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DEPARTMENT OF EDUCATION

TIME ON TASK REVISITED:

DYNAMIC RELATIONS AMONG

TIME ON TASK, QUALITY OF TEACHING, PERSONALITY TRAITS

AND THINKING STYLES

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ΠΕΡΙΛΗΨΗ

Η έρευνα αυτή επικεντρώνεται στη μελέτη του χρόνου εμπλοκής των μαθητών. Ερευνά εάν και πώς επηρεάζει τα μαθησιακά αποτελέσματα και εάν επηρεάζεται από άλλους παράγοντες που λειτουργούν σε επίπεδο μαθητή ή τάξης. Συγκεκριμένα, η έρευνα διερευνά κατά πόσο η ποιότητα διδασκαλίας, όπως προτείνεται από το Δυναμικό Μοντέλο Εκπαιδευτικής Αποτελεσματικότητας, καθώς επίσης και παράγοντες που εδράζονται στο επίπεδο του μαθητή και σχετίζονται με την ψυχολογική διάσταση της Έρευνας για την Εκπαιδευτική Αποτελεσματικότητα (συγκεκριμένα, ο τύπος προσωπικότητας και το στιλ μάθησης), έχουν έμμεσες επιπτώσεις στα μαθησιακά αποτελέσματα μέσω του χρόνου εμπλοκής. Επιπρόσθετα, η έρευνα αυτή μελετά το βαθμό στον οποίο η ποιότητα διδασκαλίας καθώς επίσης και ο τύπος προσωπικότητας του μαθητή και το στιλ μάθησης του, μπορούν να επηρεάσουν τα μαθησιακά αποτελέσματα.

Μια συστηματική επισκόπηση της βιβλιογραφίας όπως παρουσιάζεται στη διατριβή, αποκαλύπτει ότι ο χρόνος εμπλοκής είναι ένας παράγοντας στο επίπεδο του μαθητή που έλαβε αρκετή προσοχή στο παρελθόν επειδή φάνηκε να σχετίζεται με τα μαθησιακά αποτελέσματα, αλλά εγκαταλείφθηκε καθώς δεν μελετήθηκε κάποια άλλη πτυχή του. Παρόλα αυτά, εάν ο χρόνος εμπλοκής είναι ένας παράγοντας που επηρεάζει τα μαθησιακά αποτελέσματα, αξίζει να διερευνηθεί ποιοι παράγοντες τον επηρεάζουν. Εάν αυτοί οι παράγοντες μπορούν να εντοπιστούν, τότε μπορούν να σχεδιαστούν παρεμβάσεις που να βελτιώνουν τους εν λόγω παράγοντες. Βελτιώνοντας αυτούς τους παράγοντες, ο χρόνος εμπλοκής των μαθητών μπορεί να μεγιστοποιηθεί, και ως αποτέλεσμα να βελτιωθούν τα μαθησιακά τους αποτελέσματα. Μια μεταβλητή που ενδέχεται να επηρεάζει τον χρόνο εμπλοκής είναι η ποιότητα διδασκαλίας και συγκεκριμένα οι παράγοντες αποτελεσματικότητας σε επίπεδο εκπαιδευτικού όπως προτείνονται από το Δυναμικό Μοντέλο. Παρόλο που πολλές έρευνες εξέτασαν την άμεση επίδραση της ποιότητας διδασκαλίας στα μαθησιακά αποτελέσματα, καμία έρευνα δεν έχει διερευνήσει την ύπαρξη έμμεσων αποτελεσμάτων της ποιότητας διδασκαλίας στα μαθησιακά αποτελέσματα μέσω του χρόνου εμπλοκής. Επιπρόσθετα, ο χρόνος εμπλοκής ενδέχεται να επηρεάζεται από τον τύπο προσωπικότητας και το στιλ μάθησης του μαθητή, καθώς είναι όλοι παράγοντες που εδράζονται στο επίπεδο του μαθητή, και το δυναμικό μοντέλο αναμένει ότι παράγοντες του ίδιου επιπέδου ενδέχεται να αλληλοεπηρεάζονται. Παρόλα αυτά φαίνεται ότι η υφιστάμενη βιβλιογραφία που αφορά τον τύπο προσωπικότητας και το στιλ μάθησης επικεντρώθηκε στο πώς οι μεταβλητές επηρεάζουν άμεσα τα μαθησιακά αποτελέσματα, ενώ δεν ερευνήθηκε κατά πόσο υπάρχουν έμμεσες επιπτώσεις μέσω του χρόνου εμπλοκής. Συνεπώς, η παρούσα

έρευνα, εντοπίζοντας τα κενά στη βιβλιογραφία, διαμόρφωσε τους σκοπούς που παρουσιάστηκαν πιο πάνω.

Για να διερευνηθούν οι σκοποί της έρευνας, οι συμμετέχοντες επιλέχθηκαν με κατά στάδιο δειγματοληψία. Η διαδικασία επέφερε ένα σύνολο από 27 σχολεία δημοτικής εκπαίδευσης, 107 εκπαιδευτικούς και 1718 μαθητές. Οι μεταβλητές που συμπεριλαμβάνονται σε αυτή την έρευνα είναι ο χρόνος εμπλοκής, η αρχική επίδοση, η τελική επίδοση, ο τύπος προσωπικότητας και το στιλ μάθησης των μαθητών, καθώς και η ποιότητα διδασκαλίας του εκπαιδευτικού. Για να μετρηθεί η αρχική και τελική επίδοση των μαθητών, χορηγήθηκαν δοκίμια επίδοσης στην αρχή και στο τέλος της σχολικής χρονιάς αντίστοιχα. Ο τύπος προσωπικότητας του μαθητή μετρήθηκε με τη χρήση του Ερωτηματολογίου Προσωπικότητας για μαθητές, ενώ το στιλ μάθησης μετρήθηκε με το Ερωτηματολόγιο του Στιλ μάθησης για μαθητές. Η ποιότητα διδασκαλίας του εκπαιδευτικού μετρήθηκε με το Ερωτηματολόγιο για την Ποιότητα Διδασκαλίας για μαθητές. Τέλος, ο χρόνος εμπλοκής των μαθητών μετρήθηκε με τη χρήση ενός καινούριου εργαλείου που αναπτύχθηκε από αυτή την έρευνα, το Εργαλείο Παρακολούθησης Μαθητή για καταγραφή Χρόνου Εμπλοκής κατά τη διάρκεια παρακολούθησης δύο μαθημάτων.

Με την αξιοποίηση της Πολυεπίπεδης ανάλυσης παλινδρόμησης, φάνηκε ότι η κατηγορία χρόνου εμπλοκής «1.Ενεργής συμμετοχή» έχει θετική επίδραση στα μαθησιακά αποτελέσματα, καθώς η κατηγορία «4β.Μη συμμετοχή με ευθύνη μαθητή» έχει αρνητική επίδραση. Από τις μεταβλητές της Προσωπικότητας, η «Ευσυνειδησία» και η «Δεκτικότητα στην Εμπειρία» φάνηκε να έχουν θετική επίδραση στα μαθησιακά αποτελέσματα. Από τις μεταβλητές του στιλ μάθησης, το «Εκτελεστικό» και το «Τοπικό» στιλ είχαν θετική και αρνητική επίπτωση αντίστοιχα. Οκτώ από τους παράγοντες της ποιότητας διδασκαλίας (συγκεκριμένα, Δόμηση: Ποσότητα, Δόμηση: Ποιότητα, Εφαρμογή: Ποιότητα, Διαχείριση χρόνου, Υποβολή ερωτήσεων: Ποιότητα, Μοντελοποίηση, Διαχείριση απειθαρχίας και Αξιολόγηση) είχαν θετική επίδραση στα μαθησιακά αποτελέσματα.

Επιπρόσθετα των άμεσων επιδράσεων των πιο πάνω μεταβλητών στα μαθησιακά αποτελέσματα, αυτή η έρευνα εξετάζει επίσης κατά πόσο ο τύπος προσωπικότητας, το στιλ μάθησης, και η ποιότητα διδασκαλίας έχουν και έμμεσες επιδράσεις στα μαθησιακά αποτελέσματα μέσω του χρόνου εμπλοκής. Η Πολυεπίπεδη ανάλυση παλινδρόμησης δεν μπορεί να αναζητήσει έμμεσες επιδράσεις, επομένως αξιοποιήθηκαν τα Πολυεπίπεδα δομικά μοντέλα εξίσωσης από όπου και προέκυψαν οι πιο κάτω σχέσεις. Σε επίπεδο μαθητή, από τους τύπους προσωπικότητας, η «Ευσυνειδησία», η «Δεκτικότητα στην Εμπειρία» και η «Συγκαταβατικότητα» φάνηκε να έχουν θετική επίδραση στα μαθησιακά αποτελέσματα.

Αναφορικά με τα στιλ μάθησης, το «Εκτελεστικό» είχε θετική και το «Τοπικό» αρνητική επίπτωση στα μαθησιακά αποτελέσματα. Αναφορικά με τον χρόνο εμπλοκής, η κατηγορία «1.Ενεργής συμμετοχή» είχε θετική επίδραση στα μαθησιακά αποτελέσματα, καθώς οι κατηγορίες «4α. Μη συμμετοχή με ευθύνη εκπαιδευτικού» και «4β. Μη συμμετοχή με ευθύνη μαθητή» είχαν αρνητική επίδραση. Σε επίπεδο τάξης, από τους παράγοντες ποιότητας διδασκαλίας, η «αλληλεπίδραση εκπαιδευτικού-μαθητή» και η «αξιολόγηση», παρουσίασαν άμεση θετική επίδραση στα μαθησιακά αποτελέσματα. Επιπλέον, η «Δόμηση: Ποσότητα», «Δόμηση: Ποιότητα», και Διαχείριση χρόνου παρουσίασαν τόσο άμεσες επιπτώσεις στα μαθησιακά αποτελέσματα, όσο και έμμεσες μέσω του χρόνου εμπλοκής. Ακόμη, τρεις παράγοντες, «Υποβολή ερωτήσεων: Ποιότητα», «Υποβολή ερωτήσεων: Ποσότητα» και «Διαχείριση απειθαρχίας» παρουσίασαν μόνο έμμεσες επιπτώσεις στα μαθησιακά αποτελέσματα μέσω του χρόνου εμπλοκής. Αναφορικά με τον τύπο προσωπικότητας και το στιλ μάθησης, δεν βρέθηκαν παράγοντες που να επηρεάζουν τον χρόνο εμπλοκής.

Ένα σημαντικό εύρημα της έρευνας είναι ότι η ποιότητα διδασκαλίας φάνηκε να έχει, όχι μόνο άμεση επίδραση στα μαθησιακά αποτελέσματα, αλλά και έμμεσα, μέσω του χρόνου εμπλοκής. Αυτό δείχνει ότι η ποιότητα διδασκαλίας του εκπαιδευτικού είναι σημαντική όχι μόνο επειδή βοηθά τους μαθητές να κατανοήσουν καλύτερα το μάθημα, αλλά και επειδή επηρεάζει τον χρόνο εμπλοκής των μαθητών και κατ' επέκταση τα μαθησιακά αποτελέσματα. Αυτά τα ευρήματα τονίζουν τη σημασία της ποιότητας διδασκαλίας, καθώς φάνηκε για πρώτη φορά ότι επηρεάζει τα μαθησιακά αποτελέσματα όχι μόνο άμεσα αλλά και έμμεσα μέσω του χρόνου εμπλοκής. Επιπροσθέτως, φάνηκε ότι ορισμένοι τύποι προσωπικότητας και στιλ μάθησης επηρεάζουν τα μαθησιακά αποτελέσματα, όπως αναμενόταν. Παρόλα αυτά, δεν βρέθηκαν έμμεσες επιπτώσεις μέσω του χρόνου εμπλοκής. Ακόμη, αυτή η έρευνα αναδεικνύει την περιπλοκότητα της έννοιας του χρόνου εμπλοκής. Δείχνει ότι ο χρόνος εμπλοκής είναι πολυδιάστατος και παρουσιάζει νέες πληροφορίες αναφορικά με τις σχέσεις αυτών των διαστάσεων με την ποιότητα διδασκαλίας και τα μαθησιακά αποτελέσματα. Επίσης, ένα νέο εργαλείο δημιουργήθηκε, το Εργαλείο Παρακολούθησης Μαθητή για καταγραφή Χρόνου Εμπλοκής, το οποίο φάνηκε ότι είναι έγκυρο και κατάλληλο για να μετρήσει τις διαστάσεις του χρόνου εμπλοκής.

