exploring the differences between trainee teachers and in-service teachers in terms of their beliefs about the aetiology of behaviour, as well as other characteristics we moved on to exploring the data collected on teacher self-efficacy. These are presented below.

Teacher Self-Efficacy Scale (TSES) descriptives

Overall, 216 valid responses were collected, with a minimum Mean of 3.83 and a maximum of 8.50 (possible scores range from 1-9). The highest the score the higher the reported sense of self-efficacy of the respondent. Overall, the average score for teacher self-efficacy, as presented in Table x, was $M=6.50, SD=.86$). We asked whether teacher self-efficacy beliefs would differ by group and, in particular, whether the postgraduate sample, made up of experienced teachers, would show significantly higher levels of self-efficacy than the undergraduate sample that was made up of trainee teachers (See Table 2.4).

Table 2.4. Descriptive statistics and independent samples t-tests for undergraduate and postgraduate responses on the Teacher-Self-efficacy Scale.

Graduate Status	N	Mean	SD	<i>t</i>	<i>p</i>	<i>Df</i>	Cohen's <i>d</i>
UG	164	6.41	.87				
PG	48	6.80	.78	2.80	.006	210	.46
Total	212	6.50	.86				

The t-test results show that postgraduate self-efficacy beliefs were significantly higher

($t=-2.803$, $p=.006$) than those of undergraduates, with a medium to large effect size (Cohen's $d= 0.46$).

Openness to Genetics in Education Descriptive Statistics

We further asked participants how open they were to genetic research having an influence in the classroom, and explored differences between trainee and experienced teachers in this respect. The Openness to Genetics in Education Scale was administered to all participants and 216 valid responses were collected. Of those $n=165$ were from undergraduates, and $n=48$ from postgraduate students. The average score for openness to genetics was $M=3.88$ (using a 5 Point scale in which higher scores represent greater openness). Table 2.5 presents descriptive statistics for the full sample and separately for undergraduate and postgraduate participants.

Table 2.5. Descriptive statistics and independent samples t-test for the Openness to Genetics in Education Scale.

Sample	N	Mean	SD
Full sample			
UG	165	3.8242	0.59337
PG	48	4.0667	0.52077

An independent-samples t-test showed that, with regards to Openness to Genetics in Education, postgraduates were significantly more open to genetic research entering the classroom than undergraduates were ($t=-2.558$, $p=.011$, $df= 211$) . This significant difference represented a medium to large effect size (Cohen's $d= 0.43$).

Genetically-linked learning difficulties and instruction - opinion statement

An opinion statement, similar to the one that was included in the Walker & Plomin (2005) survey of UK teachers and parents, was used. Participants were asked to respond to the following statement: If I knew that a child had a genetically linked learning difficulty it would affect my teaching of the child. Participants responded using a 5 point Likert scale, with 1 being Strongly Agree and 5 being Strongly Disagree. 213 valid responses were collected for this question. Overall most of the respondents either agreed or strongly agreed (63.8%) while another 20.2% neither agreed nor disagreed. Finally, a total of 16% disagreed or strongly disagreed with the statement. Findings are presented in Figure 2.1.

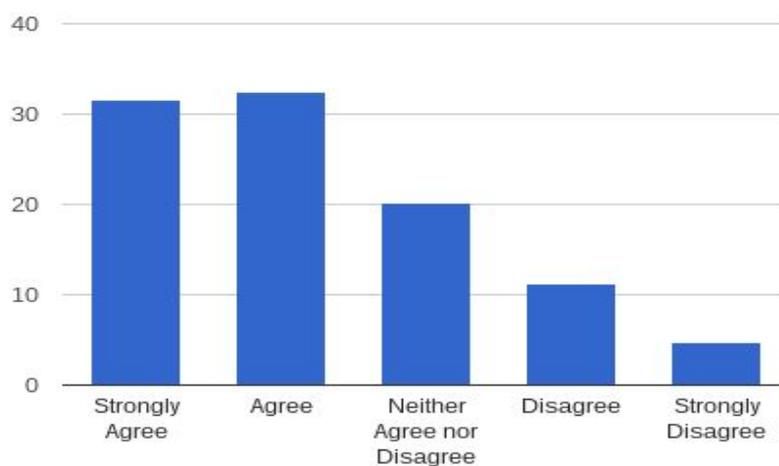


Figure 2.1. Percentages of responses (n=213) to the statement "If I knew that a child had a genetically linked learning difficulty it would affect my teaching towards the child".

Pearson's r was calculated to assess the strength of association between responses to this item (would teaching change?) and the earlier item about the relative influence of genes and environments on learning difficulties. A small but significant correlation was found ($r = .146$,

$p=.033$) suggesting that the stronger the perception that environment played a bigger role in learning difficulties, the higher the chance that a teacher would change the method of instruction.

The following graph (figure 2.2) is a comparison of a study of UK teachers (Walker & Plomin, 2005) and the results from the Greek teachers' response to the statement. This is discussed in the next chapter.

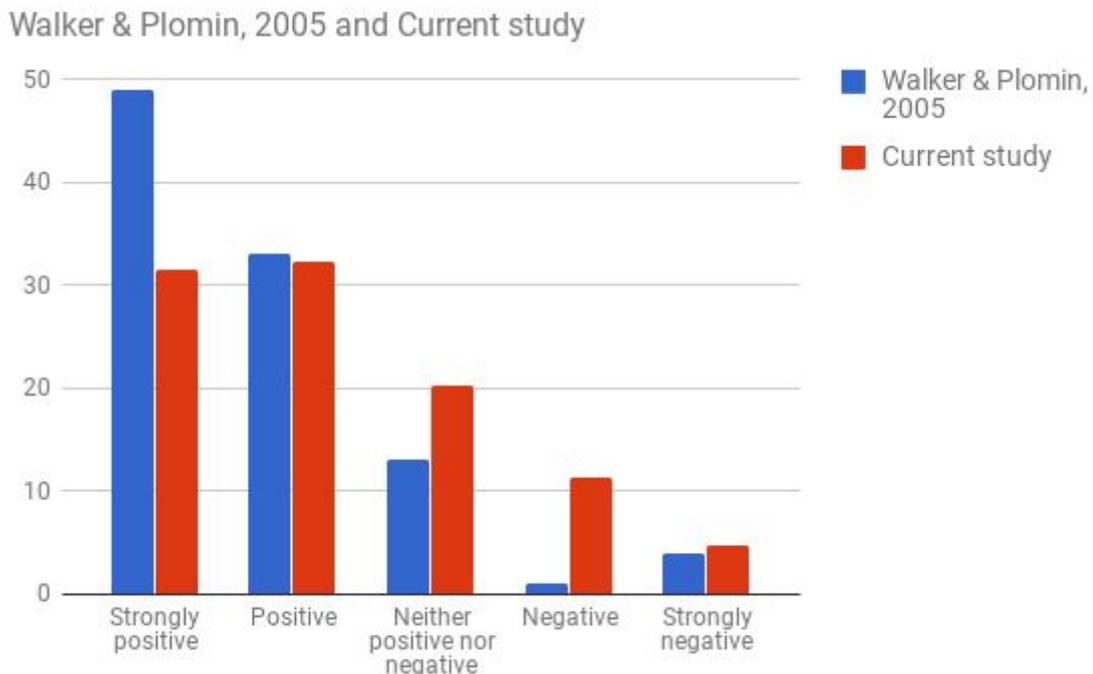


Figure 2.2. Comparison between Walker and Plomin (2005) opinion statement and current study (in percentage).

The data presented above was further used to address four of the five of the study's research questions.

Research Question 2

Do teachers' beliefs about the genetic and environmental origins of learning behaviour

correlate with their self-efficacy as teachers?

Correlations were calculated (Pearson's r) between teachers' beliefs about the aetiology of six traits and their self-efficacy beliefs. Five of the six correlations were statistically non-significant. The exception was a small correlation between teachers' beliefs about the aetiology of behaviour and their self-efficacy ($r=.14$, $p=.04$). Teachers who believed behaviour problems to be more environmental in origin were also likely to have slightly higher self-efficacy beliefs. Finally a Pearson's correlation was calculated for the combined mean beliefs (across the six domains) score, and a small positive but non-significant correlation was found ($p=0.92$) – beliefs in more environmental influence were not significantly associated with self-efficacy. These are presented in Table 2.6.

Table 2.6. Correlations between each Genetics Beliefs Question and mean TSES scores

	TSES
Personality	.060
Intelligence	.002
Behaviour	.141*
Learning Difficulties	.048
Mental Health	.074
Subjective Wellbeing	.027
Total	.115

*Correlation is significant at the 0.05 level (2-tailed).

Research Question 3

Does Openness to Genetics Research in Education (OGRE) correlate with teacher self-efficacy?

Pearson's r was calculated for OGRE score and teacher self-efficacy. A moderate correlation between the two variables was found ($r=.305$, $p=.000$, with the correlation being significant at 0.01 level). Teachers and teacher trainees with higher self-efficacy beliefs were significantly more likely to be open to the introduction of genetic research into their classrooms.

Research Question 4

Does teaching experience correlate with teachers' beliefs about genetics?

Descriptive statistics about the perceived origins of behaviour are presented separately for participants with no teaching experience, those with 1-3 terms, those with 2-5 years and those with more than 5 years. It is important to remember that a lower M represents more belief in genetic than environmental influences, and vice versa.

Table 2.7. Beliefs about the relative influence of nature and nurture by teaching experience.

	none ($n=74$)		1-3 terms ($n=36$)		2-5 years ($n=32$)		more than 5 years ($n=26$)	
	mean	SD	mean	SD	mean	SD	mean	SD
Personality	3.65	.650	3.5	.697	3.53	.621	3.58	.703
Intelligence	3.14	.751	3.03	.736	2.88	.871	2.96	.720
Behaviour	3.86	.689	4.03	.654	3.91	.641	3.92	.484
Learning								
Difficulties	2.45	.796	2.67	.793	2.84	.628	2.73	.667
Mental	3.66	.816	3.5	.737	3.69	.693	3.54	.761

Health								
Subjective								
Wellbeing	4.31	.739	4.28	.741	4.16	.723	4.27	.724

A one-way between subjects ANOVA was used to calculate the effect of teaching experience on beliefs about the aetiology of behaviour (using a combined average for beliefs about all six traits). There was a non-significant effect ($p=.997$) of years of experience on the aetiological beliefs mean score [$F(3-163)=.016$, $p=.997$].

Research Question 5

Does thinking about genetics affect trainee teachers' self-efficacy beliefs?

To examine whether thinking about genetics affected participants' sense of self-efficacy an experimental design was used by producing two versions of the same questionnaire. Type A questionnaires had the questions relating to genetic vs environmental influences on behaviour first, while Type B started off with the TSES questions. In order to determine whether thinking about genetics (by answering the nature versus nurture items first) had any effect on participants' responses to the TSES an independent samples t-test was performed, comparing the TSES mean scores of Type A ($n=110$) and Type B ($n=105$) respondents. There was no significant difference for TSES means scores found between the two groups ($t=-1.291$ $p=0.198$, $df=213$). The effect size was small (Cohen's $d=.176$).

A cross-national comparison

Finally, a cross-national comparison of Greek results with UK results from a study on teachers' beliefs about genetics will be presented here (Walker and Plomin, 2005). The following table (2.8) presents the percentages of teachers who believe that genetic factors are as or more important than environmental ones, in Greece and in the UK samples. The same results are then presented in graph form in figure 2.2. There are notable differences between the two samples. UK teachers tend to give more genetic attributions to all of the characteristics studied. However, as figure 2.2 shows the relative attributions between the

two countries are similar. These results are discussed in the Discussion chapter.

	UK teachers (n=667)	Greek teachers and teacher trainees (n=223)
Personality	87%	40%
Intelligence	94%	73%
Behaviour	43%	25%
Learning difficulties	94%	87%

Table 2.8. Percentages of teachers who believe that genes are as, or more important, than environmental factors in shaping the above traits.



Figure 2.3. Percentages of teachers who believe that genes are as, or more important, than environmental factors in shaping the above traits.

Study 2 Analysis of Results

Thematic analysis was used to identify key concepts emerging from the data, in order to shed more light on the research questions. A quick reminder of these questions follows. The main question related to whether there are certain traits that are seen by teachers and trainee teachers as being influenced more by genes than by the environment (Research Question 1). Secondly, the researcher aimed to gather more information and richer data on a potential link between beliefs in genetics and teacher self-efficacy, as well as probing into any differences between trainee teachers and more experienced teachers. Finally, it was deemed important to try to understand the sources of information that the participants had, when it came to their beliefs about genetic and environmental influences on behaviour and cognition.

Overall nine ($n=9$) interviewees were recruited, six ($n=6$) female and three ($n=3$) male (method described in more detail in the Methodology section). Of the total number of participants, four ($n=4$) were postgraduates and teachers in-service, while the other five ($n = 5$) were undergraduates with very limited classroom experience. Table 2.8 shows the breakdown of participants and their characteristics.