Τέλος, συζητούνται οι επιπτώσεις των ευρημάτων της έρευνας για την ανάπτυξη του τομέα της αποτελεσματικότητας. Συγκεκριμένα, γίνεται αναφορά στους κυριότερους περιορισμούς της έρευνας και γίνονται εισηγήσεις για περεταίρω έρευνα. Επιπλέον, συζητούνται οι συνέπειες αναφορικά με την πολιτική για την ποιότητα διδασκαλίας, τον

χρόνο εμπλοκής και την επαγγελματική ανάπτυξη των εκπαιδευτικών. Καταλήγοντας, γίνονται εισηγήσεις για τη χρήση του καινούριου Εργαλείου Παρακολούθησης Μαθητή για καταγραφή Χρόνου Εμπλοκής, από ερευνητές, εκπαιδευτικούς, εκπαιδευτές και αξιολογητές.

ABSTRACT

This study is concerned with students' time on task. It examines if and how it affects student achievement gains, and if it is affected by other student- or classroom-level factors. Specifically, this study investigates whether the teacher effectiveness factors included in the dynamic model and student-level factors associated with the psychological perspective of educational effectiveness research (i.e. personality traits and thinking styles), have indirect effects on student achievement through time on task. Additionally, this study explores the extent to which the teacher factors included in the dynamic model and the students' personality traits and thinking styles, can influence student achievement.

A systematic review of the literature presented in the thesis, reveals that time on task is a student-level factor that received attention in the past because it was found to be connected to achievement, but was later abandoned as no new aspects of the factor were examined. If, however, time on task is a factor that affects student achievement, it is worth investigating which factors influence it. If these variables can be determined, one can design interventions aiming to improve the said variables. By improving these variables, the students' time on task can be maximized and consequently, their achievement gains can be improved. One variable that could affect time on task is quality of teaching and specifically the teacher factors included in the dynamic model, as they include time-related factors. Although many studies have examined the direct effect of quality of teaching on achievement, no study has yet searched for indirect effects of quality of teaching on student achievement gains through time on task. Additionally, it could be argued that time on task may also be affected by the students' personality traits or thinking styles, as they are all factors operating at the student level and the dynamic model expects that factors which operate at the same level may be interrelated. It seems, however, that the existing research regarding personality traits and thinking styles has so far focused on how they directly affect achievement, while the possibility that they affect achievement indirectly through time on task has not been examined. Therefore, this study, considering the gaps in the literature, formed the aims of the study as they were presented above.

To address the aims of the study, participants were selected through stage sampling. The procedure resulted in a total of 27 primary schools, 107 teachers and 1718 students. The variables included in this study are the students' time on task, prior achievement, final achievement, personality traits and thinking styles and the teachers' quality of teaching. To measure the students' prior and final achievement, achievement tests were used at the beginning and at the end of the school year, respectively. The students' personality traits

were measured with the use of the Personality Questionnaire for students, while their thinking styles were measured with the use of the Thinking Style Questionnaire for students. The teachers' quality of teaching was measured with the use of the Quality of Teaching Questionnaire for students. Finally, the students' time on task was measured with the use of a new instrument developed by this study, the Instrument for Student Observation measuring Time on Task (ISOTOT), during two classroom observations.

By using Multilevel Regression Analysis, it was found that time-on-task category "1.Active on-task" has a positive effect on student achievement while "4b.Off task by Student's responsibility" has a negative effect. From the variables of Personality, "Conscientiousness" and "Openness to Experience" were found to have a positive effect on achievement. Regarding the variables of Thinking Style, "Executive" had a positive effect on achievement while "Local" had a negative effect. Eight of the variables of Quality of Teaching (i.e. Structuring: Quantity, Structuring: Quality, Application: Quality, Management of Time, Questioning: Quality, Modelling, Managing misbehaviour and Assessment) had a positive effect on student achievement.

In addition to the direct effects of the above variables on student achievement, this study also examined whether personality traits, thinking styles and quality of teaching have indirect effects on student achievement through time on task. Multilevel Regression Analysis cannot seek indirect effects; therefore, Multilevel Structural Equation Modeling (SEM) Analysis was employed and the following findings emerged. At student level, from the personality trait factors, "Conscientiousness", "Openness to Experience" and "Agreeableness" were found to have a positive effect on student achievement. Regarding the Thinking Style factors, "Executive" presented a positive effect and "Local" presented a negative effect on achievement. From the time-on-task factors, category "1.Active on-task" had a positive effect on student achievement, while "4a: Off-task by teacher's responsibility" and "4b.Off-task by student's responsibility" had a negative effect. At classroom level, from the Quality of teaching factors, "Teacher-student interactions" and "Assessment" presented only a direct effect on student achievement. Additionally, "Structuring: Quantity", "Structuring: Quality" and "Management of time" presented both a direct effect on student achievement, as well as an indirect effect through time on task. Furthermore, three factors, "Questioning: Quality", "Questioning: Quantity" and "Managing misbehaviour" presented only an indirect effect on student achievement through time on task. Regarding the personality traits and thinking styles, no factors were found to affect time on task.

A significant finding of the study is the fact that quality of teaching was found to have, not only a direct effect on student achievement, but also an indirect effect through time on task. This finding suggests that the teacher's quality of teaching is important, not only because it assists students to comprehend the lesson, but also because it affects the students' on-task and off-task time and therefore influences their achievement gains. These findings highlight and reinforce the importance of quality of teaching, as it has been shown for the first time that it affects student achievement gains, not only directly, but also indirectly through time on task. In addition to that, it was found that certain personality traits and thinking styles affect student achievement directly as hypothesized. However, no indirect effects on student achievement through time on task were detected. Additionally, this study emphasizes the complexity of the construct of time on task. It illustrates that time on task is multidimensional and it provides new information regarding the relations of these dimensions with both quality of teaching and student achievement. Furthermore, a new instrument was developed, the Instrument for Student Observation measuring Time on Task (ISOTOT), which was found to be valid and suitable to measure the dimensions of time on task.

Finally, implications of the findings for the development of the field are drawn. Specifically, the main limitations of the study are discussed and suggestions for further research are put forward. In addition, implications regarding policy for quality of teaching, time on task and teacher professional development are discussed. Concluding, suggestions regarding the use of the new Instrument for Student Observation measuring Time on Task by researchers, teachers, trainers and evaluators are made.

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To Natalia and Maximos

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CHAPTER 1: STATEMENT OF THE RESEARCH TOPIC

Background to the Study

Educational effectiveness research (EER) is the field that deals with the question of what works in education and why (Creemers & Kyriakides 2006; Kyriakides, Creemers & Charalambous, 2018), while more recently, Scheerens (2016) gives a broader definition of EER, arguing that it should not only identify what works in education and why, but also under which conditions and on who these factors bring an effect on learning outcomes. Effectiveness in education is an issue that concerns and should concern everyone involved in it (Connolly, 2009) as the demand for schools to improve grows stronger by the years (Gray, Goldstein & Thomas, 2001). Educational effectiveness research is a field that includes various models and different approaches and it is a field that keeps evolving. From a historical perspective the field of EER has gone through four phases. The first phase of EER was mainly concerned with demonstrating that teachers and schools matter in promoting student learning outcomes. The second phase of EER was concerned with the identification of factors that may explain differences in the effectiveness of schools (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). During the third phase of EER, researchers attempted to explain why certain factors were associated with student learning outcomes (Scheerens & Bosker, 1997). The fourth phase of EER has been evolving since the 2000s. The research done in this phase is not static but emphasises on the complex and dynamic nature of effectiveness (Creemers, Kyriakides & Sammons, 2010; Reynolds et al, 2011). Specifically, this last phase no longer sees education as a fundamentally unchanging set of arrangements. On the contrary, teaching and learning are seen as dynamic processes that are constantly adapting to changing needs and opportunities (Kyriakides, Creemers, Antoniou, Demetriou, & Charalambous, 2015; Scheerens, 2013) and the various levels of the educational system are considered to be interacting and achieving variable outcomes (Creemers & Kyriakides, 2008). During this phase, Creemers and Kyriakides (2008) presented the Dynamic Model of Educational Effectiveness which constitutes the theoretical framework of the current study.

The dynamic model is multilevel in nature and it refers to factors associated with learning outcomes that are situated at four different levels: student, classroom, school, and system (Kyriakides, Creemers, Antoniou & Demetriou, 2010). Further, it is expected that some factors which operate at the same level are interrelated (Creemers & Kyriakides, 2006; Creemers, 2005; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). As aforementioned, EER is concerned with improving the effectiveness in education. This can

be attempted by causing change to factors that are related to student achievement. It can be expected, however, that this intervention can be achieved with factors that are able to change over time.

The dynamic model makes a distinction among the student-level factors as a) factors that are unlikely to change, including SES, ethnicity, gender and personality traits, b) factors that change over time, including expectations, subject motivation and thinking style, and c) aptitude, perseverance, time on task and opportunity to learn. The dynamic model suggests that these student-level factors from all three categories affect student achievement, may affect each other, and may affect and be affected by quality of teaching. Nonetheless, it does not specify which factors interact with which and in what way. Hence, there is a lack of in-depth information regarding the operation of student-level factors among either themselves or factors operating at different levels, such as classroom-level factors. Therefore, the need for further development and clarification regarding the relations between student-level factors is imperative. Studies that focus their interest on specific factors and examine how they interact can further develop the theoretical framework of EER. The current study attempts to do so, by examining the relations between student-level factors, quality of teaching and student achievement.

One student-level factor that is subject to change is time on task. Time on task is defined as the time the student is engaged on particular learning tasks (Berliner, 1990) and Anderson (1981) clarifies that time on task refers to "the amount of time students are actively engaged in learning rather than the amount of time students are exposed to learning activities and materials" (p. 289). This study acknowledges these definitions and considers time on task as the time the student is actively and observably engaged on learning tasks. The discussion regarding time-on-task began long ago when Carroll (1963) published the paper "A Model of School Learning" in which he proposed that student learning depends on the amount of time a student spends on actively engaged in the learning process in relation to the time the student needs to achieve a learning goal. Much of the work since then has been built upon Carroll's theory that time in classroom settings influences student achievement (National Center on Time & Learning, 2010). Twenty five years later, Carroll (1989) acknowledged that the various studies conducted, highlighted the importance of time on task, but the construct of quality of teaching has not been systematically examined, not even by Carroll.

Researchers have long been examining the relationship between time on task and academic achievement and many have found positive associations between time and learning (Anderson, 1976; Cobb, 1972; Karweit, 1984; Lahaderne, 1968; Ozcekick, 1973; Stallings,

1980). On the other hand, there are researchers that doubt the examination of time and its relation to academic achievement. Some even argue that time-on-task-based research is uncertain (McNamara, 1981), while others question the power of time on task even when measured adequately (Karweit, 1983; Levin, Glass & Meister, 1984). However, there has been little scientific interest in the field of time on task in the last decades. One factor that may have led to declined scientific interest is the fact that so far, time on task has been measured mainly dichotomously: students were characterised as being on-task or not with the information produced not presenting much importance in the long term (National Center on Time & Learning, 2010). Nevertheless, in the research concerning the construct of time on task, there are still questions that have not been asked and relations that have not been explored and exposed. Among the latter is the relationship between time on task and quality of teaching. Hence, there is a commanding need for further research regarding the field of time on task.

It has been shown that time on task is a variable that seems to affect student achievement. Therefore, it is important primarily to determine whether time on task truly affects student achievement gains and how; that is, which aspects of time on task present an effect. Once established that time on task affects student achievement gains, it is important to determine which variables affect time on task. In this way, by improving the variables that affect time on task, the students' time on task can be maximized and consequently their achievement gains will be improved. As mentioned above, the relationship between time on task and quality of teaching has not been thoroughly examined. More specifically, a question that calls for further investigation is whether quality of teaching could make students spend more time on-task and as a result increase their achievement. Based on the literature, it seems that until now, research regarding quality of teaching focuses on finding direct effects of quality of teaching to student achievement.