Table 2.9. Demographics of interviewees for Study 2

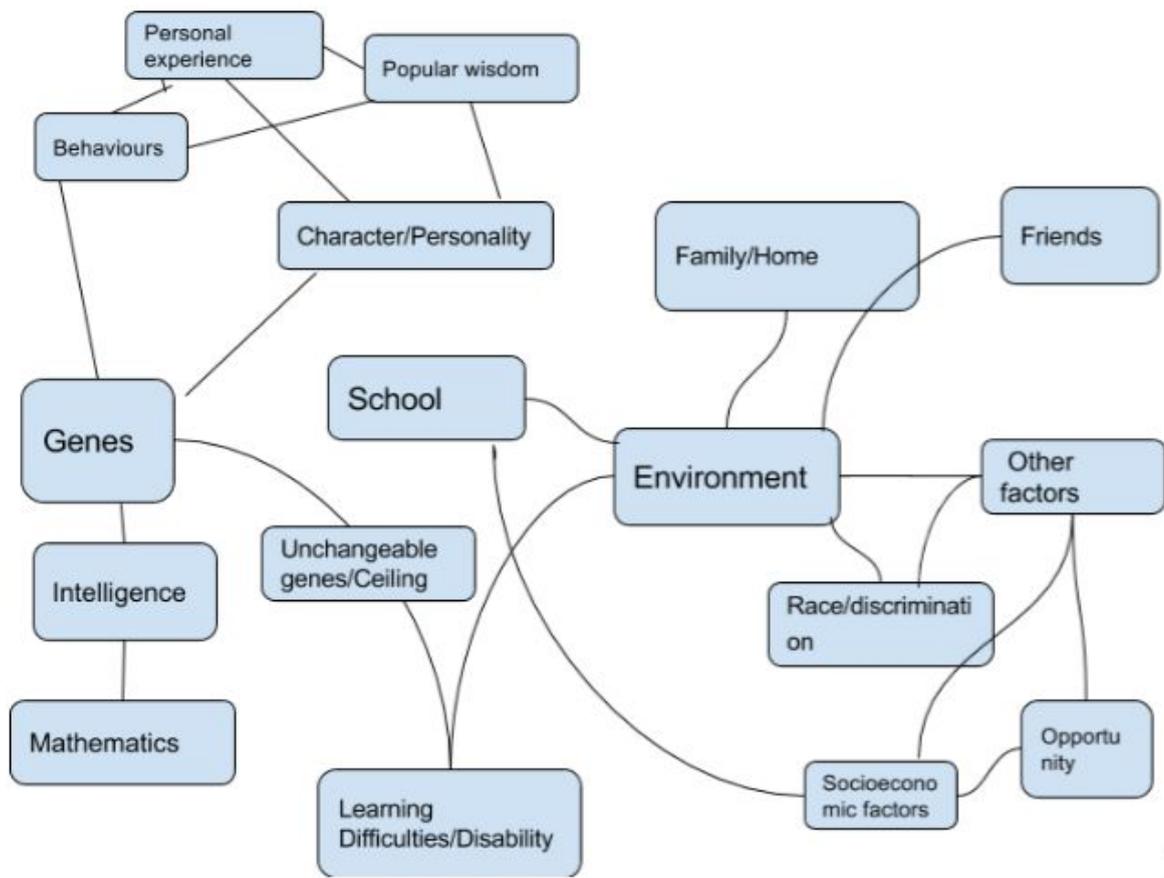
<i>Participant number</i>	<i>Sex</i>	<i>Age</i>	<i>Study Status</i>	<i>Years of classroom experience</i>
<i>Participant 1</i>	<i>Male</i>	<i>39</i>	<i>Postgraduate</i>	<i>15</i>
<i>Participant 2</i>	<i>Female</i>	<i>43</i>	<i>Postgraduate</i>	<i>14</i>
<i>Participant 3</i>	<i>Male</i>	<i>27</i>	<i>Postgraduate</i>	<i>4</i>
<i>Participant 4</i>	<i>Female</i>	<i>38</i>	<i>Postgraduate</i>	<i>11</i>
<i>Participant 5</i>	<i>Male</i>	<i>22</i>	<i>Undergraduate</i>	<i>0</i>

<i>Participant 6</i>	<i>Female</i>	<i>21</i>	<i>Undergraduate</i>	<i>0</i>
<i>Participant 7</i>	<i>Female</i>	<i>19</i>	<i>Undergraduate</i>	<i>1*</i>
<i>Participant 8</i>	<i>Female</i>	<i>19</i>	<i>Undergraduate</i>	<i>0</i>
<i>Participant 9</i>	<i>Female</i>	<i>24</i>	<i>Undergraduate</i>	<i>0</i>

*experience gained as assistant

The process proposed by Braun and Clarke (2006) was followed, as described in the Methodology chapter. A brief reminder of the process is presented here. Familiarisation with the data was achieved through repeated reading, transcription and translation. Initial ideas were generated, noted, and later refined to facilitate theme development. The coding phase followed, using the ideas noted, and taking into consideration the research questions. Repeated patterns within the data set were particularly noted, taking into account the entirety of the interviews. Themes started forming as separate ideas and codes combined to create larger units. It is at that stage that an initial thematic map was created. (Figure 2.2)

Figure 2.4. Initial Thematic Map



This map incorporates all of the themes and subthemes that emerged from the data, and was useful in helping the researcher to visualise the complex relationship between themes and subthemes. A refinement of themes took place at this time, with thematic units that lacked sufficient evidence to be strongly supported by the data being discarded. Therefore in the final report of the analysis, little mention was made of the racial discrimination elements in terms of environmental influences of behaviour, as well as the influence of friends and peer group as those two subthemes had limited evidence to support them. More specifically, racial discrimination was mentioned by one interviewee only, and was perhaps alluded to by another when talking of lack of inclusion, while the influence of peers groups or friends was surprisingly only mentioned by only one of the participants. It was decided that these two

subthemes would be excluded from the final report.

The above process of generating the initial thematic map and then looking at it against the data, ensured that the theme generation truly represented the ideas present in the dataset as a whole. In phase 5 definition and naming of the themes took place. In the final stage, the researcher returned to the data to select excerpts which best illustrated particular points and communicated the themes accurately and well.

Table 2.10. shows the themes and subthemes, both developed during phase 5 of the thematic analysis of results. The following themes (and subthemes) were identified.

Table 2.9. Themes and subthemes identified by thematic analysis

Themes	Subthemes
Nature vs Nurture	Cognitive skills vs Behaviours
	Disability/illness as genetic
	Physical characteristics as genetic
Sources of information with regards to genetics	Formal
	Informal
	Common fallacies relating to genetics
Environmental Influences	School
	Home
	Socioeconomic
Genes and learning difficulties	The 'ceiling'
	Learning difficulties/disability seen as genetic
	Wishes vs reality

Teachers' power/powerlessness	Trainee teachers vs experienced teachers
-------------------------------	--

The main themes ran along the axes of questioning, and were therefore instrumental in answering the research questions, as mentioned in the literature review (chapter 1) and briefly above. The main aim of this qualitative study was to add depth and texture to the quantitative findings. However, the timing of the analysis of the quantitative results and the beginning of the interviews was not ideal, as the two data collection cycles were concurrent. This prevented the researcher from adapting the interview schedule to truly fit the needs of complementing the quantitative data. This will be discussed further in the Discussion chapter.

The first theme that emerged from the interviews related directly to the sorts of characteristics both trainee teachers and experienced teachers attributed to genes and to the environment and will be explored later in this thesis. Moreover, the subtheme of a distinction between behavioural traits and cognitive ones was observed. The theme of the diversity of sources of information was first detected by the researcher during the interviews, and was further pursued as the interviewing process went on. Consequently, participants who were interviewed last were explicitly asked if they had received any genetics training during their undergraduate or postgraduate studies. This is explored in depth below.

Another theme that was highlighted in several instances during the interviews was the importance of environmental influences, explored further below. What was of interest was the sorts of environmental influences that interviewees mentioned explicitly and rated highly, as well as a conspicuous absence of any mention of influences from peers. The last subtheme, of race and discrimination, made it into the initial thematic map but it was felt by the researcher that there was insufficient evidence for it to be included in the final table and the analysis of themes and subthemes.

Following up from one of the questions in the quantitative survey, that enquired into whether knowing that a child had a genetically linked learning difficulty would make a difference to the way the teacher taught and assessed the pupil, the same question was asked in the interviews. In this way the researcher could get a clearer picture of the interviewees' feelings about genetically linked disabilities. Interesting subthemes arose, in that although most

participants initially answered no, meaning no difference would be made, when further probed there seemed to be an implicit belief that a genetically linked learning difficulty was associated with a 'ceiling' of achievement. Moreover, participants, especially trainee teachers, linked a genetically linked learning difficulty with disability. Both of these subthemes are looked at more closely in the following sections.

Finally, the researcher wished to explore the idea of teacher self-efficacy. The theme of power and powerlessness emerged in most interviews, and a marked difference was observed between trainee teacher beliefs and those of more experienced teachers. These are discussed in detail below.

Nature vs Nurture

Overall, most participants stated that there are genetic influences on behaviour and other traits, acknowledging that both genes and environment play a role. Often, while they could not quantify the split between heritable and environmental factors, they seemed very aware of the influences of both.

...So, certainly, and we have learned from here, from our lectures that indeed there is some... influence... from genes. But I also believe... it is 50-50. Both from genes, [...] But, the environment also affects, in that it gives you different stimuli to grow as a person. So it is both. Equally.

Trainee teacher, Participant 8, female

Interestingly, one participant was adamant that genes play no role in educational outcomes. She characteristically said:

"Participant: I think it is purely the environment. Because it basically... whatever the child has learnt at home he will work hard to do them at school. To change them and to shape them himself. But it is from within himself too.

Researcher: What do you mean within himself?

Participant: Depending on how much a child wants to work, or change things. In his character.

Researcher: Ok... so how heritable do you think that (character) is? Does it relate to genes?

Participant: Hmm... [pause]

Researcher: Are you born a certain way or does environment shape you?

Participant: No, character is... you become... It's the environment."

Participant 7, trainee teacher, female

One participant, a trainee teacher, indirectly mentioned the reciprocal relationship between genes and environment, suggesting that the relationship is more complex than linear. This indicates a rather deeper understanding of genetic influences, and rises above many misconceptions relating to genetics. Other participants too made some mention of the complexity of genetic influences, without being able to articulate as clearly how they felt environmental and genetic influences related to each other and to the behaviours observed.

"I believe that it is certainly partly genetic, but that environment, we have learned in biology, that it affects to a great extent child development. And that certain areas of development, for example... they affect each other."

Trainee teacher, Participant 6, female

An interesting discrepancy was made by several interviewees between skills that were viewed as cognitive and those that were viewed as behavioural. Having been presented with the initial questionnaires that offered several traits for participants to consider (personality, intelligence, behaviour, learning difficulties, mental health and happiness/subjective wellbeing) it was noted that interviewees had some preconceptions when it came to talking about which characteristics that they felt were most influenced by genes and this appeared to depend on whether they saw the trait in question as a 'cognitive' or a 'behavioural' skill. To clarify, it seemed that participants made a distinction between traits that were seen as more 'cognitive', like for example intelligence or mathematical ability, and those they saw as more

'behavioural', like character and behaviour. Moreover, they saw the more 'cognitive' traits as being more heavily influenced by genes as opposed to the 'behavioural' ones.

It was of interest to the researcher to note that two of the four in-service teachers, and one trainee teacher, mentioned mathematics as a 'trait' or skill that they felt was greatly influenced by genes. Mathematics was presented by these participants as a truly cognitive skill, something that someone has a 'natural talent' for, and therefore, linked to genetics. The discrepancy between behavioural versus cognitive was particularly obvious here, with participants placing enormous value on the mathematical thinking as an innate ability, and not mentioning practice, or learning and teaching as a factor affecting mathematical thinking. This links in perhaps with the idea of fixed ability thinking, especially linked to mathematics (Boaler, 2013).

"Participant: I think definitely intelligence is.

Researcher: What do you mean is...can you elaborate?

Participant: Is affected by genes. I also strongly suspect that mathematical ability is too, not so much language. Less convinced about behavioural traits. There must be some behavioural traits that might follow through (from parents to children)."

In-service teacher, participant 1, male

"I mean, certain, erm, traits are very heritable. I know intelligence is very genetic. But... and dyslexia. And of course problems like Down's Syndrome and other diseases (sic). But, hmmm, as a teacher I think maths is too. You know, when I have taught a brother and he has been good the little one is good too."

Participant 3, in-service teacher, male

Finally, several interviewees mentioned physical characteristics and 'illness'/disability as being the only ones that were wholly influenced by genes. It is of interest to note here, from the researcher's previous personal experience that this very much links with the way genetics and heritability is taught at secondary school level in Greece.

“But some, like some illnesses or some diseases from the parents [...] or some characteristics like facial characteristics are from genes. They are heritable.”

Participant 6, trainee teacher, female

Res: “Can you give me an example of a trait that you consider mainly genetic?”

Hmm... Maybe the way we look. In children. [...] Height. Eyes. Like eye colour, and hair. And maybe weight. [Pause] And only if there is a disease...”