What has not been searched before, is whether additionally to the direct effects, both indirect effects exist through time on task. When searching for variables that may affect time on task, one can assume that other time-related variables may be related to time on task. For instance, one could consider the variable "management of time" which is a quality-of-teaching factor. It can be assumed that if a teacher has poor time-management skills, his/her students are left off-task for longer periods of time, which might affect the students' achievement gains. Similar assumptions can be made for the factor "managing misbehaviour" which is another quality-of-teaching factor related to time. A teacher that manages student misbehaviour effectively, has more time to focus on the instruction of the lesson's goals, providing his/her

students with more potential on-task time. Not only quantitative factors, but also qualitative characteristics of a teacher's quality of teaching may affect students' time on task. For instance, a sufficient amount of quality-appropriate structuring activities could be something that could keep students interested and actively involved in the lesson. Similar assumptions can be made with more quality of teaching factors such as questioning or interaction opportunities. Consequently, it can be seen that quality of teaching, time on task and student achievement gains may share a connection. This study suggests that time on task acts as a mediator of the effects the quality of teaching have on student achievement gains. This has never been examined before and if this relation can ultimately be demonstrated, this would suggest that the effect of the quality of teaching on student achievement gains has been underestimated so far, as it is measured only by the direct effect the former has on the latter.

In addition to quality of teaching, time on task may also be influenced by other variables as well. As mentioned earlier, the Dynamic Model suggests that student-level factors may affect one another. As all students are different, their time on task may be affected by their personal characteristics. Therefore, the current study will explore two student-level factors, namely, personality traits and thinking styles. Personality traits, and more specifically, the Five Factor Model as proposed by McCrae and Costa (1987) that this study is concerned with, argues that persons can be characterized by individual differences that are stable over time, consistent across situations, and involve patterns of thought, affect, and behaviour (Eysenck & Eysenck, 1985; McCrae & Costa, 1996, McCrae & Costa, 1999; White, Hendrick & Hendrick, 2004). Additionally, thinking styles constitute the preferred ways of using one's abilities in order to organize oneself (Zhang, 2006).

It seems that the existing research concerning the connection between personality traits and academic achievement has so far focused on how achievement is directly influenced by certain personality traits. There is however a visible lack of evidence of whether personality traits affect factors that are also found to influence academic achievement, such as time on task. This lack of evidence makes the investigation of whether personality traits have indirect effects on student achievement through time on task worth of further examination. Respectively, research on thinking styles has focused on how thinking styles affect achievement. This study will explore both direct and indirect effects of personality traits and thinking styles on student achievement through time on task. If personality traits are found to affect time on task, then this should be taken into consideration by the teacher when preparing the lesson. The teacher, through proper differentiation, could ensure that students are not left off-task as a result of their personality trait. Respectively, if the study finds that

some thinking styles assist students remain on task for longer periods of time, this should also be taken into consideration by the teacher. More specifically, since thinking style is a student characteristic that can change over time, the teacher may develop strategies to assist students turn to "optimal" thinking styles that will enable them to stay on task for longer periods of time and therefore improve their achievement.

Research purpose

This study is concerned with student's time on task. It examines if and how time on task affects student achievement gains, and if it is affected by the quality of teaching, and more specifically, the teacher effectiveness factors as they are proposed by the Dynamic Model of Educational Effectiveness. So far, research regarding quality of teaching has focused on finding direct effects of quality of teaching to student achievement. Many studies have also found a positive relation of time on task on student achievement. What has not been examined before, is whether additionally to the direct effects both indirect effects exist. The purpose of this study is to explore both. More specifically, it will explore whether time on task is a mediator between quality of teaching and student achievement gains. Does quality of teaching affect time on task and through that, is there an effect on student achievement? Can quality of teaching make students spend more time on-task and therefore increase their achievement? This will shed light and provide supplementary information to the existing knowledge regarding time on task and quality of teaching.

Additionally, two more student-level effectiveness factors will be examined in-depth: personality traits and thinking styles. It will be examined if these psychological variables affect time-on-task and through that the student achievement. For example, is a student whose personality trait is Conscientiousness more likely to remain on-task? Similarly, is a student with Anarchic thinking style more likely to get off-task?

Finally, a broader understanding of the term time on task can be acquired through this study. With the use of the Classroom Observation Instrument for the collection of the time-on-task data, detailed information will be obtained. There will be an effort to associate this data with quality of teaching. For example, it will be examined if the task assigned by the teacher and its relevance to the lesson's goals affects whether the student will present an on-task or off-task behaviour.

Research Questions

1. To what extent can a) the teacher effectiveness factors included in the dynamic model, b) the students' time on task, c) the students' personality traits and d) the students' thinking styles, influence student achievement?
2. Do a) the teacher effectiveness factors included in the dynamic model, b) specific personality traits and c) specific thinking styles have an indirect effect on student achievement through time on task?

Methodology

To address the questions presented in the previous section, this study selects participants from the fourth, fifth and sixth grade of primary schools, using stage sampling. The variables included in this study are the students' time on task, prior achievement, final achievement, personality traits and thinking styles and the teachers' quality of teaching. To measure these variables, a number of instruments were employed. More specifically, achievement tests are used at the beginning and at the end of the school year to measure the students' prior and final achievement, respectively. The personality traits of the students are measured with the use of the Personality Questionnaire for students, while their thinking styles are measured with the use of the Thinking Style Questionnaire for students. The teachers' quality of teaching is measured with the use of the Quality of Teaching Questionnaire for students. Finally, the students' time on task is measured with the use of a new instrument developed by this study, the Instrument for Student Observation measuring Time on Task (ISOTOT), during two classroom observations.

One of the main questions of this study is whether the students' personality traits, their thinking styles, their time on task and the teacher's quality of teaching have a direct effect on student achievement. To answer this question, Multilevel Regression Analysis is used. In addition to the direct effects of the above variables to student achievement, indirect effects are also sought. More specifically, this study examines whether personality traits, thinking styles and quality of teaching have indirect effects on student achievement through time on task. Multilevel Regression Analysis cannot seek indirect effects; therefore, to answer this question, Multilevel Structural Equation Modelling (SEM) is employed.

Significance of the study

The importance of quality of teaching on student achievement has been stressed by many researchers (Creemers & Kyriakides, 2008; Hextall & Mahony, 1998; Kyriakides, Campbell, & Gagatsis, 2000; Scheerens & Bosker, 1997; Muijs & Reynolds, 2000; Muijs et al., 2014; Rowe, 2003). Additionally, researchers have found correlations between time on task and student achievement gains (Karweit, 1984; Bennett, 1982; Anderson, 1976; Ozcekick, 1973;

Cobb, 1972; Lahaderne, 1968; Stallings, 1980). Even though quality of teaching is considered an important factor for student achievement, studies have examined only its direct effect on student achievement, not the indirect effect through time on task. The current study seeks to find any indirect effect of quality of teaching on student achievement gains through time on task. If successful, it can argue that until now, the effect of quality of teaching might have been underestimated since its indirect effect on student achievement has not been taken into consideration. As this is the first time such relations are being explored, the results of this study can elucidate and throw light upon time on task and its relations with quality of teaching and student achievement gains. Thus, it can be claimed that the results of this study can further develop the theory on the educational effectiveness area. Additionally, the findings of this study can highlight the importance of the teacher's quality of teaching and stress its relation to students' achievement gains. That being the case, the study can advise policymakers on how they can use the results of the study to improve students' achievement gains.

In the same respect, researchers have found correlations between personality traits and student achievement gains (Chamorro-Premuzic & Furnham, 2003b; Costa & McCrae, 1992; Eysenck & Eysenck, 1985; O'Connor & Paunonen, 2007; Trapmann, Hell, Hirn & Schuler, 2007), as well as correlations between thinking styles and student achievement gains (Bernardo, Zhang & Callueng, 2002; Zhang, 2001, 2004; Zhang & Sternberg, 1998). Even though researchers have explored the direct relations of personality traits and thinking styles on student achievement gains, there has not been any research examining the possibility of indirect effects of the above factors on student achievement gains. This study seeks to find indirect effects of personality traits and thinking styles on student achievement gains through time on task. Therefore, this study can provide new information as regards to time on task and its relations with personality traits, thinking styles and student achievement gains and can in turn further develop the field of educational effectiveness.

This study is mainly concerned with time on task and seeks to provide a broader and better understanding of the term. To study new and complex questions regarding time on task, a new time-on-task instrument is created which includes an elaborate categorization of all possible student behaviour. With the use of this new instrument, important information can come to light regarding the various categories of time-on-task behaviours and their relation to student achievement. Therefore, it can be claimed that this study, by providing this new information, can contribute to the enrichment and development of the Educational Effectiveness Research.

Additionally, the current study can further develop the Dynamic Model of Educational Effectiveness. As was mentioned earlier, this study draws from the theoretical framework of the Dynamic Model. The dynamic model suggests that student-level factors affect student achievement, may affect each other, and may affect and be affected by quality of teaching (Creemers & Kyriakides, 2008). Even so, it does not identify which factors interact with which and in what way. The current study examines student-level factors in more depth, can provide new information and will consecutively further develop the Dynamic Model. Finally, the current study also examines certain student-level factors included in the dynamic model and their association with student achievement gains. If the study verifies the above association, it can therefore verify that their inclusion in the dynamic model is correct.

Organization of the thesis

The thesis consists of five chapters. In the first chapter, the problem has been presented and the research questions have been stated. The second chapter includes the analysis of the theoretical foundations of the study. In this chapter, the fields that are being examined are educational effectiveness research, quality of teaching, time on task, personality traits and thinking styles. Throughout the review of the literature, the lack of certain information was highlighted. This led to the creation of the Theoretical Model of this study, which is presented in Chapter 2. Chapter 3 introduces the methodology used to examine the research questions of the present study. It describes the methodology adopted, justifies the chosen research design, and explains the process of sampling and data collecting. The data-collection instruments used in the study are presented, as well as the analyses conducted to check their validity. Additionally, Chapter 3 presents the statistical techniques employed to analyse the data. The validation of the Observation Instrument, as it is a new instrument created by the current study and is one of the main purposes of the study, is presented extendedly in Chapter 4. Additionally, the fourth chapter presents the results of the study. More specifically, the results of the Multilevel Regression Analysis as well as the results from the Multilevel SEM Analysis are presented. Finally, chapter 5, discusses the results of the study. Last but not least, chapter 5 involves a discussion regarding the degree to which the original theoretical model of the study has been validated. Implications of the findings regarding the development of the theory of EER as well as implications regarding the policy are drawn. In chapter 5, the limitations of the study are acknowledged and suggestion for further research is provided.

CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter includes the analysis of the theoretical foundations of the study. In this chapter, the historical development of Educational Effectiveness Research (EER) is presented. The first three phases of EER are discussed, as well as the critique that they have received. It is explained how these events led to the fourth phase, the phase from which the Dynamic Model of Educational Effectiveness, the theoretical framework of this study, derives. After the presentation of the dynamic model, the variables that are examined by this study are reviewed. First, the quality of teaching is discussed, and the teacher effectiveness factors as they are proposed by the dynamic model are presented. Next, time on task is discussed and the existing literature regarding this variable is introduced. Following that, the variable of personality is introduced. It is explained why among various personality models, the current study decides to focus on the Five Factor Model as proposed by McCrae and Costa (1987). After that, the Five Factor Model is presented and the relations between the personality traits and student achievement are discussed. Following that, thinking styles are put forward, as well as the theory of mental self-government, from which the thinking styles have emerged. As with the personality traits, the relations between the thinking styles and student achievement is examined. Finally, the critical discussion of the above literature, led to the creation of the Theoretical Model of this study, which is presented at this point in Chapter 2. The chapter closes with the conclusions which help formulate the design of a new research.

Educational Effectiveness Research

Introduction

Effectiveness in education is an issue that concerns and should concern everyone involved in it (Connolly, 2009) as the demand for schools to improve grows stronger by the years (Gray, Goldstein & Thomas, 2001). Based on the concept of effectiveness in education, a research field was developed. This research field includes different research areas such as school effectiveness research, school improvement research, educational change research, educational effectiveness research and teacher effectiveness research (Teddlie, 2009). Without getting more detailed on these research areas, it could be argued that the specific names used to describe each field frequently depend on the particular direction of the researchers involved (Teddlie, 2009). It is important to note, however, that making a

distinction among the issues that are being addressed or the contributions made by researchers coming from these different fields is difficult as many of the research results across the areas are similar to one another and often overlap (Teddlie, 2009). From all the research areas concerned with the issue of effectiveness in education, educational effectiveness research has been chosen as the theoretical base of this study.