Participant 9, trainee teacher, female

In terms of differences between experienced/in-service teachers and undergraduates with little or no experience there was not a marked difference, though it should be noted here that the sample was very small (only $n=4$ in-service teachers and $n=5$ trainee teachers were interviewed). The only obvious difference that was observed was what is explored above, in terms of mathematical ability. However, the numbers are small in that 3 out of 4 of the in-service teachers mentioned mathematical talent or ability as something heritable, or genetic, while none of the teacher trainees made that distinction.

Sources of information with regards to genetics

It was of interest to the researcher to gain knowledge of the various sources of information that both undergraduates/trainee teachers and postgraduate/in-service teachers regularly accessed in relation to genetics. As mentioned in the literature review most lay-persons gain their information on genetics from the popular press and the internet. This can often lead to certain common fallacies relating to the way genes work to influence behaviour and other characteristics, misunderstandings and simplifications. As the interviews progressed the researcher added a question, directly enquiring into the sort of training, if any, teachers and trainee teachers had gained in relation to genetics. This was done in an effort to get a clearer picture of how information was accessed.

Although the undergraduate course that students undertook had no module on the biological basis of behaviour, two of the in-service teachers, who were taking part in the same seminar, mentioned that they had recently been taught about the genetic basis of intelligence. The importance of such courses that will answer big questions for both teachers and trainee teachers alike will be discussed in the final section of this thesis. Here a postgraduate student and in-service teacher makes an explicit mention of knowledge gained at the seminar she is attending, in relation to genes and IQ.

“I know certain things are very... heavily influenced by genetics. Like IQ, for example. We learned that at the seminar.”

Participant 2, in-service teacher, female

Another source of information, clearly referred to by two other participants, one in-service teacher and one trainee, both of whom were under 30 though, and therefore recently graduated from secondary education, was the high school biology lesson.

Researcher: Did you have any genetic training in your undergraduate course?

Participant: (Laughs) No. In 1st grade of Lyceum maybe, in biology. Gosh, that is years ago. But not at University. No.

Participant 3, male, in-service teacher

“ Participant: But I have read that there are some certain genes, I have learned in biology, that affect not just our outward appearance but also our behaviour.

Participant 8, trainee teacher, female

Personal experience also has its place and is mentioned in some of the interviews. More specifically, two of the participants offered specific comparisons between them and a family member, in order to suggest that perhaps there was in fact heritability of personality. This use of personal experience is interesting, and seems to sometimes be taking the place of formal teaching, for those who have not had any at university.

Professional experience was also recounted and seemed to form a source of information for the more experienced teachers. Several participants related their experience of teaching twins and/or siblings, and linked that with the heritability of characteristics, most notably cognitive skills, like intelligence and mathematical ability. Others made connections with parents and their children cognitive skills. Overall, this professional anecdotal experience emerged as a strong force of shaping individual beliefs, in the absence perhaps of more formal sources of information.

“Researcher: Would you say personality/character traits are influenced by genes?”

Participant: Oh, that’s hard. Let me think about it. For me... I am an introvert, like my dad. And I now my son is too... So... Yes. But then, like being kind or patient? Can that be... like... genes?”

Participant 3, in-service teacher

“Res: Do you think personality traits are genetic?”

Oh, err... I hope not. (laughs) My mum always said I’m like my dad, but I think, you know she just said it. I feel I am so different to my sisters. So different. So how can it be (character be affected by genes)? Maybe a bit, but not even 50%. More from home and from, like, experiences. The things we have lived through. And it changes a bit, you know, as you get older.

Two participants freely expressed the desire to learn more, or the wish to have had more

training in the genetic influences on behaviour at some point in their student or teaching career. Participant 4, an in-service and special needs teacher said:

“I would like to learn more, especially in learning difficulties. If you can do anything. [...] So it’s good to know more. And to help those kids.

Participant 4, in-service teacher, female

Finally, one participant interestingly mentioned traditional sayings that link personality/behaviour with genetic likeness and heritability. Again, in the absence of formal teaching, we have informal sources, such as traditional wisdom and personal experience coming in to fill the gap in knowledge.

“...It may be... heritable, as we say. In behaviour. We have many sayings in Greek about how “the apple will fall under the apple tree” or “like father, like daughter”...”

Trainee teacher, Participant 5, female

In terms of myths and misconceptions relating to genetics, several emerged. ‘One gene per trait’ a common misconception was the most common one. One participant referred to a ‘gene for happiness’.

“Participant: I have read about a lot of research that being positive, in a person, can be from genes.

*Internal. Like there are some genes, that regulate some hormones, I think, that that in some situations... like for example in depression... there are some people who are able to get over it more quickly than others, who might have depression for years. **A gene for happiness, or... for being positive.***

Res. Do you believe this?

Participant: Yes, I believe this.”

Participant 8, trainee teacher, female

Another stated that there might be a gene for dyslexia.

“Like dyslexia? I know there is a gene for that.”

Participant 3, in-service teacher, male

In these two quotes we can see the common fallacy of ‘one gene per trait’. Such misconceptions will be discussed in the last chapter of this thesis, in light of the evidence available and in relation to the teaching of genetics at all education levels. Implications and suggestions will also be explored.

Environmental influences

As was the case with the quantitative data presented in Chapter 3.i, there was a strong emphasis on the effects of various environmental influences on character and educational outcomes from both trainee, as well as in-service teachers. The aim of this qualitative study was to further clarify the types of environmental influences teachers and trainees believed played a role in the shaping of character and the various educational outcomes that were mentioned in study one. A large subtheme of this could have been the extent to which teachers believed themselves to be part of this environmental influence. Initially the researcher had deemed this a subtheme on this question, however, as this links directly to one of the main research questions of this thesis, which relates to self-efficacy, meaning the belief in one’s abilities. As teacher self-efficacy directly relates to the feelings and beliefs of having the power to influence students’ educational outcomes, this theme will be analysed to a greater extent further down.

The role of the environment as a major force in shaping a child was almost universally expressed. When compared to genes most participants stressed the importance of various

environmental factors, analysed in the paragraphs following. This remains consistent with the results of the quantitative survey. Indicatively, one participant stated:

Participant: I don't think that genes are that important, as much as the environment a child grows up in. Because that gives the stimuli and that [the environment] gives the... errr... that [the environment] shapes the character and the feelings of a child.

Participant 7, trainee teacher, female

When asked to further analyse their views on the types of environmental influences that affect a child's development and educational outcomes the effect of school, as a whole, was seen as substantial by all participants. Given the common beliefs, as highlighted above in section x.1, but also as seen in the quantitative section analysis (chapter x), that educational outcomes and personality are mostly influenced by environmental factors, this was not unexpected.

"Well, many factors do (affect educational outcomes). How good the school is, the teacher. And how much support (there is), you know, from home. I think attitude towards school, like how much you want to be there, can have a great influence. For me, it's important to know why you are there."

Participant 2, in-service teacher, female

What was interesting is the extent to which school and teaching were not always equated - rather many participants made a distinction between the power a teacher has, individually, and that of school as a collective instrument. This will be looked at more closely when teacher self-efficacy is explored.

Family and home life were at the forefront of influences on a child's educational outcome. This needs to be seen in the context of Greek society, which sees the role of the family as central to social and emotional development, despite a lot of recent changes in the structure of society and the family itself (Georgas, 1989). This will be explored further in the discussion.

"I definitely think it is the family [a big influence]. What happens at home and with the family. The self-confidence a child has, and again this is to do with the family. And from other social...errr.. relationships."

Participant 6, trainee teacher, female

One participant hinted at the difficulty of untangling the role of genetics and home environment, given that most children grow up with their biological parents. He did this, however, while expressing the belief that it was home environment that was of great importance. He also hints here, at some differences between parents of different socioeconomic positions. He said:

Researcher: "Can you tell me a little bit about what factors you think affect how well a child does in school?"

Participant: Motivation from home. It's weird, right, because I have taught in, er, private schools, but before [when I taught at state schools] I can see if parents push the kid at home. Maybe not push, er, wrong word maybe. Like support, but also, erm, motivate, you know, like value too. But then maybe it's genetic (laughs). It's confusing! Because how do you know, right?"

Researcher: How do you know what?"

Participant: Erm, you know, whether it's genetic or not. If they take it from the parents. Because they grow up with them too. (laughs)"

Participant 3, in-service teacher, male

An experienced special needs teacher made an important point, echoed by others, on the support of the family in school and school work. Although she mentioned it within the context of special needs education, it was further mentioned by another participant, a trainee teacher. The latter related it to homework and preparation for school work at home. This

should be seen within the Greek context of a few hours spent at school and the expectation of several hours of homework, even at primary level, often with independent tutors or parents. She also hints at economic variables.

“For kids without a disability? I guess home, like family and economic conditions make a huge difference. If I compare the kids, like the classroom ones [without special needs], the kids who have parents who are... like interested. Supportive, is what I mean. They tend to do better. And they are more interested. But sometimes you have a problem. And again, home is important how you deal. How they deal with it. The parents.”

Participant 4, special education teacher, female

Finally, school and teachers were both seen by some participants as a safety net - there to address the needs of children whose families could not provide.

“[...] if the parents can't give a child the right stimulation, then the teacher, who spends many hours with the child every day, becomes a person of influence for the child.”

Participant 8, trainee teacher, female

“And some kids don't get the help they need at home, and school is there for them.”

Participant 5, teacher trainee, male

An interesting dichotomy was observed between the answers of trainee teachers and those of in-service teachers. The former seemed to place a lot more emphasis on the effect a single teacher can have on a child, while the latter seemed to be more comfortable talking about the influence of school and the learning community in general, while underplaying the role of a single teacher. Humour seemed to be used in several of the interviews at this point, with a sense that the more experienced teachers, while they felt they should have a sense of power and agency, in fact had become aware of their relative powerlessness, when taking into account all other factors, both genetics and environmental. This will be revisited in the last section of this chapter.

Genes and learning difficulties

Study 1, the quantitative study, included a question that enquired as to whether knowing that a child had a genetically-linked learning difficulty would make a difference to the teaching and assessment of that child. In Study 2, the qualitative part, the researcher wanted to delve more deeply into this question and find out how participants understood the term genetically-linked difficulty, as well as how it might change their approach to teaching a particular child.

The most commonly mentioned genetically-linked learning difficulty, as mentioned by four separate participants, was dyslexia. Participants were clear that dyslexia is in some ways influenced by genes. Autism was another genetically-linked learning difficulty, and was identified by the teacher who was a special needs specialist at primary level.

A couple of participants expressed the opinion that all learning difficulties are genetically-linked.

“Erm, I don’t know. Like what? (Pause) Aren’t they (learning difficulties) all genetic? Like what might be not genetic?”

Participant 3, in-service teacher, male

However, many expressed the opinion that this made no difference to the way they taught these children.

“Researcher: Would it make a difference to you if it is genetically linked or not?”

Participant: No, I don’t think so. No. I think the approach would be the same, to support the child.”

Participant 1, in-service teacher

Going a little deeper, though, difference in expectations is mentioned by two participants.

Linking to it, the idea of a ceiling of ability for children with a genetically-linked difficulty, although not explicitly mentioned by any of the participants, seems to be implied by several of them. One participant states:

“Participant: It’s always good to start at... the beginning. So to identify the difficulty. If it is genetic, well, does it matter? I guess not. I just want to know what it is, so that I can help to, I can help the child to reach their potential. To get somewhere down the line. But I guess it’s different when you know what they have, then you can deal with it and you can, erm, support. And have different expectations.

Researcher: how would your expectations be different?

Participant: Well, if it’s genes, you know, genetic, then you have different, erm, expectations. You expect different things. Like if you know they can’t do it, you will not push, but find a different way.”

Participant 4, special needs teacher, female

Linking to the above, regarding expectations, another participant, also mentioned the following.

“[I would be] more aware of the limitations and not push too much.”

Participant 3, in-service teacher, male

A third participant makes an implicit link between the role of genes and an ‘incurable’ difficulty. This too can be seen as something affecting the way one would approach children with a genetically-linked special learning difficulty, as it would perhaps affect self-efficacy.

“Participant: I guess it depends on what the difficulty is. If it’s something big, then it might be harder. With minor things, like dyslexia you can work with a child, and with the family, to improve certain things. Not everything can change, but you can certainly er... improve.

Researcher: Would it make a difference to you if it is genetically linked or not?

Participant: Well, if it can't be cured, then it does make a difference, doesn't it? You have to work with what you've got, as it is."

Participant 2, in-service teacher, female

In the penultimate sentence of this quote we get a sense that genetically linked learning difficulties are perhaps seen as 'incurable'.

Trainee teachers were consistently a lot more vague in their descriptions of how they would help a child with special needs. It is understandable, given the fact that they are likely to not have had any specialist training or experience at this stage of their studies. They don't mention any learning difficulties by name, and four out of five talk about getting help with the diagnosis or in class, and getting a referral.

"Participant: If you have observed that there is a problem, you or someone else, and you have alerted the specialists, then I think the most important thing is to be more helpful to that child, than to the rest of the pupils."