Definition

A number of definitions is given in order to describe educational effectiveness research (EER). Stringfield (1994), for example, describes EER as the process of distinguishing existing ideas and methods along dimensions estimated to be of value. Creemers (2005) points out that this theoretical field aims to establish and test theories which explain the reasons and the methods used that lead some schools and teachers to be more effective than others. This is done, according to the same author, by focusing on understanding the lessons to be drawn from existing practices rather by inventing new ideas or programs. For Creemers and Kyriakides (2006, 2018) and Kyriakides, Creemers, Panayiotou and Charalambous (2021), educational effectiveness research deals with the question of what works in education and why. More recently, Scheerens (2016) gave a broader definition of EER, arguing that it should not only identify what works in education and why, but also under which conditions and for whom these factors have an effect on learning outcomes. The fundamental questions of educational effectiveness research can be briefly described as "what makes a "good" school?" and how to make more schools "good"?" (Reynolds et al, 2014). EER has developed quickly, Reynolds et al (2014) argue, both in the quantity as well as the quality of the research answers it can deliver for these questions.

Educational effectiveness research is a field that includes various models and different approaches. What unites all of these is the concern over determining whether a particular educational approach or type of provision is effective in terms of achieving improvements in relation to some specified outcomes (Connolly, 2009). It could be argued that effectiveness refers to goal attainment, hence, the accomplishment of educational goals is vital to the concept of educational effectiveness (Creemers & Scheerens, 1994). Researching into educational effectiveness usually involves two forms. The first form tries to evaluate the effectiveness of a certain educational programme or intervention and aims to decide if that programme has achieved the desired effects or results specified for it. The second form seeks to understand and explain the effects found (Connolly, 2009). It appears that student

achievement is considered the principal effectiveness criterion in EER although in recent years, researchers have been investigating a broad range of outcomes of education, including non-cognitive outcomes such as student well-being and achievement motivation (Reynolds *et al*, 2011).

Educational effectiveness research is an ever-evolving field. From a historical perspective the field has gone through four phases (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). In this study the first three phases are distinguished from the fourth as it could be argued that these three phases with their advances and their downsides helped the formation of the latter. In the following section, the three first phases are presented.

Historical development of the field

The first three phases.

Educational effectiveness research started initially in the United States and the United Kingdom (Creemers, 2005) and it has its roots in two different theoretical fields, namely, the economically-oriented studies of education production functions and the sociological input-output studies (Creemers & Scheerens, 1994). On the one hand, economically-oriented studies of education production functions are concerned with identifying what inputs can lead to more output while considering their cost (Scheerens, 1991). The models that emerge from this approach are based on the assumption that increasing the inputs will lead to increasing the outcomes (Kyriakides, 2005). Their major characteristics involve the selection of resource inputs as the major type of selection of antecedent condition, the measurement of direct effects and the use of data at only one level of aggregation (Kyriakides, 2005). It seems, however, based on the research conducted using models coming from the economist approach that the relation between input and outcomes is more complex than was first assumed (Creemers & Kyriakides, 2006, Creemers, 2005). On the other hand, sociological input-output studies evaluated the influence on outcomes of alterable educational conditions to sociologically-determined background characteristics of students (Creemers & Scheerens, 1994). Perhaps the most famous example of the sociologically-oriented studies is the Coleman report (Coleman et al., 1966) because through its findings the effect that schooling had on students' outcomes was questioned causing the emergence of a new line of educational effectiveness research (Creemers & Scheerens, 1994).

The studies conducted in the first phase of EER were primarily focused on exploring if different teachers and schools have different impact on student performance, relying on the

belief that a student's progress partly depends on who their teacher is and which school he/she attends (Kyriakides, Creemers, Charalambous, 2018; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). More specifically, the first phase of educational effectiveness research emerged as a reaction to the findings of two studies, Coleman report (Coleman et al., 1966) and Jencks et al. study (1972). Both studies were concerned with the amount of variance that can be explained by educational factors and concluded almost similarly that schools had little effect upon the outcomes of their students compared to the effects of their own ability and social backgrounds (Reynolds *et al*, 2011; Creemers, 2005). The findings of these two studies led, according to Scheerens (1991), to three conclusions. Firstly, that rather little variance in educational achievement can be accounted to school process variables; secondly, that resources and material input alone cannot explain school output and thirdly, that students' background characteristics such as socio-economic status should be used for the adjustment of measurements in order to get to valid performance indicators and therefore be able to interpret in an unbiased way the influence of process characteristics on school functioning. In brief, their findings were interpreted as forming serious doubts on the ability of schools to make a difference compared to the influence of the students' socio-cultural and economic background (Rowe, 2003).

A number of studies came as a reaction to this pessimistic conclusion; included in these is the work of Edmonds (1979) and Rutter, Maughan, Mortimore and Ouston (1979). These studies adopted a different starting point and focused on identifying the characteristics of schools in which students were performing better compared to students of other schools (Rowe, 2003). Edmonds (1979) investigated the possible effect that the school has on students' outcomes and found that a small number of factors contribute to effectiveness. These were educational leadership, focus on the teaching of basic skills, high expectations regarding students' progress, frequent evaluation and a climate that is orderly and safe (Edmonds, 1979). Additionally, the study of Rutter et al found that specific factors were not associated with overall effectiveness, like class and school size and age and size of school buildings (Creemers, 2005). The basic message that emerged from these studies was that some schools were more effective than others even when the background characteristics of the pupil populations were controlled, a conclusion that strengthened the educational effectiveness research programme (Creemers & Scheerens, 1994).

While the first phase of educational effectiveness research aimed at finding the process that made the distinction between effective and less effective schools (Creemers & Scheerens,

1994), during the second phase, by the late 1980s and early 1990s, studies were focused on factors related to student outcomes (Creemers, Kyriakides & Sammons, 2010 Kyriakides, Creemers & Charalambous, 2018; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). More specifically, the second phase of educational effectiveness research was mainly focused on variables at student level which were assumed to predict student outcomes (Creemers & Kyriakides, 2006; Creemers, 2005). Thus, in this phase the scientific properties of school effects in areas like the stability of school effects over time, the consistency of school effects on different outcome areas, the differential effects of school on students with different background characteristics, the size of school effects and the long term effects of schools were studied (Reynolds *et al*, 2014).

One of the most influential models that determined this phase was Carroll's Model (Carroll, 1963). Carroll's model (1963) stated that the degree of mastery is a function of the ratio of the amount of time students actually spend on learning tasks to the overall amount of time they need (Creemers, 2005; Kyriakides, 2005). In particular, Carroll (1963) argued that time actually spent on learning is defined as equal to the smallest of three variables: a) opportunity (time allowed for learning), b) perseverance (the amount of time students are willing to engage actively in learning), and c) aptitude (the amount of time needed to learn under optimal instructional conditions). However, it is worth mentioning, that although Carroll's model (1963) focused on the importance of the quantity and quality of instruction and the influences of student and environmental characteristics, it was criticised for not being useful enough in identifying which are these school and classroom factors that improve student outcomes as well as the way the factors were supposed to cause the effects on student outcomes (Creemers & Reezigt, 1999).

Creemers (1994), with the principles of mastery learning and direct instruction, developed Carroll's model of learning by identifying three components within quality of instruction, those being curricular materials, grouping procedures and teacher behaviour (Creemers, 2005; Kyriakides, 2005). For Creemers, these three components influence the time on task and opportunity to learn which alongside individual students' aptitudes are directly related to students' achievement (De Jong, Westerhof & Kruiter, 2004; Kyriakides, Campbell & Gagatsis, 2000). Thus, while Carroll's model explained why students perform differently in handling a task, Creemers' model ultimately explains why educational systems perform differently as the influences on student achievement are multilevel (Kyriakides, 2005). The validity of Creemers' model was tested by a number of studies that followed (e.g., De Jong,

Westerhof, & Kruiter, 2004; Kyriakides, 2005; Kyriakides, Campbell, & Gagatsis, 2000; Kyriakides & Tsangaridou, 2008) which confirmed the multilevel nature of effectiveness but acknowledged that the relationship between factors at different levels might be more complex than assumed (Creemers & Kyriakides, 2006).

Creemers' model is indicative of the third phase of educational effectiveness research. In this phase, by the late 1990s and early 2000s, several theoretical models had been developed, which intended to explain why factors operating at different levels are related to academic achievement (Creemers, Kyriakides & Sammons, 2010). Besides Creemers' model, other models were also developed this period (e.g., Stringfield & Slavin, 1992; Scheerens, 1992; Creemers, 1994) having as common ground a multilevel structure, where students are nested in classrooms or teachers, classrooms are nested in schools and schools are nested in contexts (Creemers, 2005). All these models draw on organisational theories and theories of learning and refer to multiple factors at different levels; however, each of them either focuses on the classroom or the school level (Creemers & Kyriakides, 2006).

The research undertaken in these three phases helped establish the recognition that schools have an effect on the education of their students (Teddlie, 2009). Following this, is the acknowledgment that schools could change the education that they provide, altering in this way the lives of their students and the society around them (Reynolds *et al*, 2011). The research done in these three phases, also provided the field with a valid body of knowledge that provides information on the issue of educational effectiveness (Teddlie, 2009). However, it must be noted here that the research done in these three phases revealed a number of issues that emanate from the theoretical and empirical investigation of the effectiveness in education in this period (Reynolds *et al*, 2011). These issues are considered as critiques and are presented next.

Critiques on the research done in the three first phases.

Four major concerns against the effectiveness research done in the first three phases have been stressed. To begin with, research done in this period has been accused of providing little knowledge on the causal mechanisms that explain the correlations of effectiveness noticed in different schools (Scheerens, 1991). More specifically, as Coe and Taylor Fitz-Gibbon (1998) argued, the research done in these phases failed to provide a causal connection between schools and their effectiveness and was found inadequate to demonstrate the extent to which differences among schools and their effectiveness are actually caused by

identifiable factors within the school. What is more, in most effectiveness studies there was no clear distinction between the different aspects of an effectiveness factor which were found to be associated with student achievement (Kyriakides & Creemers, 2008). However, it is important to recognise two points made by Creemers and Reezigt (1999). Firstly, that it is hard to relate the small proportion of variance accounted for by schools and classrooms to a specific set of factors, and secondly, that even when some effectiveness factors achieve the effects that they are supposed to achieve, these effects are often not stable but change over time.

A second critique of effectiveness research regarding the first three phases involves the lack of theoretical foundation that impedes the identification of the factors that contribute to effectiveness. Firstly, the difficulty of establishing effectiveness criteria could be attributed to the term "effectiveness" being rather vague with only few agreed international constructs concerning it (Reynolds, Creemers, Stringfield & Teddlie, 1998). One other factor that hinders the establishment of effectiveness criteria in these early phases, is that studies in EER often conceptualised them differently, often measured them differently and often employed different methods in their analysis (Reynolds *et al*, 2011). A third factor that can be linked to the difficulty of establishing effectiveness criteria involves the fact that there has been noticed a shortage of rational models from which researchers can build theory (Creemers & Kyriakides, 2006; Creemers, 2005) and the occasional use of whatever models exist (Scheerens & Bosker, 1997). Therefore, the majority of studies on educational effectiveness have been criticised of being atheoretical and of establishing statistical relationships between variables rather than testing theories to explain those relationships and contribute to the design of strategies for improving educational effectiveness (Creemers, 2005).

A third issue involves the methods used in order to collect data in educational effectiveness research. During these three phases, an emphasis was placed on the collection of quantitative data. Quantitative data sets the dependent variable of student performance, and those school and classroom variables that could have been expressed in numerical data, such as teacher behaviours and school size (Reynolds, Creemers, Stringfield & Teddlie, 1998). This emphasis was reasonable considering that it was the quantitative data that provided the researchers with proof that schools varied in their effects (Reynolds *et al*, 2011). There was not, nonetheless, enough qualitative data that would explain the findings of the quantitative data. This made it difficult for policymakers and practitioners to access the findings of the

field and the field itself (Reynolds *et al*, 2011). Basically, EER lacked detailed descriptions (Reynolds *et al*, 2011) that could be provided through qualitative data and mixed methods studies. Thus, the additional use of qualitative methods is required in order to understand the actual meanings and motivations related to those involved and the complex social processes and practices related to the intervention (Connolly, 2009).