Participant 5, teacher trainee, female

On the other hand, more experienced teachers seemed to have come across learning difficulties in the classroom and are more comfortable discussing strategies. Of interest was the sense of agency, as well as a desire to learn more in order to help children, expressed here by participant 4, a special needs teacher.

"Participant: I would like to learn more, especially in learning difficulties. If you can do anything. How I can help if it's genetic. I know, I think, like dyslexia, is mostly genetic. And you see sometimes the parents can't help. But we can and that is great. So it's good to know more."

Participant 4, special education teacher, female

Teachers' sense of power/powerlessness

The final question that this qualitative study wished to look more deeply into, was teachers' and trainee teachers' sense of self-efficacy, to shed light on findings from Study 1.

A question was included in the interview schedule to try and get some more information on just how important participants felt a teacher's contribution was to educational outcomes. The theme of power and powerlessness emerged in participant interviews, as presented in the thematic analysis table.

There was a marked difference between experienced teachers and trainees. Experienced teachers expressed the wish that they had some influence, but often admitted to feeling a little powerless. It was clear that they felt that they should feel more powerful in relation to how much they feel they can influence children's educational outcomes, but that at the end of the day, realistically they did not feel they had this power.

"Participant: I would like to think a lot (laughs). [That it is] very important. But I think in reality it is a factor amongst many other factors. I think a bad teacher might do a lot of damage, I think depending on school and home support some factors from the previous questions, I think a teacher might not make as great a contribution but it can still add to a positive effect. A net positive effect."

Participant 1, in service teacher, male

Another participant, with 11 years of experience, clearly states that her feelings with regards to how much influence she has over children's outcomes have changed as she has aged/gained more experience.

"Participant: I think I used to think a lot. Or more, certainly."

Participant 4, special needs teacher

Moreover, two of the experienced teachers made the point that a bad teacher could have more of a negative influence than a good one could make a positive one. Participant 2

states:

*“Participant: I think a good teacher can make a difference. A bad teacher... well, even more maybe!
You could turn a child off, for sure!”*

Participant 2, in-service teacher, female

Finally all four experienced teachers emphasised the influence not just of the teacher but of a consistently good education.

“Participant: Oh no. I should say a lot, shouldn't I? (laughs) I want to say there's a big effect, but... and with some pupils you really do make a difference. [...] But most of the times, I feel, I think it's... well, if we had them for more years maybe (laughs). But yes, if there is consistently good teaching I can see the value. One good teacher... I don't know.”

Participant 3, in-service teacher, male

On the contrary, trainee teachers were adamant about the importance that they felt a teacher's role entailed. They linked this with the potential inability of the parent to provide, or unavailability of the parents due to other commitments. An extension of this is the way that the teacher is seen as a safety net for the child: the last chance to help him/her do well in the world. These ideas are illustrated by the following three quotes, all from trainee teachers.

“Participant: I think the influence of a teacher is very very important. Because, especially early years teachers, often spend more time with children than their own parents. They [parents] may work or... So the teacher is like a role model. [pause] In the early years children learn by imitation, so the pedagogue is very important.”

Participant 6, teacher trainee, female

“Incredibly important! Incredibly. Because if the parents can’t give a child the right stimulation, then the teacher, who spends many hours with the child every day, becomes the person with the most influence for the child. They trust him. The child... has to... The teacher has to try and inspire the child in any ways he can. Find things that the child is interested in, so that the child can learn.”

Participant 8, teacher trainee, female

“They are very important. Teachers are important. Because a teacher is a person who gives all the stimulation to a child, so that he can put them to good use so that he (the child) can become what he wants.”

Participant 9, trainee teacher, female

These quotes illustrate how trainee teachers, have a clear sense of idealism, and feel that they will be making a difference as they go into their teaching careers. This will be discussed in light of evidence that supports this pattern between pre-service and in-service teachers in terms of self-efficacy.

Integration of Questionnaire and Interview Findings

Overall participants seemed to hold a number of misconceptions regarding genetic influences on behaviour. This came through both in the binary nature of some of the questionnaire responses (for example, 2.8% of participants believed that the environment was the sole influence on personality, with 13.7% and 11.5% believing the same for behaviour and mental health) and in the interviews. Moreover, a strong environmental bias came through in both strands of data.

The qualitative data offered a glimpse into teachers’ sense of power or powerlessness that was not seen in the quantitative data. As observed above, there was no correlation between genetic beliefs and TSES from the analysis of the questionnaires. However, it should be noted that the sense of powerlessness was perhaps reflected in the low, in comparison to previous research findings, overall TSES levels.

DISCUSSION

This study attempted to examine Greek teachers' beliefs regarding the relative influences of nature and nurture on educationally relevant behaviour. Moreover, it was the aim of this research to explore the relationship between such beliefs and teachers' self-efficacy. The literature review suggested a relationship between attributional beliefs and agency, leading to a hypothesis that a stronger belief in the importance or influence of genes might be associated with lower self-efficacy beliefs. That is, if teachers see genetic factors as explaining why some pupils learn better or more easily than others they may also believe that they can't make very much difference to those they teach. This section will attempt to discuss and integrate the findings of both the quantitative and qualitative studies. To recap, the study addressed the following four questions:

- 1) Are there certain traits that are seen as more influenced by genetics than by the environment?
- 2) Do teachers' and trainee teachers' beliefs about the genetic and environmental origins of learning behaviour correlate with their self-efficacy as teachers?
- 3) Does Openness to Genetics in Education correlate with teacher self-efficacy?
- 4) Does teaching experience correlate with trainee teachers' beliefs about genetics?
- 5) Does thinking about genetics affect trainee teachers' self-efficacy?

Research question 1

Are there certain traits that are seen as more influenced by genes than by the environment?

The first research objective related to whether there are certain traits that are seen as more influenced by genes than others and explored teachers' perceptions of the aetiology of personality, intelligence, behaviour, mental health and subjective well-being. This was, in part, a replication of a previous study (Walker & Plomin, 2005).

Overall, both trainees and in-service teachers, showed a clear tendency to regard the environment as more influential than genes, more so than was the case in Walker and

Plomin's (2005) sample. The overall mean for all traits was 3.48, on a five point scale in which 1 = only genetic influences and 5 = only environmental influences. To compare this to the overall mean of the original study which was 2.66 (Walker & Plomin, 2005) showing a clear tendency towards a more 50:50 attribution to the traits studied in the UK teachers' sample than the current study's Greek sample.

There were, however, differences in participants' responses for different traits. Specifically, subjective well-being was the trait was seen as most influenced by environmental factors (83% of participants stated that environmental influences were more important than genetic ones). On the other hand, learning difficulties were more likely to be attributed to genetic causes, with 87.1% of participants regarding genes as being as or more important than the environment in the development of learning difficulties.

In both the quantitative and qualitative findings there seemed to be a dichotomy between what participants viewed as 'behavioural' traits (behaviour, subjective well-being) and what they viewed as 'cognitive' traits (intelligence, learning difficulties). In this study behavioural traits were more often attributed to environmental factors, while cognitive traits were generally seen as more influenced by genes. This trend was also observed in previous literature (Walker & Plomin, 2005).

When comparing the results from this study to those of the original Walker and Plomin (2005) study we can see that the general trend is similar, though the exact numbers differ. The biggest difference - almost 50 percentage points related to participants' beliefs about the aetiology of personality. While nearly 90% of teachers in the UK believe that genes are as or more important than environmental factors when it comes to personality, only 40% of Greek teachers believed the same. Although this was also seen in the qualitative study, it should be noted that several interviewees did perceive a link between personality and genes, some by comparing their own personality characteristics with those of others in their family, or by referring to traditional sayings (like 'the apple will not fall far from the tree').

Intelligence was seen as more heritable, by Greek teachers and in Walker and Plomin's UK sample, with 73% believing genes are as or more important than environmental factors in the current sample. Moreover, two of the interviewees mentioned that the heritability of intelligence had been mentioned in a post-graduate seminar they had attended, meaning,

perhaps, that this might not have been the most representative sample.

Learning difficulties were the least different, when comparing the UK and the Greek sample, with 94% and 87% respectively. The small difference is perhaps attributed to the press received by recent findings in behavioural genetics, especially with regards to dyslexia.

Such cross-national comparisons can be of some use, as they can be helpful in obtaining a good description of cultures, through psychological methods (Triandis, 1996). For comparison purposes table 3.1. shows the percentages of teachers who believe that genes are as or more important than environmental factors in the aetiology of personality, intelligence, behaviour and learning difficulties.

These same results are also provided in graph form below (Figure 3.1), in an attempt to more clearly present any trends. In this graph we see that while the general trend is the same, Greek teachers and trainee teachers seem to put greater emphasis on environmental influences across all traits studied. The qualitative study supported this emerging trend, with the Greek teachers and trainee teachers who were interviewed greatly emphasising environmental factors, and underplaying the heritability of traits. Notable exceptions to this in the interviews were mathematical ability, as mentioned above, and learning difficulties, and disability. It is notable that intelligence and learning difficulties were the traits on which the UK and Greek samples were most similar in their beliefs. The latter was exemplified in an extremely interesting number emerging from the quantitative study: 4.6% of participants stated that learning difficulties were solely a product of genes. Interestingly 5.9% of UK teachers stated the same, while in the same study 12.6% of parents studied stated that learning difficulties are purely genetic. Although there are certain learning difficulties linked to disabilities that are entirely genetic in origin, such as Down Syndrome or Williams Syndrome, this finding also puts forward an interesting question of agency: if a difficulty is seen as genetic, how changeable is it believed to be? The qualitative study answers partially address that, with some ideas of 'fixed' ability or a 'ceiling' emerging in this context. Furthermore, the implications of these beliefs with regards to teacher education and CPD will also be looked at in detail further in this chapter.

It should be noted here that the current study also looked at two additional traits not addressed by Walker and Plomin's study, namely mental health and subjective well-being. For mental health 44.2% of participants stated that genes were as or more important than environment - a similar percentage to personality. It seems that mental health is seen as more of a behavioural trait by Greek teachers.

Finally, while most teachers expressed a balanced view of the relative influences of nature and nurture, acknowledging interplay between the two, there were notable exceptions to this. A small number of participants subscribed to the belief that certain traits were entirely genetic in origin, as mentioned with learning difficulties, above. Of course, this could reflect participants thinking of disabilities that are in fact purely genetic, as mentioned above, as well as more common, complex learning difficulties. 1.4% of participants also attributed intelligence purely to genetic factors. Although intelligence is a highly heritable behavioural trait (Plomin & Deary, 2015) there are certainly environmental influences too, particularly for younger pupils for whom the environment explains more variance than it does for older pupils and adults (Haworth et al, 2010).

On the other end of the spectrum 11.5% believed mental health was only influenced by environmental factors. This should be seen in context and taking into account the two trends seen above, namely the dichotomy between traits perceived as cognitive and those perceived as behavioural, and the trend towards a belief in stronger environmental influences on most traits (when compared to UK teachers 12 years ago). It is an interesting finding, especially considering the actual estimates of the heritability of mental health, and of certain mental illnesses such as schizophrenia, can be high (Cannon, Kaprio, Lönnqvist, Huttunen & Koskenvuo, 1998; Gejman, Sanders, & Duan, 2010). Moreover, there is evidence, as mentioned in the literature review, that our beliefs about the heritability of a disorder can affect our attitudes towards those suffering from them. In this way, we see that strong biogenetic explanations increase stigma (Read & Harre, 2001) and are linked to significantly higher perceptions of danger and unpredictability (Walker & Read, 2002; Kvaale, Gottdiener & Haslam, 2013).

In a lot of Europe and the US attitudes towards mental illness have evolved over time. A 2012 meta-analysis of 33 reports on populations from varying cultural backgrounds charted this evolution of public attitudes, showing a trend towards a more hereditary/genetic view of

illnesses such as schizophrenia and depression (Schomerus, et al., 2012). This trend was also linked with behaviours, such as being more likely to seek treatment for one of the above illnesses. On the other hand, attitudes towards people who suffer from mental illness did not see that much of a change, with stigmatising attitudes still prevailing, despite (or, in fact linked to, as we saw above) the biological explanation to them.

Of interest, given the Greek sample's tendency towards environmental attributions for mental health would be to explore what are perceived as the environmental roots of illness such as schizophrenia. Taking into account historical models, such as the Refrigerator Mother Theory, developed in the 1950s, linking autism and schizophrenia to lack of maternal warmth. It would be interesting to see if such models have somehow persisted in Greek public opinion.

The percentage of teachers attributing traits to purely environmental influences rose even further for behaviour (13.7% for the Greek sample, compared to 1.2% for the UK sample) and subjective well-being, with 42.9% of participants attributing happiness to purely environmental factors. In terms of happiness, studies have found happiness to be partly heritable, with as much as 35-50% of variance explained by genes (Lykken & Tellegen, 1996; Chen et al., 2013). Interestingly, one of the participants in the qualitative study mentioned a 'gene for happiness', at the other end of the spectrum - believing it to be highly heritable. Again, there are interesting implications for both of the extreme positions: on the one hand, believing something to be only genetic can lead to people believing it is impossible to change it (Meehl, 1974) while on the other hand, when attributing something solely to environmental circumstances, one might be tempted to 'blame' something, from maternal behaviour, as we saw above was done historically, to personal choice. Interestingly, in the qualitative study, one of the nine participants, a teacher trainee, was adamant that genes play no role in any educational outcomes.