Finally, a last critique of effectiveness research done in the first three phases concerns the use of achievement test data on a limited set of subjects (Rowe, 2003). It has been noticed that most effectiveness studies have used achievement test data on a limited set of subjects, specifically language and mathematics, even though educational attainment data has also been used (Scheerens, 1991). The lack of in-depth understanding regarding the experience of different subjects, different student groups and different student groups within different subjects, has restricted the understanding of schools and the extent to which EER is relevant for practitioners who work in "whole school" (Reynolds *et al*, 2014). Hence, EER was critiqued that it is only interested in the cognitive domain and focuses on basic knowledge and skills, which is restrictive to the field. Therefore, the field was criticized that its narrow scope reduces school learning to measurable and comparable fragments of academic knowledge (Slee & Weiner, 1998).

To sum up, the research done in the first three phases of EER was criticised for the inability to explain the causal mechanisms that clarify the correlations of effectiveness noticed in different schools, the lack of theoretical foundation which complicates the identification of the factors that contribute to effectiveness, and the emphasis that was given in the use of quantitative data and the use of achievement test data on a limited set of subjects. These critiques have led the researchers of the field to develop a new theoretical framework of EER. This new theoretical field comprises the fourth phase and is presented below.

The fourth phase of EER.

The fourth phase of EER has been evolving since the 2000s. The research done in this phase is not static but emphasises the complex and dynamic nature of effectiveness (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Creemers, Kyriakides & Sammons, 2010; Reynolds *et al*, 2014). Specifically, this last phase does no longer see education as a fundamentally unchanging set of arrangements and moves towards one that sees the various levels of the educational system interacting and achieving variable outcomes (Creemers & Kyriakides, 2008). In this phase, teaching and learning are seen as dynamic processes that

are constantly adapting to changing needs and opportunities (Kyriakides, Creemers, Antoniou, Demetriou, & Charalambous, 2015; Scheerens, 2013). In addition to this, newer forms of statistical analysis are being used; ones that better fit the dynamic point of view and allow the establishment of both direct and indirect relationships between educational factors and student outcomes, and also allow the establishment of reciprocal relationships between educational factors, made possible by the increased popularity of structural equation modelling (Reynolds *et al*, 2014). It was during this phase that Creemers and Kyriakides (2008) presented their own model based on the dynamic theory of educational effectiveness which they developed. The dynamic model of educational effectiveness of Creemers and Kyriakides (2008) is presented next.

Dynamic model of educational effectiveness

Introduction

Creemers and Kyriakides' (2008) Dynamic Model, builds on the "comprehensive model" of educational effectiveness, developed by Creemers (1994). As Scheerens (2016) points out, the Dynamic Model shares common characteristics with other integrated, multi-level educational effectiveness models; for instance, those developed by Scheerens (1992), Slater and Teddlie (1992), and Stringfield and Slavin (1992). A common characteristic of the models mentioned above, is that they combine school-level and classroom-level factors that impact achievement, sometimes even school-level factors as well (Scheerens, 2016). The dynamic model of educational effectiveness is essentially the result of an effort to create a framework of effectiveness that serves two functions. On the one hand, the framework should incorporate the dynamic nature of education. On the other hand, it should be comprehensive enough to be able to be used by stakeholders in education to enhance student achievement gains (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). In their model, effectiveness is not regarded as a relatively stable feature of schools but rather as one that progresses over time (Sammons, 2009). This is due to the fact that their dynamic model is based on the recognition that teaching and learning are dynamic processes that are constantly adapting to changing needs and opportunities and that effective schooling should be treated as a dynamic, ongoing process (Creemers & Kyriakides, 2010). The Dynamic Model recognises that education has new goals that do not expect the outcome of schooling to be only the acquisition of basic skills. It recognises and takes into consideration the need to promote not only students' cognitive skills, but also metacognition, as well as affective

and psychomotor skills (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). What is more, the dynamic model assumes that schools which are able to identify their weaknesses and take actions to improve their policy on teaching-related aspects and school learning environment-related aspects, are ultimately able to improve their effectiveness status (Creemers & Kyriakides, 2010). Creemers and Kyriakides' (2008) dynamic model of educational effectiveness research has been categorised as a "grand theory" in the sense that it attempts to provide an overall explanation of phenomena within a particular area of study (Teddlie, 2009).

Description of the dynamic model

The dynamic model refers to multiple factors of effectiveness which operate at different levels. Although effectiveness factors are seen as generic in nature, in this context, it is acknowledged that they may have a different effect on different groups of students/teachers/schools (Creemers & Kyriakides, 2006; Creemers, 2005). Consequently, differentiation is treated as a measurement dimension and focuses on the extent to which activities associated with a factor are implemented in the same way for all the subjects involved with it (Kyriakides & Creemers, 2008). Further, it is expected that some factors which operate at the same level are related to each other and for this reason, it is important to specify groupings of factors (Creemers & Kyriakides, 2006; Creemers, 2005). Additionally, it is assumed that each factor can be defined and measured using similar dimensions, even though there are different effectiveness factors and groupings of factors (Creemers & Kyriakides, 2006; Creemers, 2005). This allows for each factor to be considered as a multidimensional construct while simultaneously, to be consistent with the model's parsimonious nature (Creemers & Kyriakides, 2006). Considering effectiveness factors as multidimensional constructs, contributes to the understanding of what makes teachers and schools effective (Kyriakides & Creemers, 2008). Moreover, the model's design allows for the possibility that the relationship between the factors and the outcomes may not be linear (Creemers & Kyriakides, 2006; Creemers, 2005), which refers to the possibility of searching for optimal values of the different dimensions of the factors and optimal combinations between factors (Creemers & Kyriakides, 2006).

The multilevel nature of the dynamic model is attributed to the fact that it refers to factors associated with learning outcomes that are situated at four different levels: student, classroom, school, and system (Kyriakides, Creemers, Antoniou & Demetriou, 2010; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). In the dynamic model, the

teaching and learning situation is emphasised and the roles of the teachers and students are analysed (Creemers & Kyriakides, 2010). The model refers to two main categories of background factors operating at the student level which can influence the effectiveness of education. The two categories are: a) Sociocultural and economic background variables emerging from the sociological perspective of EER and b) Background variables emerging from the psychological perspective of EER. Additionally, the dynamic model refers to background variables related to specific learning tasks that emerge from the psychological perspective of EER (such as time on task and opportunity to learn) which are also included as significant student-level factors (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). At the classroom level, based on the main findings of teacher effectiveness research (e.g., Brophy & Good, 1986; Doyle, 1986; Emmer & Stough, 2001; Muijs et al., 2014; Muijs & Reynolds, 2001; Rosenshine & Stevens, 1986), the dynamic model refers to factors which describe teachers' instructional role and are associated with student outcomes (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). Since the classroom level is under examination in the current study, the factors operating at this level are described in one of the sections that follow. Above the student-level and the classroom-level factors, the dynamic model refers to school-level factors. The school-level factors that are included in the model are: School policy for teaching and actions taken to improve teaching practice, Policy for creating the SLE and actions taken to improve the SLE, Evaluation of school policy for teaching and of actions taken to improve teaching, and Evaluation of the SLE (Creemers & Kyriakides, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). The final level (context-level factors) refers to the influence of the educational system through a more formal way, especially through developing and evaluating the educational policy at the national/regional level (Creemers & Kyriakides, 2008). Finally, the model assumes that school-level factors and context-level factors have both direct and indirect effects on student achievement (Creemers & Kyriakides, 2010).

The dynamic model is based on the assumption that, although there are different effectiveness factors, each factor can be defined and measured using five dimensions: frequency, focus, stage, quality, and differentiation (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Creemers & Kyriakides, 2008). Frequency is considered the quantitative way to measure the functioning of each effectiveness factor. The other four dimensions examine qualitative characteristics of the functioning of each effectiveness factor at the system/school/classroom level (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). This measurement framework implies that each factor should not only be examined by measuring how frequently the factor is present at the specific level, but also

by investigating specific aspects of the way the factor is functioning, that is, the qualitative characteristics of the factor's functioning (Kyriakides & Creemers, 2008). The five dimensions are briefly presented next.

Firstly, frequency dimension refers to the quantity that an activity associated with an effectiveness factor is present in a system, school or classroom and it is regarded as the easiest way to measure the effect of a factor on student achievement (Creemers, 2005). Almost all studies use frequency to define effectiveness factors (Creemers, Kyriakides & Sammons, 2010), although this dimension may not always be related in a linear way with student outcomes (Heck & Moriyama, 2010). Secondly, focus dimension refers to the qualitative characteristics of the functioning of a factor and it has two aspects; the first aspect addresses the purpose or purposes for which an activity takes place and the second refers to the specificity of the activities which can range from specific to general (Kyriakides & Creemers, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). It is expected that the measurement of an activity's focus can be related in a curvilinear way with student outcomes (Creemers & Kyriakides, 2008). Thirdly, the stage at which activities associated with a factor take place, is also measured. It is assumed that the factors need to take place over a long period of time to ensure that they have a continuous direct or indirect effect on student learning (Creemers, 1994; Creemers & Kyriakides, 2008). Measuring the stage dimension, provides information regarding the continuity of the existence of a factor even if the activities associated with the factor may not necessarily be the same (Kyriakides & Creemers, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). Fourthly, the quality dimension refers, on the one hand, to the properties of the specific factor itself and, on the other hand, to the impact of the factor upon the subjects addressed by the factor (Creemers, 2005; Creemers & Kyriakides, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). The importance of using this dimension arises from the fact that looking at the quantity element of a factor ignores the fact that the functioning of the factor may vary (Kyriakides & Creemers, 2008). Lastly, the differentiation dimension refers to the extent to which tasks associated with a factor are implemented in the same way for all the subjects involved with it (Kyriakides & Creemers, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). It is important to treat differentiation as a separate dimension of measuring effectiveness factors, since students will differ from one another in various skills, in prior knowledge, in interests and motives, in their socio-economical background, and in personal styles of thoughts and work during learning (Dowson & McInerney, 2003).

The validity of the model was examined and proven by several studies. Some data supporting the validity of the dynamic model had been developed since 2003 when the model was first developed. In particular, 20 empirical studies and two meta-analyses have been conducted in order to test the main assumptions of the model and the findings of the empirical studies seem to be in line with the results of the two meta-analyses (Kyriakides & Creemers, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). The first meta-analysis was a quantitative synthesis of studies investigating the impact of teacher factors to student learning outcomes by Kyriakides, Christoforou, and Charalambous (2013). This meta-analysis revealed that factors included in the dynamic model are moderately associated with student achievement while almost all the factors that are not included in the dynamic model are weakly associated with student learning. Finally, it was found that both the empirical studies that tested the importance of teacher factors included in the dynamic model, as well as the meta-analysis by Kyriakides, Christoforou, and Charalambous (2013) provide some support for the assumption that teacher factors can be considered generic in nature (Kyriakides & Creemers, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). The second meta-analysis was a quantitative synthesis of studies investigating the impact of school factors on student achievement and was conducted by Kyriakides, Creemers, Antoniou, and Demetriou (2010). Regarding the main findings of this meta-analysis, empirical support for the overarching school factors included in the dynamic model was provided and school factors were found to be generic in nature (Kyriakides, Creemers, Antoniou & Demetriou, 2010). The meta-analysis also examined the impact of eight school factors that are not included in the dynamic model but can be found in studies. The findings did not suggest that there is strong evidence to support the inclusion of any of these factors in the dynamic model (Kyriakides, Creemers, Panayiotou & Charalambous, 2021).

Creemers and Kyriakides' dynamic model provides a more convincing and wide-ranging theoretical framework for the EER field as it provides a better basis for policy-makers and practitioners to improve practice (Sammons, 2009). This is because the model is based on the acknowledgment of the multilevel nature of schools and education systems while further exploring the relationships between different factors that operate at different levels, namely, student, teacher/classroom, school, and context level (Sammons, 2009). It is worth noting that in Creemers and Kyriakides' dynamic model, school climate is seen as one of the most important predictors of school effectiveness, given that the model accounts for school effectiveness through the extent to which a learning environment has been created in the school. Therefore, the dynamic model refers to factors at the school level that are related to the main concepts of quantity of teaching, quality of teaching and provision of learning

opportunities (Kyriakides, Creemers, Panayiotou & Charalambous, 2021), and meta-analyses have shown that they are related to student achievement (Kyriakides et al., 2010; Scheerens et al., 2005; Witziers, Bosker, & Krüger, 2003).