One aspect of nature vs nurture that seemed to surface from the qualitative part of this study was the idea that some cognitive skills, such as mathematical ability, were perceived as particularly highly heritable. This seems to be supported by previous research on the subject, supporting the idea that teachers believe that mathematical ability tends to be highly heritable, although these beliefs seem to be deeply cultural as suggested by research done

by Uttal (1997).

Furthermore, this idea that mathematical ability is innate rather than acquired, may get in the way of developing a growth mindset in both pupils and teachers (Boaler, 2013). A growth mindset relates to the underlying beliefs people have about learning and intelligence. More specifically, holding the belief that maths is a 'talent' (fixed mindset) rather than a skill one quite acquire and slowly work on (growth mindset) has been linked with lower performance in maths.

As in Walker and Plomin (2005) an opinion statement was included in the quantitative part of the investigation. The statement read: "Would knowing that a child has a genetically-linked learning difficulty affect your method instructing the child?" It should be noted here that the wording was slightly different between the two surveys, with Walker and Plomin (2005) including the word 'tracking' in the statement, while the current study dropped it for lack of a suitably appropriate word to translate it into in Greek. (The two statements can be compared in Appendices 1 and 2.) Moreover, again for linguistic purposes the response format was slightly different, with the original study using the categories "Certainly true" all the way to "Certainly false", while the current study used "Strongly agree" all the way to "Strongly disagree". The results, with the replies presented as positive, meaning that their method of instructions would change, or negative to fit both studies, are summarised in figure 2.2 in the Results section.

Although there is a general trend that is met in both the UK and Greek sample, with the majority of teachers being positive or strongly positive in both studies, in the Greek sample we see a fifth of the sample opting for a 'neither agree nor disagree' choice, compared to about 12% of the UK teachers, suggesting a slightly higher degree of uncertainty. Moreover,

the Greek sample had more participants in the negative or strongly negative answers - suggesting that there are teachers who would not change their teaching style to accommodate genetically linked learning difficulties, although these teachers were still a minority. This is probably in line with modern Greek education practice, where differentiation is non-existent. Pupils in mainstream classrooms are all taught from one textbook, prescribed by the ministry, with no concessions for learning difficulties, language difficulties or disabilities. Children with learning difficulties are often supported in parallel classrooms, within the school, or adjacent centres. It would, therefore, follow and it was mentioned in the qualitative part of the study, that outside and parallel support would be sought for such children.

However, when looking at the results of the qualitative study to support the above findings, it was clear that many teachers were able to propose ways to support children with learning difficulties. It was only implicit that a genetically-linked difficulty might be seen as a barrier to learning, or pose a perceived 'ceiling' in the eyes of some educators. Moreover, all teachers interviewed were very aware of the importance of diagnosis and intervention, mostly outside the classroom. Finally, this issue too was linked by the teachers interviewed with the need for greater teacher education on the topic of genetics as it affects educational outcomes, and more specifically as it relates to learning difficulties.

A small but significant correlation ($r = .146$, $p = .033$) was found between stronger perceptions of the role of the environment in relation to learning difficulties and there being a higher likelihood that a teacher would change the method of instruction. This could be taken to mean that believing that the environment drives learning could empower teachers to change their behaviours/teaching methods in order to help children experiencing difficulty. On the other side of the same spectrum the opposite can be seen in the findings of the qualitative study, which brought forward ideas of a 'ceiling' when thinking about ability as genetic, would offer a possible explanation of this small, but significant correlation.

Research question 2: Do teachers' and trainee teachers' beliefs about the genetic and environmental origins of learning behaviour correlate with their self-efficacy as teachers?

No significant relationship was found between teachers' beliefs in nature vs nurture and their

self-efficacy, in the quantitative data. However, subtle and implicit ideas about power vs powerlessness emerged from the qualitative data, as well as misconceptions about the way genes might affect behaviour, that could have implications for the way teachers instruct children. For example, the 'ceiling effect' for certain difficulties perceived as genetic in origin would lead, some participants said, to lower or different expectations.

In terms of self-efficacy, the study provides useful data on Greek teachers' and trainee teachers' self-efficacy, only partially studied before. Poulou (2007) presented results for teacher trainee self-efficacy, although the results are not directly comparable, as it used the full version of the scale, with 24 items, while this study employed the short-version, with 12 items. An adapted Likert scale (from 9 point, to 5) was also used in the current study, making a direct comparison difficult. Moreover, to the best of the author's knowledge, the TSES has not been used to date on Greek in-service teachers, although it has been used with a sample of Greek-speaking Cypriot teachers (Klassen et al., 2009).

In the current sample, the mean score for teacher self-efficacy was lower ($M=6.5$, $SD=.86$) than that presented by Klassen et al (2009) ($M=7.3$, $SD=.85$) in a culturally comparable group of Greek speaking Cypriot teachers ($n=210$). This difference could, perhaps, be attributed to the different composition of the two samples, with the current study having a mixed composition of pre-service and in-service teachers. Taking into account how self-efficacy seems to be related to years in service (Klassen et al, 2010), a finding in this study also, this could be a defining factor. However, even when looking at in-service teachers only, the two mean scores are still different, with Klassen et al reporting a mean score of $M=7.3$ ($SD=.85$) and this study finding a mean score of $M=6.8$ ($SD=.78$). This is perhaps the case because the in-service teachers were mostly early on in their careers, with more than half of them (32 of the 48) having less than 5 years of experience. Moreover, the factor of point in time might be important here, as the Klassen et al study is from 2009, from Cyprus, when conditions in schools might have been better. In 2017 Greece, after 7 years of recession ("Greek economy back into recession", 2017) and diminishing school budgets (Ministry of Finance budget, 2017), and with the substantial influx of refugees to schools classroom size has grown, while resources have dwindled. This might have had an effect on teacher self-efficacy and stress levels.

The data analysis presented a significant difference ($p=.006$) between the mean TSE of the

two groups, trainee teachers ($M=6.41$, $SD=.87$) and in-service teachers ($M=6.8$, $SD=.78$). The effect size (Cohen's $d=.46$) was moderate. This moderate difference between pre-service and in-service teachers is in line with the literature, which suggests that self-efficacy, although non-linear, increases from 0 years of experience to 23 years -which is when it reaches its peak (Klassen, 2010). Interestingly, the same study has found to decline in teachers at their later stages of their careers.

Research question 3: Does Openness to Genetics Research in Education correlate with teacher self-efficacy?

A significant correlation ($r=.31$, $p=.000$) was found between self-efficacy and Openness to Genetic Research in Education (OGRE). This suggests that teachers and teacher trainees with higher self-efficacy beliefs were significantly more likely to be open to the introduction of genetic research into their classrooms. Openness also correlated with years of experience. Therefore, as we see self-efficacy grow with more years of experience, up to a level, as mentioned above, Openness to Genetic Research in Education grows too.

Moreover, a medium to large effect (Cohen's $d = 0.43$) was observed in the difference for the Openness to Genetic Research in Education scale results between the two groups studied. In-service teachers were found to have higher levels of Openness to Genetic Research in Education. This is an interesting finding, and while the scale is new, and there is no comparison to be made, to date, between past differences relating to age or experience in the profession, it might be partially explained by the data collection circumstances. More specifically, in-service teacher data was collected at a post-graduate seminar for teachers. This might indicate that the sample was skewed towards a general openness to evidence-based education and CPD.

The willingness to learn more (OGRE) was very much mirrored in the qualitative data. Several teachers lamented their lack of knowledge and mentioned that they would be keen to learn more, especially as it applies to their own classroom practice. This is indeed a positive finding and will be discussed further, as it relates to implications for policy and practice.

Sources of information about genetics in education

Although not initially posed as a research question, the sources of information about genetic research that are available to teachers, as well as some common misconceptions that might be derived by the potential inadequacy of these sources, were examined in the qualitative study. More specifically, after the initial two interviews it became clear that this was an emerging theme relevant to both future research and current practice.

Sources of information discussed by participants were mostly informal. These included personal and professional experience, traditional beliefs and sayings and the popular press. Formal sources included high-school biology courses, while two participants also mentioned getting some limited training at the postgraduate seminar they were attending, especially relating to the heritability of intelligence. Both of these participants were very enthusiastic when relating this, and expressed a wish to learn more. This was echoed by other interviewees, as well as in the quantitative results in the Openness to Genetic Research in Education (OGRE) scale.

When the void in lack of formal education is filled with information accessed through the press, it is inevitable that certain misconceptions will prevail. These misconceptions, such as the 'one gene per trait' which was encountered twice in the qualitative part of this study, as well as the deterministic nature of genes can be harmful when applied in an educational context. Steps to remedy that are suggested in the implications for practice.

Research question 4: Does teaching experience correlate with teachers' beliefs about genetics?

The one-way between subjects ANOVA that was used to calculate the effect of teaching experience on beliefs about the aetiology of behaviour found nonsignificant effect of ($p=.997$) of years of experience on the aetiological beliefs mean score [$F(3-163)=.016$, $p=.997$], as reported in the results section.

This finding is in contrast with Georgiou (2008), who found that more experienced teachers

were more likely to attribute achievement to hereditary and biologically determined characteristics. By contrast, newly qualified teachers believed less in the above factors, and more in controllable factors, like teacher effort.

It should be noted that there were several limitations to the current study in this regard, including the way that teacher experience was reported on (interval scale) as well as the fact that most teachers surveyed had less than 5 years of experience ($n=142$) versus more than 5 years ($n=26$). Future research should include greater numbers, and more variety, of experienced teachers.

Research question 5: Does thinking about genetics affect trainee teachers' self-efficacy?

Two types of questionnaires were given out to participants, Type A, which had the genetics questions first, followed by the self-efficacy questions, and Type B, which was the opposite. In order to understand whether thinking about genetics (by answering the nature versus nurture items first) had any effect on participants' self-efficacy scores an independent samples t-test was performed. It compared the TSES mean scores of Type A ($n=110$) and Type B ($n=105$) respondents. No significant difference for TSES mean scores was found between the two groups ($t=-1.291$ $p=0.198$, $df=213$). The effect size was small (Cohen's $d=.176$).

It should be noted that this experimental condition had major limitations, namely that each questionnaire containing all of the questions was given out at in one collated leaflet. That meant that a participant could easily leaf through the whole questionnaire before filling it in, or start from the back and move towards the front. Moreover, as Type A and Type B questionnaires were handed out to alternate participants sitting in a lecture theatre, a participant could easily look at the questionnaire of the person next to them.

Integration of quantitative and qualitative data

One of the reasons that a mixed-methods investigation was used was to complement and expand on the quantitative findings by using a qualitative strand (Bryman, 2006). The research design dictated that the two data collections were going to be sequential (Morse, 1991). This would allow for findings from the questionnaires to inform the interview schedule,

so that a deeper exploration of the issues could have been achieved. Moreover, a triangulation of the findings could occur. This was only partially achieved, as the quantitative data was only analysed part-way through the interviews. At that point in the research an extra question was included in the interview. However, this design and implementation limitation did not fully allow for an optimal use of a mixed-methods investigation in this study. The quantitative data informed the examination of the qualitative data and provided direction during the process of thematic analysis. These directions, based around, for example the dichotomy between the origin of cognitive and behavioural characteristics, informed the overall scope of the qualitative data readings. Finally, it is felt that using mixed methods has allowed for a deeper understanding of the issues explored.

Limitations

The current study faced several limitations, some of which have been mentioned above, that may have had an impact on the quality of the data. The following section will attempt to identify and explain these limitations. One obvious limitation was the failure to use a probability sampling technique in both the quantitative and qualitative parts of the study. This most likely has an impact on the generalisability of the results. A convenience sampling technique was employed, in order to recruit as many participants as possible, given the limitations of time and access to student lists at the teaching institutions. However, that said, a good response rate was achieved, close to 100%, and there is no reason to believe the quantitative data is particularly skewed. It should be noted that all undergraduate students were from the same year of study, namely the second and therefore the generalisability of the results to all students, of all years and courses should also be done with care.

On the other hand, for the qualitative sample, which was self-selecting, this limitation has a potentially higher impact (the response rate here was 4%). It could be that individuals more interested in genetics or research in general were more likely to respond in order to be interviewed. Moreover, the small number of participants in this part of the research further compounds the problem and suggests a low generalisability of the results, from the qualitative data.

Study design limitations also existed. The study was designed so that the quantitative and qualitative aspects of the research were conducted at the same time, or with little time in between. It would have been very useful to have had an initial analysis of the quantitative results before embarking on the qualitative interview study. Such a preliminary analysis

could have informed the interview schedule and sampling and would have focused the scope of the interviews more precisely, potentially yielding data that would more greatly complement the quantitative data.

A design limitation which was, however, done with the knowledge of the researcher, was the use of the shortened 12-point scale for Teacher Self-Efficacy. The 12-point scale was used, as mentioned in the methodology chapter, in order to keep the overall length of the questionnaire to a manageable 3 pages. However, this had the consequence that the subscales could not be calculated for trainee teachers, as for preservice teachers the factor structure is less distinct (Tschannen-Moran & Hoy, 2001).