This study draws from the theoretical framework of the Dynamic Model of Educational Effectiveness. As mentioned earlier, the dynamic model takes into consideration factors operating at the student level and essentially divides them into 3 major categories: socio-cultural and economic background variables that emerged from the sociological perspective of EER (such as SES, ethnic background and gender), background variables that emerged from the psychological perspective of EER (such as aptitude, motivation, expectations, personality and thinking styles) and finally, variables related to specific learning tasks that emerged from the psychological perspective of EER (such as time on task and opportunity to learn) (Creemers and Kyriakides, 2008; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). EER is concerned with improving the effectiveness in education. This can be attempted by causing change to factors that are related to student achievement. It can be expected however that this intervention can be achieved with factors that are able to change over time. The dynamic model makes a distinction among the student-level factors as a) factors that are unlikely to change, including SES, ethnicity, gender and personality traits, b) factors that change over time, including expectations, subject motivation and thinking style, and c) aptitude, perseverance, time on task and opportunity to learn. In the third category, the dynamic model accepts that some factors are not generic but depend on the outcome measured. For example, subject motivation is not stable over all subjects. One student can present high subject motivation in one subject such as Maths, while at the same time present low subject motivation in a different subject, Geography for instance. Thus, subject motivation must be measured every time we have a different outcome. This is not the case with factors such as SES, personality or thinking style, which are the same even if we measure different outcomes. Hence, this third category includes factors that require a different measurement every time we have a different outcome. However, the dynamic model does not provide any information whether each of the factors included in this category is likely or unlikely to change. Regarding motivation, it is argued in the literature that not only it can influence student achievement, but academic achievement can influence motivation (Creemers, 1994). This suggests that there is a reciprocal relationship between motivation and student achievement (Creemers, 1994). Regarding aptitude, since it embraces general intelligence and prior achievement, it can be considered as a factor that is unlikely to change. Perseverance is placed by the dynamic model among student aptitude and time on task and is treated as a rather stable trait. Concerning time on task and

opportunity to learn, the dynamic model argues that they are determined by student characteristics and can be influenced by elements of education at classroom level, like the teacher's management of time ability (Creemers and Kyriakides, 2008). The dynamic model suggests that these student-level factors from all three categories affect student achievement, they may affect each other, and they may affect and be affected by quality of teaching. However, it does not specify which factors interact with which and how. Therefore, the dynamic model does not provide in-depth information regarding the operation of student-level factors among either themselves or factors operating at different levels, such as classroom-level factors. It needs further development and clarification regarding relations of student-level factors. Studies that focus their interest on specific factors and examine how they interact, can further develop the theoretical framework of EER. The current study attempts to do so, by examining the relations between student-level factors, quality of teaching and student achievement. From these key variables, the teacher's quality of teaching will be discussed in the section that follows.

Quality of teaching

Introduction

Until a few decades ago, a lot of emphasis was placed on the role of effective schools in an attempt to specify the criteria that improve the effectiveness of a school. However, during the last few years, the focus has shifted to teacher effects and generally on issues related to the effectiveness of teachers' work (Kyriakides, Charalambous, Philippou & Campbell, 2006). This change of focus can be attributed to the fact that research on school effectiveness revealed that the teacher is an important component of the school effect upon students' progress (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Reynolds, Muijs, & Treharne, 2003; Scheerens & Bosker, 1997). In fact, it is argued that teacher behaviour matters more to student achievement than any other aspect of schooling (Creemers and Kyriakides 2015; Muijs et al. 2014). Several effectiveness studies conducted in different countries over the past three decades have shown that in terms of explaining the variance noticed in student achievement, classroom level is more important than school level (Hextall & Mahony, 1998; Kyriakides, Campbell & Gagatsis, 2000; Muijs & Reynolds, 2000; Scheerens & Bosker, 1997; Muijs & Reynolds, 2000, Muijs et al., 2014). Thus, it appears that although students' literacy skills, general academic achievements, attitudes, behaviours

and experiences of schooling are influenced by their background and intake characteristics, the size of these effects seems to be inferior compared to class/teacher effects (Rowe, 2003). This is due to the fact that without effective teacher guidance and instruction in the classroom, learning cannot be achieved (Oser, Dick, & Patry, 1992; Scheerens & Bosker, 1997). The above recognition highlights the role of quality of teaching as one of the most significant influences on students' cognitive, affective, and behavioural outcomes of schooling (Rowe, 2003). With all this new interest, models and theories about effective teaching, learning and assessment, from those such as Creemers and Kyriakides (2007) and Hattie (2009) have increased in number, all with the behaviours of teachers in classrooms at their heart. Hence, quality of teaching is certainly considered a factor worthy of further investigation.

Characteristics of effective teacher

Throughout the years, many researchers attempted to identify the characteristics that make teaching more effective. A number of teachers' characteristics appear in the literature, and are briefly presented below. To begin with, effective teachers emphasise academic instruction and see learning as the main classroom goal (Reynolds, 1998). An effective teacher engages students in activities suitable in difficulty level and appropriate to the students' current achievement levels and needs (Stallings, 1985). Teacher's knowledge on the subject taught and how this knowledge is used in classrooms also contribute to effective teaching (Hill, Rowan & Loewenberg Ball, 2005).What is more, findings suggest that teachers' content preparation is linked to students' academic achievement (Arbaugh, Ball, Grossman, Heller, Monk, 2015; Monk, 1994). Further, teacher expectations are very important. From the late 1960s onwards, research has found that teachers' expectations of their pupils can become a self-fulfilling prophecy. Pupils that teachers expect to do well tend to achieve better than the pupils whose teachers expect them to perform badly (Muijs, 2014). Effective teachers believe that all students can acquire the knowledge transmitted through the curriculum, not just a percentage of the students. They emphasise the areas each student is good at (Reynolds, 1998), and their positive expectations are passed on to their students (Kyriakides & Creemers, 2011). Effective teachers emphasise the importance of effort and help students acquire an internal locus of control by frequently highlighting how important their own work is (Borich, 1996). Additionally, it has been revealed that teachers with strong efficacy beliefs create mastery instructional strategies for their students and enhance their cognitive development. On the contrary, teachers with weak self-efficacy beliefs create classroom environments that weaken students' sense of efficacy (Bandura, 1993). Collective teacher efficacy was also found to be significantly and positively related to student

achievement (Tschannen-Moran & Barr, 2004). Furthermore, it appears that children learn more in classes where they spend time being taught or supervised by their teacher rather than working on their own (Reynolds, 1998). Additionally, in classrooms where teachers spend higher proportions of time in whole-class interactions, students spend more time on task rather than when they are working individually (Croll & Moses, 1988). An effective teacher asks a lot of questions and involves students in class discussion. In this way students are kept involved in the lesson and the teacher has the chance to monitor children's understanding of the concepts taught (Kyriakides & Creemers, 2011; Reynolds, 1998). Within the activities that occur during the class period, teachers' instructional interaction patterns are also found related to achievement. This is based on findings suggesting that quality of instruction influences achievement as teacher's instruction that accommodates students' differing education backgrounds, abilities and learning styles has been linked to better academic results (Aronson, Zimmerman & Carlos, 1999). Furthermore, it seems that in classrooms where teachers provided more support and positive corrective feedback, the students gained more in achievement especially concerning reading skills (Stallings, 1980). Finally, research on effective teaching focuses on the importance of classroom management. This is because effective management turns classroom into an efficient learning environment in which engagement rates are maximised (Creemers & Reezigt, 1996; Kyriakides, 2008). Effective teachers are able to organise and manage classrooms as effective learning environments in which academic activities are conducted seamlessly, transitions between different lesson sections are brief and little time is spent getting organised or dealing with inattention or confrontation (Brophy & Good, 1986). A successful teacher not only does s/he actively presents material to the students, but also structures it starting with overviews and/or review of objectives, outlining the content to be covered and signalling transitions between lesson parts next and calling attention to main ideas and reviewing main ideas at the end (Rosenshine and Stevens, 1986 in Panayiotou et al., 2014). For this to happen it is essential that the classroom is appropriately prepared with the installation of clear rules and procedures (Reynolds, 1998).

The above-mentioned characteristics of effective teachers are suggested to have a positive effect on students' academic achievement. However, their importance can be better evaluated if they are presented through a solid theoretical base. The dynamic model of educational effectiveness, which constitutes the framework of the present study, takes into consideration the main findings of the teacher effectiveness research (e.g. Brophy & Good, 1986; Fraser, Walberg, Welch & Hattie, 1987; Kyriakides, 2005; Muijs & Reynolds, 2001;

Opdenakker & Van Damme, 2000; Rosenshine & Stevens, 1986; Seidel & Shavelson, 2007) and refers to factors which describe teachers' instructional role and are associated with student outcomes. The dynamic model of educational effectiveness essentially portrays the outcome of a systematic effort to develop a framework of effectiveness that is able to incorporate the dynamic nature of education and that is comprehensive enough to be able to be used by stakeholders in education in order to improve the outcomes of educational gains. It considers the new goals of education, which are not limited merely to the attainment of basic skills, but more broadly define the expected outcomes of schooling. The dynamic model takes into consideration the necessity to encourage not simply the students' cognitive skills, but also their metacognition and their affective and psychomotor skills. Therefore, it aligns with the need to view education in a more holistic manner and comprises ways of building upon previous theories of educational effectiveness (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). Even though teacher background characteristics, such as gender, age, education, beliefs and motivation, are an important topic in theory and research because these characteristics may explain differences between teachers in the way they behave in classrooms (Fraser, 1995), empirical studies have not provided support for this argument so far (Creemers & Kyriakides, 2015). Consequently, these characteristics are not included in the dynamic model since the dynamic model is mainly concerned with teacher factors that can directly affect learning (Kyriakides, Creemers, Panayiotou & Charalambous, 2021). Teacher effectiveness factors as they are proposed by the Dynamic Model of Educational Effectiveness are presented next.

Presentation of the teacher effectiveness factors as they are proposed by the Dynamic Model of Educational Effectiveness

The dynamic model refers to eight factors which describe teachers' instructional role and are associated with student outcomes (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Kyriakides, Christoforou & Charalambous, 2013; Kyriakides & Creemers, 2008). These factors refer to observable instructional teacher behaviours in the classroom rather than to factors that may explain such behaviours, such as teacher beliefs/knowledge, or their interpersonal competences (Kyriakides, Christoforou & Charalambous, 2013; Kyriakides, Creemers, Panayiotou & Charalambous, 2021). Moreover, the model is based on the assumption that teaching factors are not separate entities but some of them are interrelated (Campbell et al., 2003; Creemers, 2005; Johnson, 1997). Specifically, the dynamic model

does not refer only to skills associated with direct teaching and mastery learning such as structuring and questioning, but also to orientation and teaching modelling, which are in line with theories of teaching associated with constructivism giving emphasis to independent learning and the construction of knowledge by the learner (Antoniou & Kyriakides, 2011; Brekelmans, Sleegers, & Fraser, 2000; Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Simons, Van Der Linden, & Duffy, 2000).

The eight factors included in the model are as follows: orientation, structuring, questioning, teaching-modelling, applications, management of time, the teacher's role in making classroom a learning environment, and classroom assessment. The eight factors operating at classroom level, as proposed by Creemers and Kyriakides (2008) are briefly described next.

Orientation refers to the teacher behaviour of providing the objectives for which a task or a lesson takes place. It is expected that orientation will make students understand why tasks take place and therefore motivate the students to participate more actively in the lesson. The engagement of students with orientation tasks may urge them to actively participate in the classroom, as the tasks that are set will be meaningful for them (De Corte, 2000; Paris & Paris, 2001). Structuring is present in a lesson when a teacher begins the lesson with a review of the objectives, signalizes transitions between the different parts of the lesson, calls attention to the main ideas and reviews them at the end of the lesson. The above structuring elements were described by Rosenshine and Stevens (1986) to maximise achievement and therefore it is imperative to be included in the classroom. Questioning techniques are also an important quality of teaching factor. It is not enough for researchers to examine the number of questions a teacher asks during a lesson. On the contrary, additional properties should be examined as well, such as the ratio between process and product questions, the clarity of the questions and the teacher's response to the answers. The teaching-modelling factor refers to teaching higher-order thinking. The aspects that should be taken into consideration include the role that the teacher plays in order to help the students use a strategy to solve problems and whether or not the strategies can be used to solve problems of different subjects. The application factor refers to the exercise opportunities provided to the student regarding a topic he/she was taught. The emphasis given to application by teachers can be found by looking at the total time spent on applications tasks. Another factor of the quality of teaching is the teacher's contribution in the creation of a learning environment in the classroom. More specifically, the following five elements are included in this factor: teacher-student interaction, student-student interaction, and students' treatment by the teacher, competition

between the students and classroom disorder. Management of time is considered as an important factor since effective teachers are expected to manage the classroom environment as an efficient learning environment and management of time is one of the most significant indicators of a teacher's ability to effectively manage the classroom. Finally, assessment is seen as an integral part of teaching (Stenmark, 1992) and formative assessment, in particular, has been shown to be one of the most important factors associated with effectiveness at all levels, especially at the classroom level (e.g., De Jong,Westerhof, & Kruiter, 2004; Kyriakides, 2005; Kyriakides, Christoforou & Charalambous, 2013; Shepard, 1989).

When taking into consideration the literature regarding the characteristics of effective teachers and the teacher effectiveness factors as they are proposed by the dynamic model, it could be argued that, until now, the research with respect to quality of teaching has mainly focused on finding direct effects of quality of teaching on student achievement. What has not been searched before is whether, in addition to the direct effects, indirect effects exist as well. More specifically, it could be examined if quality of teaching affects student achievement gains through another factor. Quality of teaching includes some time-related variables, such as the "management of time" and "managing misbehaviour". Therefore, one could assume that the teacher's quality of teaching can affect the students' time on task. For instance, as presented in Chapter 1, it can be assumed that if a teacher has poor time-management skills, his/her students are left off-task for longer periods of time. "Managing misbehaviour" is another quality-of-teaching factor related to time. A teacher that manages student misbehaviour effectively, has more time to focus on the instruction of the lesson's goals, providing his/her students with more potential on-task time. In addition to the quantitative factors, qualitative characteristics of teacher's quality of teaching may affect students' time on task. For instance, a sufficient amount of quality-appropriate structuring activities could be something that could keep students interested and actively involved in the lesson. Similar assumptions can be made with more quality of teaching factors such as questioning or interaction opportunities. Therefore, it is worth investigating whether quality of teaching, time on task and student achievement gains share a connection. The construct of time on task is presented in the next section.

Time on task

Introduction

In educational settings, the concept of time was described by Aronson, Zimmerman and Carlos (1999). They describe education time as an inverted pyramid, where at the top one would find the allocated time, which is the number of hours in a school day and days in a school year. This is the time most broadly described, most easily measured and most easily mandated. At the bottom of the inverted pyramid one would find the academic learning time, which is the time when learning is actually taking place. This is time most narrowly focused, most difficult to measure and most difficult for policymakers to influence. Allocated time is divided in instructional time and non-instructional time. Instructional time can be defined as the time spent in class either for core academic subjects, non-core academic subjects or non-academic electives. Non-instructional time, on the other hand, is the time spent for recess, eating and other non-classroom activities. The next level of the pyramid is engaged time. It is a subset of instructional time when students are participating in learning activities, but a portion of this time is often spent on activities having little or nothing to do with learning, such as disciplinary issues or interruptions for announcements. Finally, at the bottom of the pyramid, one would find the academic learning time, which is the time when learning actually occurs. Therefore, it can be argued than instructional time is a complex construct able to provide useful data. Berliner (1990) considers the concept of instructional time worthy of the researchers' attention as it allows for understanding, prediction, and control which are the three goals of scientific work. However, instructional time has a multifaceted nature which includes other time-related concepts. One concept of main concern included is time on task. The term is further analysed below.

Time on task is usually defined as the time the student is engaged on particular learning tasks (Berliner, 1990). Anderson (1981) clarifies that time on task refers to "the amount of time students are actively engaged in learning rather than the amount of time students are exposed to learning activities and materials" (p. 289). Similarly, Scheerens and Hendriks (2013), define time on task as the amount of time that students are actively engaged in learning tasks during lesson hours. In addition to that, Berliner (1990) dissociates time on task from engaged time which is defined as the time that students appear to be paying attention to materials or presentations that have instructional goals, stating that the former has a more restricted and more complex meaning than the latter, a meaning which includes the particular

curriculum, instructional activities, or tasks in which the student engages. Kyriakides, Creemers, Panayiotou and Charalambous (2021) argue that time on task refers to the time in which students are really involved in learning, provided that this time is filled with opportunities to learn. Finally, Bloom (1980) points out that time on task is not fixed but it is something that can change according to the instructional process. He also notes that change is directly connected to the learning that will occur. This study takes into consideration these definitions and considers time on task as the time the student is actively and observably engaged in learning tasks. Time on task is influenced by the total amount of time provided by the school (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Creemers & Kyriakides, 2008; Croll & Moses, 1988), the amount of time actually spent during the lesson (Croll & Moses, 1988), as well as by the student's motivations and expectations (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Creemers & Kyriakides, 2008). The proposition that the amount of time that teachers can maintain children 'on task' is a crucial factor affecting their learning outcomes is particularly attractive in the contemporary educational settings (McNamara, 1981). In the sections that follow, the development of research concerning time on task and the relation between time on task and academic achievement are presented.

The development of research concerning time on task

The discussion regarding time-on-task began long ago when Carroll (1963) published the paper "A Model of School Learning" in which he proposed that student learning depends on the amount of time a student spends on actively engaged in the learning process in relation to the time the student needs to achieve a learning goal. In this paper, Carroll suggests that the time needed for learning is related to aptitude (the amount of time a student needs, under optimal instructional conditions, to reach a learning goal), perseverance (the amount of time a student is willing to spend on learning a task), opportunity to learn and the quality of instruction. From this brief presentation, it is illustrated that Carroll turned opportunity to learn into an instructional time concept. Opportunity to learn is related to a lot of factors such as the length of the school day, the hours of reading experience taught and the use of homework (Reynolds, 1998; Scheerens & Bosker, 1997). It is also related to the quality of teachers' classroom management and especially to time-on-task (Reynolds, 1998). Much of the work since that time has been built upon Carroll's theory that time in classroom settings influence the achievement of a particular individual (National Center on Time & Learning, 2010). Bloom (1974) extended Carroll's model by making a distinction between allocated

and utilized time. Based on Carroll's model, he created "Mastery Learning", a practical instruction strategy. Bloom proposed that if the instruction provided appropriate opportunities to learn and appropriate quality of teaching, the majority of the students could learn well and attain mastery (The Core Academic Learning Time Group, 2002). While both Carroll and Bloom's models for learning was widely accepted and received minimal criticism in the immediate years immediately after being published, in the 1970s as discussions over the efficiency of schools emerged, these models were placed under increased examination (National Center on Time & Learning, 2010). This was due to the fact that the evidence originating from the research on teaching in the 1970s advocated that educators should allocate more time to academic subjects taking into consideration ability levels, and students should be kept engaged in the tasks (Stallings, 1980).

An important project that followed was the "Beginning Teacher Evaluation Study" (BTES). Although this study began as a project on identifying desirable competencies for beginning teachers, as the research progressed, the goals shifted to focus on identifying and describing teaching skills of veteran teachers and their impact on student outcomes. Through their work, BTES team defined a measure called Academic Learning Time (ALT) as the amount of time a student spends engaged in an academic task that s/he can perform with medium to high success suggesting that the more ALT a student accumulates, the more the student would be learning (National Center on Time & Learning, 2010). McNamara (1981) concentrated the three central conclusions originating from the studies included in BTES programme: that other things being equal, the amount of time which children are engaged 'on task' is related to the amount of learning they acquire; that certain behaviours and qualities are characteristic of teachers who can engage children 'on task' in order to maximize learning; and that effective teachers are those who can maximize children's 'on task' activities and develop pedagogic skills which foster this end. It should be mentioned however that despite its attempts to consider the importance of instructional quality, the BTES study has been criticized for methodological weaknesses (National Center on Time & Learning, 2010) and for not permitting the deduction that time on task is related to learning or that skills fostering time on task characterize the effective teacher (McNamara, 1981).

While the work of Carroll (1963), Bloom (1974) and BTES project are considered to have set the theoretical foundation for the scientific examination of time on task, it was the research that followed that revealed the real connection of time on task to academic

achievement. The relationship between time on task to academic achievement is further analysed below.

Time on task and academic achievement

Researchers have long been examining the relationship between time on task and academic achievement. Many researchers have found positive associations between time and learning. Karweit (1984), after reviewing studies from the literature, indicated that correlations ranged from +0.1 to +0.7. Similarly, Bennett (1982) found a positive association of time and learning after reviewing studies regarding student involvement. In addition to that, positive correlations between time on task and achievement were found by Anderson (1976), Ozcekick (1973), Cobb (1972) and Lahaderne (1968). Stallings' (1980) research findings suggested that the amount of time allocated to specific reading activities significantly affects student reading gain. It is worth mentioning however, that these studies do not indicate that increasing time on task will increase achievement in a straightforward manner, but that time is one of the factors affecting students' learning (Croll & Moses, 1988).

Thus, research has provided evidence of positive relationships between instructional time variables and student achievement despite the fact that the magnitude and the educational significance of the effects are still debated (Berliner, 1990). There are a lot of researchers that express their doubts concerning the examination of time and its relation to academic achievement. McNamara (1981), for example, argued that the research based on time on task is questionable and educationally barren and that information contained in method texts is more subtle and relevant to the needs of the class teacher than the findings emerging from time on task research. Karweit (1983) and Levin, Glass, and Meister (1984) have argued that even when measured adequately, instructional time variables are not particularly powerful. The critiques expressed are perhaps accountable for the little scientific interest that the field of time on task received since the '90s. One other factor that may have led to decreased scientific interest is the fact that, so far, time on task has been measured mainly dichotomously: students were characterised as being on-task or not, with the information produced not presenting much importance in the long run (National Center on Time & Learning, 2010). However, in the research concerning the relation between time on task and academic achievement there are still questions that have not been asked and relations that have not been explored. Among the latter belongs the relationship between time on task and quality of teaching. As mentioned earlier, a noteworthy question that can be further

investigated is whether quality of teaching could make students spend more time on-task and therefore increase their achievement. This question is explored by this study.

In addition to quality of teaching, it is argued that other variables may also influence academic performance, as the observed variance in academic success cannot be fully explained by teacher characteristics (Trapmann, Hell, Hirn, and Schuler, 2007). One aspect that can be further investigated is how individual differences affect the academic performance of students. This is based on the recognition that students of any age and in any culture differ from one another in various intellectual and psychomotor skills, generalized and specialized prior knowledge, interests and motives, socio-economic background, and personal styles of thoughts and work during learning (Tomlinson, 1999 in Kyriakides, 2007). Additionally, since time-on task is a student-level factor, it can be expected that it may be influenced by other student-level factors (Creemer & Kyriakides, 2008). The two student-level effectiveness factors that have been chosen for further examination are personality traits and thinking styles. Each of these factors is presented next.

Personality Traits

Introduction

In identifying which individual differences affect academic success, researchers turned as expected to ability or intelligence (O'Connor & Paunonen, 2007). There were, however, theories suggesting that even though intelligence through specific abilities can facilitate understanding and learning, personality through certain traits can enhance and/or hinder the use of these abilities. This view is found in Ackerman's (1996) PPKI theory (intelligence as process, personality, knowledge, and interests) which represents an attempt to develop an integrative conceptual framework for understanding the relation between noncognitive and cognitive individual differences underlying the acquisition of knowledge and adult intellect. This theory claims that personality traits play a significant role in the development of knowledge, in the way that they direct an individual's choice and level of persistence to engage in intellectually stimulating activities and settings. It can therefore be claimed that the PPKI theory implies that individual differences in personality may influence academic performance and indeed studies have shown that ''non-intellectual'' factors such as personality traits and thinking styles are significantly involved in academic performance. Moving one step further, Goff and Ackerman (1992) argued that long-term academic performance may be more accurately predicted by a measure of typical performance, such

as a personality scale, rather than a measure of maximal performance, such as a cognitive ability scale.

The view that besides intelligence, personality is also an important predictor of school performance, is also supported by longstanding empirical evidence. Kifer (1975), for example, suggested that certain personality characteristics can be seen as responses to accumulated patterns of academic achievement. Furnham, Moutafi and Chamorro-Premuzic (2005) provided evidence of the possible value of giving people feedback on both their intelligence and personality traits scores along with population norms. Lastly, Furnham, Chamorro-Premuzic and McDougall's (2003) study has shown that among an elite, that is, a highly selected student body, personality traits (and not cognitive ability) are noticeably related to various measures of academic success such as final examinations, written essays, and continuous assessment. Based on these findings it could be argued that behavioural tendencies reflected in personality traits affect certain habits that can have an influence on academic success (O'Connor & Paunonen, 2007). Therefore, since it is a variable that seems to have an effect on student achievement gains, personality is a variable that is further examined by the present study.