Finally, a minor, yet easily preventable error, in the design of the questionnaires was in relation to the years of experience variable. Participants were asked to tick a box representing a range of experience e.g. 1-5 years. Two issues arose here. First, one box was missed out in the questionnaire design, leading to the missing out of anyone who had experience of more than a year, but less than two. The second issue arising was with the usability of the results in the analysis. A far more useful way to access this information would have been to have asked for the precise number of years of experience each participant had, giving us a much fuller picture, and a greater scope of tests to use.

CONCLUSION

Implications for policy and practice

Linking the findings relating to sources of information from the qualitative data, with the results from the OGRE scale, it is imperative to look at some implications for practice. There is currently little formal training in genetics at Greek teacher training courses (Papadatou-Pastou, 2017). Moreover, a look at the index of textbooks used in the Education Department of the University from which the participants were drawn did not include terms such as 'genes' ('γονίδια) and 'genetics' ('γενετική) or the term 'heritability' ('κληρονομικότητα').* This void in education, often filled with information and misinformation from the press, can be create misconceptions that may prove harmful to the way teachers think about genetic influences.

There are several ways to address this lack of genetic training in education, and this section will attempt to offer some of the possibilities. First of all, wide dissemination of current research through science communication channels, such as talks, festivals, popular books, television, radio and, of course, the internet can be of great importance in facilitating contact of laypeople with the most recent advances in behavioural genetics. Such attempts as BBC Radio 4's programme, *Bringing Up Britain* (Bringing Up Britain, 2015), or popular books like *Nature via Nurture* (Ridley, 2004) and *The Epigenetics Revolution* (Carey, 2012) that bridge the gap between academia and the popular press, can provide a useful tool for the explanation of our current understanding of behavioural genetics.

With regards to teacher training in particular, though, a more rigorous approach would arguably provide the best results. Thus, incorporating seminars or lectures on behavioural genetics, in the way that they intersect with current educational theory, and highlighting their relevance for teaching, learning and assessment would be a good first step. Moreover, books, such as *G is for Genes* (Asbury & Plomin, 2013), written specifically for education professionals, have a lot to offer in providing relevant context for teachers and school administration alike.

Genetics literacy could provide teachers with the confidence to feel empowered when faced with heritable difficulties, while understanding the full impact the right environmental influences can play in the expression of these genes. Therefore, empowerment through knowledge, and the ability to understand how genes and environment can work together, could benefit the teaching profession. At the same time that would dispel common misconceptions, such as the deterministic nature of genes vs the complex interaction of genotype and environment, the complexity of patterns of inheritance, polygenic involvement vs one gene-one trait and role and genetic essentialism (Shaw, Van Horne, Zhang, & Boughman, 2008).

A phrase, the gist of which should be communicated to all educators, relating to genetics in education is the following: "The pervasiveness of genetic influence in how and how much children learn is compatible with an active view of learning in which children create their own educational experiences in part on the basis of their genetic propensities" (Howarth, Dale, Asbury & Plomin, 2011, p. 1). Moreover, changes on a policy level could also benefit

education as a whole. Some of the ones suggested by Asbury and Plomin (2013) besides teacher education are increased choice for pupils and the promotion of equal opportunities in early education as a means of accomplishing social mobility further down the line.

In terms of training opportunities, Continual Professional Development (CPD) courses could be used to address the dearth of evidence-based education in this respect. These could be in the form of a Massive Open Online Course (MOOC) and hence have a very wide impact in the world of teaching, while minimising costs for both teachers and their institutions. It is interesting to see that the uptake of MOOCs amongst teachers is particularly high (Seaton, Coleman, Davies & Chuang, 2015) making them an ideal tool to reach teachers who might otherwise have no other means of CPD.

Further Research

There are several next steps for the research on teacher beliefs in terms of genetic and environmental influences on educational outcomes. Although this study attempted to explore the relationship between those and teacher self-efficacy, there are several other important aspects of teacher behaviour that could also be explored. For example, previous research suggesting that teacher attributions can have a bearing on instructional methods (Wieman and Welsh, 2015), as well as student performance (Klehm, 2014; Gallimore, Ermeling, Saunders & Goldenberg, 2009) could be the impetus for looking at the relationship between genetic beliefs and the aforementioned variables of instructional methods and student performance. Moreover, cultural comparisons with a wider selection of backgrounds could be useful in ascertaining how culture interacts with beliefs about nature and nurture.

*Textbooks checked were *Η Παιδαγωγική Επιστήμη Άλλοτε και Τώρα*, (Καρράς, 2014) and *Πρόγραμμα για την Προαγωγή της Ψυχικής Υγείας και της Μάθησης στη Σχολική Κοινότητα. Εκπαιδευτικό Υλικό II* (Ε.Κ.Π.Α., Κέντρο Έρευνας και Εφαρμογών Σχολικής Ψυχολογίας, Χατζηχρήστου Χρυσή Γ. (επιμ.), 2011).

Appendices

Appendix 1 Information Page, Consent Forms and Questionnaires in English

Information Page Trainee Teacher Beliefs and Sense of Efficacy

Dear Student,

My name is Alexia Barrable and I am a postgraduate student at the University of York. I am currently carrying out a research project on trainee teachers and how their beliefs relate to their sense of efficacy. I hope that you are able to take part in the study.

What would this mean for me?

Taking part in this study would involve you filling in a questionnaire, containing multiple choice and open-ended questions, and returning it to the researcher, on your beliefs and sense of efficacy, as it relates to your teaching. There will also be some general personal information required, as well as some information on your teaching experience so far. Furthermore, I will ask for your contact details that could be used later in the process, for an interview, should you give your permission for me to do so.

The questionnaire, which has four parts, will be administered before one of your weekly lectures, and should take no more than 15 minutes to answer.

Anonymity

The data that you provide will be stored by code number. Any information that identifies you will be stored separately from the data.

Storing and using your data

Data will be stored on a password protected computer. The data will be kept for 5 years, after which time it will be destroyed. The data may be used for future analysis and shared for research or training purposes, but participants will not be identified individually. If you do not want your data to be included in any information shared as a result of this research, please do not sign this consent form.

You are free to withdraw from the study at any time during data collection and up to two weeks after the data is collected. Please contact the lead researcher on ab2016@york.ac.uk if you wish to do so.

Information about confidentiality

The data that we collect may be used in *anonymous* format in different ways. Please indicate on the consent form attached with a if you are happy for this anonymised data to be used in the ways listed.

We hope that you will agree to take part. If you have any questions about the project/study that you would like to ask before giving consent or after the data collection, please feel free to contact Alexia Barrable by email ab2016@york.ac.uk or the Chair of Ethics Committee via email education-research-administrator@york.ac.uk

If you are happy to participate, please complete the form enclosed/attached and hand it in to the researcher.

Please keep this information sheet for your own records.

Thank you for taking the time to read this information.

Yours sincerely

Alexia Barrable

Consent Form

Please initial each box if you are happy to take part in this research.

I confirm that I have read and understood the information given to me about the above named research project and I understand that this will involve me taking part as described above.

I understand that the purpose of the research is to look into trainee teacher beliefs and sense of efficacy.

I understand that data will be stored securely on a password protected computer, as well as in a locked cabinet, and only Alexia Barrable will have access to any identifiable data. I understand that my identity will be protected by use of a code.

I understand that my data will **not** be identifiable and the data may be used

in publications that are mainly read by university academics

in presentations that are mainly read by university academics

in publications that are mainly read by the public

in presentations that are mainly read by the public

I understand that data will be kept for 5 years after which it will be destroyed.

I understand that data could be used for future analysis or other purposes

I understand that I can withdraw my data at any point during data collection and up to **two weeks** after data is collected

Questionnaire

Type A

Name: _____

Gender: _____

Age: _____

Course studied: _____

Year of study: _____

Teaching experience (including placements): none, 1-3 terms, 2-5 years, more than 5 years

Please give your contact details (email or telephone number) if you are happy to be

contacted for a brief interview, relating to your Intponses: _____

Part 2 - Beliefs about genetics

	1 All genes	2 Mostly Genes	3 Genes and environment have equal influence	4 Mostly environm ent	5 All environ ment
To what extent do you think a child's personality is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's intelligence is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's behaviour is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's learning difficulties is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's mental health is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's subjective well-being (happiness) is influenced by nature (genes) or nurture (environment)?					

How true is the following statement:

Knowing that a child has a genetically-influenced learning difficulty would affect my method of instruction?

Certainly true Somewhat true Neither true or false Somewhat false Certainly false

If you would alter your method of instruction for a child with a known genetically-influenced learning difficulty please briefly write how you would do so:

Part 3 -

Please indicate the extent to which you agree or disagree with each statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Intearch that explains genetic influences on cognitive ability could be useful to teachers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, I feel that the science of behavioural genetics has a role to play in education.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not think that findings from behavioural genetics should be used to inform future educational directions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personally, I would not like to see findings from behavioural genetics influencing my day-to-day classroom decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would like to know more about behavioural genetics and its implications for child development.	<input type="radio"/>				
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Teachers' Sense of Efficacy Scale

Teacher Beliefs									
Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.									
How much can you do?									
	Not hin g		Ver y little		So me influ enc e		Quit e a bit		A Gre at Dea l
1. How much can you do to control disruptive behavior in the classroom?	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low intelntt in school work?	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning?									
5. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
6. How much can you do to get children to follow classroom rules?	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with each group of students?	1	2	3	4	5	6	7	8	9
9. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an alternative explanation or example when students are confused?	1	2	3	4	5	6	7	8	9
11. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative strategies in your classroom?	1	2	3	4	5	6	7	8	9

Questionnaire

Type B

Name: _____

Gender: _____

Age: _____

Course studied: _____

Year of study: _____

Teaching experience (including placements): none, 1-3 terms, 2-5 years, more than 5 years

Please give your contact details (email or telephone number) if you are happy to be contacted for a brief interview, relating to your Intponses: _____

Teachers' Sense of Efficacy Scale

Teacher Beliefs									
Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.									
How much can you do?									
	Not hin g		Ver y little		So me influ enc e		Quit e a bit		A Gre at Dea l
1. How much can you do to control disruptive behavior in the classroom?	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low intelntt in school work?	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning?									
5. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
6. How much can you do to get children to follow classroom rules?	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with each group of students?	1	2	3	4	5	6	7	8	9

9. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an alternative explanation or example when students are confused?	1	2	3	4	5	6	7	8	9
11. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative strategies in your classroom?	1	2	3	4	5	6	7	8	9

Part 2 - Beliefs about genetics

	1 All genes	2 Mostly Genes	3 Genes and environment have equal influence	4 Mostly environm ent	5 All environ ment
To what extent do you think a child's personality is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's intelligence is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's behaviour is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's learning difficulties is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's mental health is influenced by nature (genes) or nurture (environment)?					
To what extent do you think a child's subjective well-being (happiness) is influenced by nature (genes) or nurture (environment)?					

How true is the following statement:

Knowing that a child has a genetically-influenced learning difficulty would affect my method of instruction?

Certainly true Somewhat true Neither true or false Somewhat false Certainly false

If you would alter your method of instruction for a child with a known genetically-influenced learning difficulty please briefly write how you would do so:

Part 3 -

Please indicate the extent to which you agree or disagree with each statement.

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Intearch that explains genetic influences on cognitive ability could be useful to teachers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overall, I feel that the science of behavioural genetics has a role to play in education.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not think that findings from behavioural genetics should be used to inform future educational directions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personally, I would not like to see findings from behavioural genetics influencing my day-to-day classroom decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to know more about behavioural genetics and its implications for child development.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix 2 Information Page, Consent Form and Questionnaires in Greek



Πεποιθήσεις φοιτητών παιδαγωγικής και αυτοαποτελεσματικότητα

Αγαπητέ φοιτητή/φοιτήτρια,

Ονομάζομαι Αλεξία Barrable και είμαι φοιτήτρια στο Πανεπιστήμιο του York, του Ην. Βασιλείου. Η έρευνά μου εξετάζει την σχέση κάποιων πεποιθήσεων και την αίσθησή αυτοαποτελεσματικότητας σε φοιτητές παιδαγωγικής και εκπαιδευτικούς. Ελπίζω να μπορέσετε να συμμετέχετε στη μελέτη αυτή.

Τί σημαίνει αυτό για εμένα;

Για τη συμμετοχή σας στη μελέτη αυτή απαιτείται η συμπλήρωση ενός ερωτηματολογίου, που περιλαμβάνει ένα συνδυασμό ερωτήσεων πολλαπλών επιλογών και ανοιχτών ερωτήσεων σε σχέση με τις πεποιθήσεις σας και την αίσθηση αυτοαποτελεσματικότητας σας μέσα στην τάξη. Υπάρχουν επίσης και κάποιες ερωτήσεις για δημογραφικά στοιχεία (π.χ. ηλικία, φύλο κτλ.). Αν, αφού έχετε συμπληρώσει το ερωτηματολόγιο θα ενδιαφερόσασταν να συμμετέχετε και σε μία σύντομη συνέντευξη, παρακαλώ δώστε στοιχεία επικοινωνίας.

Το ερωτηματολόγιο, το οποίο αποτελείται από τέσσερα μέρη, θα σου δοθεί για συμπλήρωση πριν από μία από τις διαλέξεις σου, και θα πάρει περίπου 15 λεπτά.

Ανωνυμία

Οι πληροφορίες που θα δώσετε θα αποθηκευτούν με τη βοήθεια κωδικού, ώστε να υπάρχει ανωνυμία. Κάθε πληροφορία που μπορεί να σας ταυτοποιήσει θα αποθηκευτεί χωριστά.

Αποθήκευση και χρήση δεδομένων

Τα δεδομένα θα αποθηκευτούν κωδικοποιημένα σε ηλεκτρονικό υπολογιστή. Πρόσβαση θα υπάρχει μόνο από την Αλεξία Barrable και την καθηγήτριά της, Dr Kathryn Asbury.

Τα δεδομένα θα αποθηκευτούν για 5 χρόνια, και μετά θα καταστραφούν. Πιθανώς να χρησιμοποιηθούν στο μέλλον για περαιτέρω ανάλυση, αλλά όλοι οι συμμετέχοντες θα είναι ανώνυμοι. Αν δεν επιθυμείτε να χρησιμοποιηθούν τα ανώνυμα δεδομένα σας σε μελλοντικές έρευνες ή αναφορές, παρακαλείστε να μην υπογράψετε.

Είστε ελεύθερος/η να αποσυρθείτε από την έρευνα οποιαδήποτε στιγμή κατά τη διάρκεια συλλογής δεδομένων και για 2 εβδομάδες μετά. Επικοινωνήστε με την ερευνήτρια στην ηλεκτρονική διεύθυνση ab2016@york.ac.uk εφόσον επιθυμείτε να αποσυρθείτε.

Πληροφορίες ως προς την εμπιστευτικότητα

Όλες οι πληροφορίες που θα μαζευτούν μπορεί να χρησιμοποιηθούν ανώνυμα με διαφορετικούς τρόπους. Παρακαλώ να υποδείξετε τους τρόπους αυτούς στην φόρμα συγκατάθεσης.

Ελπίζουμε ότι θα θέλετε να λάβετε μέρος στην έρευνα αυτή. Αν έχετε ερωτήσεις πάνω στην έρευνα, πριν ή και μετά από τη συγκατάθεσή σας παρακαλείστε με την Αλεξία Barrable (ab2016@york.ac.uk) ή τον Προέδρο της Επιτροπής Ηθικής της Σχολής Εκπαίδευσης

(education-research-administrator@york.ac.uk).

Αν δίνετε τη συγκατάθεσή σας, παρακαλείστε να συμπληρώσετε το επισυναπτόμενο έντυπο και να το επιστρέψετε στην ερευνήτρια όταν τελειώσετε, μαζί με το ερωτηματολόγιο. Μπορείτε να κρατήσετε το έντυπο πληροφοριών.

Ευχαριστώ που πήρατε τον χρόνο να διαβάσετε αυτές τις πληροφορίες.

Με εκτίμηση,

Αλεξία Barrable

Έντυπο Συγκατάθεσης

Παρακαλώ βάλτε τικ δίπλα σε κάθε πρόταση αν συμφωνείτε.

Διάβασα και κατάλαβα τις πληροφορίες για την παραπάνω έρευνα και τη συμμετοχή μου σε αυτήν.

Καταλαβαίνω ότι η έρευνα εξετάζει την σχέση κάποιων πεπτοιθήσεων και την αίσθησή αυτοαποτελεσματικότητας σε φοιτητές παιδαγωγικής και εκπαιδευτικούς

Κατανούω ότι τα δεδομένα θα καταχωρηθούν και θα αποθηκευτούν κωδικοποιημένα σε ηλεκτρονικό υπολογιστή. Πρόσβαση θα υπάρχει μόνο από την Αλεξία Barrable και την καθηγήτριά της, Dr Kathryn Asbury.

Κατανόω ότι τα δεδομένα μπορεί να χρησιμοποιηθούν...
σε επιστημονικά περιοδικά, με ακαδημαϊκό κυρίως κοινό

Σε παρουσιάσεις και συνέδρια με κυρίως ακαδημαϊκό κοινό
Σε εκδόσεις που απευθύνονται στο ευρύ κοινό

Σε παρουσιάσεις που απευθύνονται στο ευρύ κοινό

Κατανόω ότι τα δεδομένα θα αποθηκευτούν για 5 χρόνια, και μετά θα
καταστραφούν.

Κατανόω ότι τα ανώνυμα δεδομένα μπορεί να χρησιμοποιηθούν σε μελλοντικές
αναλύσεις.

Κατανόω ότι μπορώ να αποσύρω τα δεδομένα μου απο την έρευνα οποιαδήποτε
στιγμή κατά τη διάρκεια συλλογής δεδομένων και για 2 εβδομάδες μετά.

Όνομα _____ Ημερομηνία _____

Υπογραφή _____

Ερωτηματολόγιο

Όνομα: _____

Φύλο: _____

Ηλικία: _____

Αντικείμενο σπουδών: _____

Έτος σπουδών: _____

Διδακτική εμπειρία (συμπεριλαμβανομένων πρακτικών): καμία, 1-3 τρίμηνα, 2-5 χρόνια, πάνω από 5 χρόνια

Παρακαλώ συμπληρώστε το e-mail σας ή το τηλεφώνό σας αν συμφωνείτε να λάβετε μέρος σε μία σύντομη συνέντευξη, σε σχέση με τις απαντήσεις που δώσατε: _____

	1 Εξ ολοκλ ήρου γονίδι α	2 Περισ σότερο γονίδια	3 Ίση επιρροή από γονίδια και περιβάλλον	4 Περισσό τερο περιβάλ λον	5 Εξ ολοκλή ρου περιβάλ λον
Σε ποιο βαθμό πιστεύεις ότι η προσωπικότητα ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η εξυπνάδα ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η συμπεριφορά ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι οι μαθησιακές δυσκολίες ενός παιδιού επηρεάζονται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η ψυχική υγεία ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η ευτυχία ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					

Κατά τη γνώμη σας, πόσο σωστή είναι η παρακάτω φράση;

Αν γνώριζα ότι ένα παιδί έχει κάποια μαθησιακή δυσκολία, που προέρχεται από γενετικούς παράγοντες, αυτό θα άλλαζε τον τρόπο διδασκαλίας μου προς αυτό το παιδί.

Τελείως σωστή Κάπως σωστή Ούτε σωστή ούτε λάθος Κάπως λάθος Τελείως λάθος

Αν συμφωνείτε παρακαλώ περιγράψτε κατά ποιόν τρόπο θα αλλάζατε τον τρόπο διδασκαλίας σας;

Παρακαλώ συμπληρώστε κατά πόσο συμφωνείτε ή διαφωνείτε με την κάθε πρόταση.

	Διαφωνώ απόλυτα (1)	Διαφωνώ (2)	Ούτε συμφωνώ, ούτε διαφωνώ(3)	Συμφωνώ (4)	Συμφωνώ απόλυτα (5)
<p>Έρευνα που εξηγεί τις επιρροές των γονιδίων πάνω στις γνωστικές ικανότητες θα μπορούσε να είναι χρήσιμη για εκπαιδευτικούς.</p> <p>Γενικώς, πιστεύω ότι η επιστήμη της γενετικής της συμπεριφοράς έχει να παίξει κάποιο ρόλο στην εκπαίδευση.</p> <p>Δεν πιστεύω ότι ευρήματα από την επιστήμη της γενετικής της συμπεριφοράς πρέπει να χρησιμοποιούνται για να επηρεάσουν την κατεύθυνση που θα πάρει η εκπαίδευση μελλοντικά.</p> <p>Προσωπικά, δεν θα ήθελα ευρήματα από την γενετική της συμπεριφοράς να επηρεάζουν τις αποφάσεις που παίρνω καθημερινά στην τάξη μου.</p> <p>Θα ήθελα να μάθω περισσότερα για την επιστήμη της γενετικής της συμπεριφοράς και την επιρροή των γονιδίων στην ανάπτυξη των παιδιών.</p>					

Αυτο-αποτελεσματικότητα εκπαιδευτικού

Οι πεποιθήσεις του διδάσκοντα

Οδηγίες: Αυτό το ερωτηματολόγιο σχεδιάστηκε για να μας βοηθήσει να καταλάβουμε καλύτερα τις συνθήκες/καταστάσεις που δημιουργούν δυσκολίες για τους διδάσκοντες στο σχολείο. Σας παρακαλώ να σημειώσετε την άποψή σας για κάθεμία από τις προτάσεις παρακάτω. Οι απαντήσεις σας είναι εμπιστευτικές.

Κατά πόσον έχεις τη δυνατότητα;

	Καθόλου		Πολύ λίγο		Κάποια επιρροή		Αρκετά		Κατά πολύ
1. Κατά πόσο μπορείς να ελέγξεις τις δύσκολες συμπεριφορές μέσα στην τάξη;	1	2	3	4	5	6	7	8	9
2. Κατά πόσον μπορείς να κινητοποιήσεις τους μαθητές σου που δείχνουν μικρό ενδιαφέρον για το σχολείο;	1	2	3	4	5	6	7	8	9
3. Κατά πόσο μπορείς να κάνεις τους μαθητές σου να πιστέψουν ότι μπορούν να τα πάνε καλά στο σχολείο;	1	2	3	4	5	6	7	8	9
4. Κατά πόσον μπορείς να βοηθήσεις τους μαθητές σου να καταλάβουν την αξία της μάθησης;	1	2	3	4	5	6	7	8	9
5. Κατά πόσο μπορείς να διατυπώσεις καλές ερωτήσεις για τους μαθητές σου;	1	2	3	4	5	6	7	8	9
6. Πόσο μπορείς να επηρεάσεις το αν οι μαθητές σου υπακούουν στους κανόνες της τάξης;	1	2	3	4	5	6	7	8	9
7. Κατά πόσο μπορείς να ηρεμήσεις ένα μαθητή που διαταράσσει το μάθημα ή κάνει φασαρία;	1	2	3	4	5	6	7	8	9
8. Κατά πόσο μπορείς να εφαρμόσεις ένα σύστημα διαχείρισης της τάξης με κάθε ομάδα μαθητών;	1	2	3	4	5	6	7	8	9
9. Κατά πόσο μπορείς να χρησιμοποιήσεις διαφορετικές μεθόδους αξιολόγησης;	1	2	3	4	5	6	7	8	9
10. Κατά πόσο μπορείς να δώσεις μια διαφορετική εξήγηση ή ένα άλλο παράδειγμα όταν κάποιος μαθητής αδυνατεί να καταλάβει; (όταν οι μαθητές μπερδεύονται;)	1	2	3	4	5	6	7	8	9
11. Κατά πόσο μπορείς να συμβάλλεις στο να μπορούν οι οικογένειες να βοηθήσουν τα παιδιά τους να επιτύχουν στο σχολείο;	1	2	3	4	5	6	7	8	9
12. Πόσο καλά μπορείς να εφαρμόσεις εναλλακτικές στρατηγικές μέσα στην τάξη σου;	1	2	3	4	5	6	7	8	9

Ερωτηματολόγιο

Όνομα: _____

Φύλο: _____

Ηλικία: _____

Αντικείμενο σπουδών: _____

Έτος σπουδών: _____

Διδακτική εμπειρία (συμπεριλαμβανομένων πρακτικών): καμία, 1-3 τρίμηνα, 2-5 χρόνια, πάνω από 5 χρόνια

Παρακαλώ συμπληρώστε το e-mail σας ή το τηλεφώνό σας αν συμφωνείτε να λάβετε μέρος σε μία σύντομη συνέντευξη, σε σχέση με τις απαντήσεις που δώσατε: _____

Αυτο-αποτελεσματικότητα εκπαιδευτικού

Οι πεποιθήσεις του διδάσκοντα

Οδηγίες: Αυτό το ερωτηματολόγιο σχεδιάστηκε για να μας βοηθήσει να καταλάβουμε καλύτερα τις συνθήκες/καταστάσεις που δημιουργούν δυσκολίες για τους διδάσκοντες στο σχολείο. Σας παρακαλώ να σημειώσετε την άποψή σας για κάθεμία από τις προτάσεις παρακάτω. Οι απαντήσεις σας είναι εμπιστευτικές.

Κατά πόσον έχεις τη δυνατότητα;

	Καθ όλο υ		Πολ ύ λίγο		Κά ποι α επι ρρο ή		Αρκ ετά		Κα τά πο λύ
1. Κατά πόσο μπορείς να ελέγξεις τις δύσκολες συμπεριφορές μέσα στην τάξη;	1	2	3	4	5	6	7	8	9
2. Κατά πόσον μπορείς να κινητοποιήσεις τους μαθητές σου που δείχνουν μικρό ενδιαφέρον για το σχολείο;	1	2	3	4	5	6	7	8	9
3. Κατά πόσο μπορείς να κάνεις τους μαθητές σου να πιστέψουν ότι μπορούν να τα πάνε καλά στο σχολείο;	1	2	3	4	5	6	7	8	9
4. Κατά πόσον μπορείς να βοηθήσεις τους μαθητές σου να καταλάβουν την αξία της μάθησης;	1	2	3	4	5	6	7	8	9
5. Κατα πόσο μπορείς να διατυπώσεις καλές ερωτήσεις για τους μαθητές σου;	1	2	3	4	5	6	7	8	9
6. Πόσο μπορείς να επηρεάσεις το αν οι μαθητές σου υπακούουν στους κανόνες της τάξης;	1	2	3	4	5	6	7	8	9
7. Κατά πόσο μπορείς να ηρεμήσεις ένα μαθητή που διαταράσσει το μάθημα ή κάνει φασαρία;	1	2	3	4	5	6	7	8	9
8. Κατά πόσο μπορείς να εφαρμόσεις ένα σύστημα διαχείρισης της τάξης με κάθε ομάδα μαθητών;	1	2	3	4	5	6	7	8	9
9. Κατά πόσο μπορείς να χρησιμοποιήσεις διαφορετικές μεθόδους αξιολόγησης;	1	2	3	4	5	6	7	8	9

10. Κατά πόσο μπορείς να δώσεις μια διαφορετική εξήγηση ή ένα άλλο παράδειγμα όταν κάποιος μαθητής αδυνατεί να καταλάβει; (όταν οι μαθητές μπερδεύονται;)	1	2	3	4	5	6	7	8	9
11. Κατά πόσο μπορείς να συμβάλεις στο να μπορούν οι οικογένειες να βοηθήσουν τα παιδιά τους να επιτύχουν στο σχολείο;	1	2	3	4	5	6	7	8	9
12. Πόσο καλά μπορείς να εφαρμόσεις εναλλακτικές στρατηγικές μέσα στην τάξη σου;	1	2	3	4	5	6	7	8	9

	1 Εξ ολοκλήρου γονίδια	2 Περισ- σότερο γονίδια	3 Ίση επιρροή από γονίδια και περιβάλλον	4 Περισσό- τερο περιβάλ- λον	5 Εξ ολοκλή- ρου περιβάλ- λον
Σε ποιο βαθμό πιστεύεις ότι η προσωπικότητα ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η εξυπνάδα ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η συμπεριφορά ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι οι μαθησιακές δυσκολίες ενός παιδιού επηρεάζονται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η ψυχική υγεία ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					
Σε ποιο βαθμό πιστεύεις ότι η ευτυχία ενός παιδιού επηρεάζεται από γενετικούς παράγοντες (γονίδια) ή από περιβαλλοντικούς παράγοντες (ανατροφή);					

Κατά τη γνώμη σας, πόσο σωστή είναι η παρακάτω φράση;

Αν γνώριζα ότι ένα παιδί έχει κάποια μαθησιακή δυσκολία, που προέρχεται από γενετικούς παράγοντες, αυτό θα άλλαζε τον τρόπο διδασκαλίας μου προς αυτό το παιδί.

Τελείως σωστή Κάπως σωστή Ούτε σωστή ούτε λάθος Κάπως λάθος Τελείως λάθος

Αν συμφωνείτε παρακαλώ περιγράψτε κατά ποιόν τρόπο θα αλλάζατε τον τρόπο διδασκαλίας σας;

Παρακαλώ συμπληρώστε κατά πόσο συμφωνείτε ή διαφωνείτε με την κάθε πρόταση.

	Διαφωνώ απόλυτα (1)	Διαφωνώ (2)	Ούτε συμφωνώ, ούτε διαφωνώ(3)	Συμφωνώ (4)	Συμφωνώ απόλυτα (5)
<p>Έρευνα που εξηγεί τις επιρροές των γονιδίων πάνω στις γνωστικές ικανότητες θα μπορούσε να είναι χρήσιμη για εκπαιδευτικούς.</p> <p>Γενικώς, πιστεύω ότι η επιστήμη της γενετικής της συμπεριφοράς έχει να παίξει κάποιο ρόλο στην εκπαίδευση.</p> <p>Δεν πιστεύω ότι ευρήματα από την επιστήμη της γενετικής της συμπεριφοράς πρέπει να χρησιμοποιούνται για να επηρεάσουν την κατεύθυνση που θα πάρει η εκπαίδευση μελλοντικά.</p> <p>Προσωπικά, δεν θα ήθελα ευρήματα από την γενετική της συμπεριφοράς να επηρεάζουν τις αποφάσεις που παίρνω καθημερινά στην τάξη μου.</p> <p>Θα ήθελα να μάθω περισσότερα για την επιστήμη της γενετικής της συμπεριφοράς και την επιρροή των γονιδίων στην ανάπτυξη των παιδιών.</p>					

Appendix 3 Sample Interview (Greek and English)

<p>Ερευνήτρια: Ευχαριστώ που ήρθες σήμερα για αυτή τη συνέντευξη. Να σου υπενθυμίσω ότι η συνέντευξη αυτή καταγράφεται</p> <p>Δάσκαλος: Ναι (νεύμα).</p> <p>Ερ: Πόσα χρόνια διδασκαλίας έχεις στο ενεργητικό σου;</p> <p>Δ: Πέντε.</p> <p>Ερ: Και σε τί περιβάλλον, σε τί σχολείο διδάσκει;</p> <p>Δ: Δημόσιο σχολείο, δημοτικό. Μόνο μεγάλες τάξεις, 5 και 6. Δέκα και έντεκα ετών.</p> <p>Ερ: Τέλεια. Ευχαριστώ. Όπως γνωρίζεις αυτή η συνέντευξη είναι μέρος της έρευνας για την οποία συμπλήρωσες το ερωτηματολόγιο πριν λίγους μήνες.</p> <p>Δ: Οκ</p> <p>Ερ: Έχει να κάνεις με τις πεποιθήσεις σου όσον αφορά τα γονίδια και την επιστήμη της γενετικής και την εκπαίδευση. Θα αρχίσουμε λοιπόν με μερικές γενικές ερωτήσεις, είσαι ελεύθερος να αναλύσει επιπλέον όσο θέλεις. Ή να ζητήσεις</p>	<p>Interviewer: Thank you for agreeing to doing this interview. Just for the record you, you are aware that you are being recorded.</p> <p>Teacher: Yes [nods]</p> <p>Int: How many years of teaching experience have you had?</p> <p>T: Five years.</p> <p>Int: And in what sort of context, environment have you been teaching in? What sort of class, what sort of school?</p> <p>T: State schools, primary age group. And only year 5 and year 6. Ten and eleven year olds.</p> <p>Int: Excellent. Thank you. So, as you know this is a follow up to the questionnaire that you filled in a few months ago.</p> <p>T: Ok</p> <p>Int: And it is about your belief regarding genetics and education. So I am going to start with some general questions, feel free to elaborate as you feel you need to. Or clarify. Or ask for clarifications if you need.</p> <p>What do you think are the effects on genes on different character traits and educational outcomes?</p>
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<p>επεξηγήσεις. Ποια νομίζεις ότι είναι η επιρροή των γονιδίων σε διαφορετικά χαρακτηριστικά σε σχέση με το προϊόν της εκπαιδευτικής διαδικασίας;</p> <p>Δ: Πόσο αναλυτικός πρέπει να είμαι; Νομίζω ότι παίζουν ρόλο, ναι. Χμμ, θα έλεγα περίπου 70%.</p> <p>Ερ: Σε σχέση με ποια χαρακτηριστικά, θα έλεγες;</p> <p>Δ: Τι χαρακτηριστικά, χμμ...</p> <p>Ερ: Ή προϊόντα της εκπαιδευτικής διαδικασίας.</p> <p>Δ: Νομίζω σίγουρα ότι η εξυπνάδα είναι.</p> <p>Ερ: Τι εννοείς είναι; Μπορείς να το αναλύσεις;</p> <p>Δ: Επηρεάζεται από τα γονίδια. Επίσης νομίζω ότι η δεξιότητα στα μαθηματικά επηρεάζεται. Όχι τόσο η γλώσσα. Και δεν είμαι τόσο σίγουρος για τη συμπεριφορά. Αν και μπορεί να υπάρχουν κάποια χαρακτηριστικά της συμπεριφοράς που επηρεάζονται.</p> <p>Ερ: Μπορείς να μου πεις λίγα πράγματα για τους παράγοντες που πιστεύεις ότι επηρεάζουν το πόσο καλά τα πάει ένα παιδί στο σχολείο;</p> <p>Δ: Υπάρχουν κάποιες επιλογές; Παραδείγματος χάρη παράγοντες από το σπίτι κάνουν τη διαφορά. Και κοινωνικο-οικονομικοί παράγοντες, σίγουρα. Φαντάζομαι πως, για παράδειγμα, φυλετικοί παράγοντες, αν είσαι σε μειονότητα. Είναι κι αυτός ένας παράγοντας</p>	<p>T: How much do you want me to elaborate? I think they do have an effect, yes. Erm, I would say about 70%.</p> <p>Int: On what sort of character traits would you say?</p> <p>T: Erm, character traits? Hmmm...</p> <p>Int: Or educational outcomes in general.</p> <p>T: I think definitely intelligence is.</p> <p>Int: What do you mean is...can you elaborate?</p> <p>T: Is affected by genes. I also strongly suspect that mathematical ability is too, not so much language. Less convinced about behavioural traits. There must be some behavioural traits that might follow through.</p> <p>Int: Can you tell me a little bit about what factors you think affect how well a child does in school?</p> <p>T: Erm, is there a choice? Home factors, for example, make a difference. Socio-economic factors make a difference. Erm, yes, socio-economic for sure. I guess sort of like, racial factors, for example if you are a minority. That's a factor in terms of success.</p> <p>Int: Can you give me an example on a trait that you consider mainly genetic?</p>
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<p>σε σχέση με την επιτυχία.</p> <p>Ερ: Μπορείς να μου δώσεις ένα παράδειγμα από κάποιο χαρακτηριστικό που πιστεύεις ότι είναι κυρίως στα γονίδια;</p> <p>Δ: Θα έλεγα το IQ, όπως πχ στα τεστ νοημοσύνης. Όχι πάντα, αλλά πολύ.</p> <p>Ερ: Πόσο σημαντικός είναι ο ρόλος του δασκάλου σε σχέση με τα προϊόντα της εκπαιδευτικής διαδικασίας;</p> <p>Δ: Θα ήθελα να πιστεύω πολύ (γελάει). Πολύ σημαντικός. Αλλά πιστεύω ότι στην πραγματικότητα είναι πολλοί οι παράγοντες. Νομίζω ότι ένας δάσκαλος μπορεί να κάνει μεγάλη ζημιά, και εξαρτάται και από το πόσο υπάρχει υποστήριξη από το σπίτι, και κάποιοι από τους παράγοντες που ανέφερα στις προηγούμενες ερωτήσεις, νομίζω ότι ένας δάσκαλος μπορεί να μην έχει τεράστια επιρροή, αλλά να έχει θετικό αποτέλεσμα. Ένα θετικό αποτέλεσμα.</p> <p>Ερ: Ευχαριστώ, ήταν πολύ ξεκάθαρο.</p> <p>Τι μπορείς να κάνεις, πιστεύεις, για να βοηθήσεις ένα παιδί που μπορεί να έχει κάποια γενετική μαθησιακή δυσκολία;</p> <p>Δ: Χμ, πιστεύω ότι όταν τακτοποιηθεί και διαγνωστεί η μαθησιακή δυσκολία, χμ, και μετά μπορείς να καταλάβεις πως μπορείς να την αντιμετωπίσεις και να υποστηρίξεις.</p> <p>Ερ: Θα έκανε διαφορά αν ξέρεις ότι είναι γενετική, ή όχι.</p> <p>Δ: Όχι, δεν νομίζω. Όχι. Νομίζω ότι η στρατηγική θα ήταν η ίδια: να υποστηρίξω το παιδί.</p>	<p>T: Erm, I would say IQ, as tested and scored. Not always, but a lot.</p> <p>Int: How important is a teacher's contribution to educational outcomes?</p> <p>T: I would like to think a lot (laughs). Very important. But I think in reality it is a factor amongst many other factors. I think a bad teacher might do a lot of damage, I think depending on school and home support some factors from the previous questions, I think a teacher might not make as great a contribution but it can still add to a positive effect. A net positive effect.</p> <p>Int: Thank you, that was clear enough.</p> <p>How much do you think you can do, to help a child who might have a genetically linked learning difficulty?</p> <p>T: Well, erm, I think identifying what the learning difficulty is, erm, and from there you can understand maybe how to tackle and how to support.</p> <p>Int: Would it make a difference to you if it is genetically linked or not?</p> <p>T: No, I don't think so. No. I think the approach would be the same, to support the child.</p> <p>Int: Are there any other thoughts you might want to share regarding genetics and education?</p> <p>T: Erm. No. (Laughs)</p>
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<p>Ερ: Έχεις κάποιες άλλες σκέψεις πάνω στα γονίδια και στην εκπαίδευση που θα ήθελες να μοιραστείς;</p>	
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Δ: Ε, όχι. (Γέλιο)

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