Presentation of the Five Factor Model proposed by McCrae and Costa (1987)

Personality refers to individual differences in the way people feel, think, and behave. It is the unique combination of characteristics and qualities that makes a person distinct across situations (Vedel & Poropat, 2017). Personality as a characteristic incorporates several traits. Although there have been several models of these traits, this study will be concerned with the Five Factor Model proposed by McCrae and Costa (1987), more commonly known as the Big Five Model. Several reasons led to this decision. Firstly, several researchers (e.g. Goldberg, 1993; Taylor & McDonald, 1999) have argued that the Big Five personality traits model accounts for most of the variability in personality as it is considered to be the product of several decades of factor analytic research focusing on trait personality (Zhang, 2003). Much of what psychologists mean by the term "personality" is summarized by the Five Factor Model and the model has been of great utility to the field by integrating and systematizing diverse conceptions and measures (McCrae & Costa, 2008). Additionally, this model dominates current research and theory (Kyriakides, Creemers & Charalambous, 2018). In fact, Tokar (1995) stated that the Big Five Model is one of the most prominent and heuristic models of personality structure. As argued by Costa and McCrae (2012), after many

years of research, a lot is now known regarding the model's factors. These personality traits appear in many cultures and are innate to a great degree. They can be measured both with the use of self-reports as well as the ratings of educated informants. Additionally, they are stable for extensive periods throughout a person's life (McCrae & Costa, 2008). Finally, most of the personality traits of this model have been found to be associated with academic performance (e.g. Blickle, 1996; Busato, Prins, Elshout & Hamaker 1999; Brandt et al., 2020; Chamorro-Premuzic & Furnham, 2003 b; DeFruyt & Mervielde, 1996; Shuerger & Kuma, 1987; Wolfe & Jonhson, 1995; Kyriakides, 2005). As its name proposes, the Big Five Model incorporates five personality dimensions, namely, conscientiousness, openness to experience, agreeableness, neuroticism and extraversion. The five dimensions are presented next.

To start with, conscientiousness has to do with the will to achieve, self-control, persistence, and dependability (Busato, Prins, Elshouta & Hamakera, 2000). Individuals who are high on the Conscientiousness scale are characterized as being organised, strong-willed, reliable, energetic and achievement-oriented whereas people low on the conscientious scale tend to be lazy, insensitive, careless and immature (Costa & McCrae, 1992; Kohnstamn & Mervielde, 1998).

Openness to experience is associated with the acceptance of new ideas, the inclination to varied sensations and intellectuality (Busato, Prins, Elshouta & Hamakera, 2000). Imagination, creativity, curiosity, originality, and artistic sensibility are associated with this trait which includes facets such as openness to fantasy, to aesthetics, to feelings, to actions, to ideas, and to values (Costa & McCrae, 1992b in Trapmann, Hell, Hirn, and Schuler, 2007). Open people are intellectually curious, appreciative of art and more aware of their feelings (Williamson, 2018). They tend to think and act in individualistic and nonconforming ways. Individuals, who score high on the openness to experience scale, are characterized by open-mindedness, imagination, fondness of variety and are less conservative and traditional, whereas people who are not high on the openness to experience scale, are more cautious and conservative (Costa & McCrae, 1992, Zhang, 2003).

Agreeableness is associated with a disposition toward nurturance, altruism, trust, and friendly compliance (Busato, Prins, Elshouta & Hamakera, 2000). Further, agreeableness (or likability) is associated with being courteous, flexible, trusting, cooperative and treating others fairly and kindly (Trapmann, Hell, Hirn, and Schuler, 2007). Agreeable individuals

tend to be tolerant, generous, forgiving and trusting while individuals low on the agreeableness scale are aggressive, argumentative and suspicious (Costa & McCrae, 1992). Also, agreeable individuals, value and respect other people's beliefs and conventions (Zhang, 2003).

Neuroticism refers to the degree people experience negative emotions (Busato, Prins, Elshouta & Hamakera, 2000) and it is considered to be the opposite of emotional stability (Zhang, 2003). Emotional stability is evident in students' responding appropriately to stress and tight time deadlines and in their adaptability to new situations or conditions (Goldberg, 2001). Anxiety, angry hostility, depression, self-consciousness, impulsivity, and vulnerability are the facets of this dimension as it was described by Costa and McCrae (1992). People high on neuroticism tend to experience negative emotions, are nervous, anxious and tense, while people low on this trait tend to be emotionally stable and content (Costa & McCrae, 1992).

Extraversion refers to the degree people are leaned towards sociability, experience positive emotions and high activity (Busato, Prins, Elshouta & Hamakera, 2000). This dimension is defined as the quantity and intensity of interpersonal interaction and it includes traits such as assertiveness, sociability, activity, cheerfulness, and gregariousness (Trapmann, Hell, Hirn, and Schuler, 2007). Individuals who score high on the extraversion scale, are usually sociable, assertive and prefer to work with others, as opposed to introverts who are withdrawn and shy (Costa & McCrae, 1992).

Relations between personality types and achievement in Education

Contemporary researchers have adopted two broad approaches in order to study the relationship between Big Five personality traits and academic performance. In the first method, investigators have examined how well the broad Big Five personality factors predict academic performance whereas in the second, researchers have investigated more narrow personality traits in terms of predicting academic success (O'Connor & Paunonen, 2007). Despite the approach used, a great number of researchers argue that personality traits are related to academic achievement (Kyriakides, 2005; Chamorro-Premuzic & Furnham, 2003b; Costa & McCrae, 1992; Eysenck & Eysenck, 1985; O'Connor & Paunonen, 2007; Trapmann, Hell, Hirn & Schuler, 2007). In fact, Chamorro-Premuzic and Furnham (2003b), in a study

with 247 British university students, found that the Big Five personality traits accounted for approximately 15% of the variance in students' examination results. However, not all personality traits have a positive correlation with academic success thus it is important that each personality trait's relation to academic achievement is presented separately.

Conscientiousness and student achievement.

The personality trait that seems to be more consistently associated with academic performance is Conscientiousness (Poropat, 2014, Busato, Prins, Elshouta & Hamakera, 2000, Chamorro-Premuzic & Furnham, 2003a). This is confirmed by an important amount of research that provide evidence of the connection between this personality trait and academic achievement for primary (e.g. Kyriakides, 2005), secondary (e.g. Wolfe & Johnson, 1995) and post-secondary education (e.g. Busato, Prins, Elshouta & Hamakera, 2000, Chamorro-Premuzic & Furnham, 2003a, Trapmann, Hell, Hirn, and Schuler, 2007). Brandt et al., 2020, showed that conscientiousness was positively related to school grades and achievement test scores even when cognitive ability was controlled for. In fact, conscientiousness consistently predicts grades in primary, secondary, and tertiary academic education (Vedel & Arthur 2017). Recently, Diedrich, Neubauer and Ortner (2018) showed that Conscientiousness was the most robust positive predictor of GPA (Grade Point Average). Additionally, the conscientiousness trait was found to account largely for the differences noticed in students' learning approaches as it was related to both the deep and the achieving approach (Zhang, 2003). Last, it has been argued that conscientiousness may affect academic performance more than intellectual ability does and that it may counterbalance poor intellectual ability (Furnham, Chamorro-Premuzic, & Moutafi, 2005).

It has not been entirely identified which processes are responsible for the association between conscientiousness and academic performance. However, research has associated conscientiousness to a wide range of behaviours and abilities beneficial to academic performance, which may partly explain the association (Vedel & Poropat, 2017). More specifically, conscientiousness presents a solid association with effortful control (Poropat, 2016), a dimension of personality reflecting self-regulatory abilities, like the ability to intentionally direct attention to a task and maintain a focus on that task (Rothbart, 2007). Additionally, conscientious students score higher on learning-related factors such as persistence (Komarraju & Karau, 2005), achievement motivation (Richardson & Abraham,

2009), class attendance (Chamorro-Premuzic & Furnham, 2003; Conard, 2006), and use of self-regulatory learning strategies (Bidjerano & Dai, 2007; McKenzie, Gow, & Schweitzer, 2004). These are factors that reliably predict student achievement (Hattie, 2009). Therefore, these associations may explain a great deal of the association between conscientiousness and academic performance (Vedel & Poropat, 2017). Additionally, a number of researchers examined certain characteristics of the conscientiousness trait that are specifically connected to achievement. A good illustration is O'Connor and Paunonen's (2007) meta-analysis on the recent empirical literature on the relations between the Big Five personality dimensions and post-secondary academic achievement which revealed that certain characteristics included in Conscientiousness trait such as achievement orientation and self-discipline are proven to be beneficial for academic success in post-secondary programmes. Chamorro-Premuzic and Furnham (2003b) examined which personality traits and to what extent they predict university examination marks. Their research revealed that conscientiousness primary traits like dutifulness, achievement striving, self-discipline, conscientiousness, stability and introversion were significantly correlated with academic performance in university settings. The positive association between academic performance and Conscientiousness was attributed by these two researchers to the hard-working, organised and ambitious nature of highly conscientious individuals.

Openness to Experience and student achievement.

With the exception of conscientiousness, openness to experience is the factor that is most firmly associated with academic performance (Poropat, 2014a, 2014b; Richardson, Abraham & Bond, 2012). Findings indicate an association between openness to experience and academic achievement in both secondary (e.g. Shuerger & Kuma, 1987) and higher education (e.g. De Fruyt & Mervielde, 1996, Hirschberg & Itkin, 1978). In fact, in primary education, self-rated openness is almost equally effective as conscientiousness in statistically predicting academic performance (Poropat, 2009). A positive association between openness to experience and learning was confirmed by the findings of O'Connor and Paunonen's (2007) meta-analysis on the relations between the Big Five personality dimensions and post-secondary academic achievement. Last, Zeidner & Matthews (2000) found that openness to experience is the personality factor which correlates most strongly with psychometric intelligence, while it is also related to the deep approach to learning (Chamorro-Premuzic & Furnham, 2009, Zhang, 2003). Among the five personality traits, openness is possibly the most complicated and most highly debated (Vedel & Poropat, 2017). This is because the

openness to experience factor contains both a creative element, which indicates creative and reflective interests, and an intellect element that indicates curiosity and approach to learning. It is argued that it is the intellect-curiosity element that leads to positive correlations between openness and academic performance (Von Stumm, Hell, & Chamorro-Premuzic, 2011). Students high on openness seem to be more investigative, more intrinsically motivated to know, think, and analyse and more interested in improving mental abilities and increasing competencies (Bernard, 2010; Clark & Schroth, 2010; Komarraju & Karau, 2005; Komarraju, Karau, & Schmeck, 2009). All these are characteristics that could be related to the positive relationship openness has with student achievement. Additionally, students high on openness appear to have reflective learning styles and learning strategies, such as elaborative processing and critical thinking (Bidjerano & Dai, 2007; Komarraju, Karau, Schmeck, & Avdic, 2011), variables that have been shown to mediate the relationship between openness and academic performance (Komarraju et al., 2011; Swanberg & Martinsen, 2010). On the other hand, however, not all research results indicate this positive correlation between Openness to Experience trait and academic success.

Agreeableness and student achievement.

Agreeableness seems to have positive though small associations with achievement (Poropat, 2009; Richardson et al., 2012; Vedel, 2014). Poropat (2009) argues that self-rated agreeableness has positive correlations with academic performance, especially in primary education. Agreeableness is linked with collaborative attitude towards the social environment and a conforming tendency to social requirements. Therefore, students with this personality trait want to have a harmonious relationship with their teachers and their parents. This need translates into academic persistence motivation and grades orientation (Komarraju & Karau, 2005), and behaviours aimed at improving academic performance primarily through surface learning (Vermetten, Lodewijks, & Vermunt, 2001). The association with positive relationships was also examined by Saklofske, Austin, Mastoras, Beaton, and Osborne (2012) who argue that these positive relations can promote learning which explains the positive association with student achievement. Similarly, agreeable individuals choose to incorporate socially accepted values they meet in academia, therefore, they value academic performance because it is the socially accepted value in educational settings (Clark & Schroth, 2010; Komarraju, Karau & Schmeck, 2009). Finally, agreeable students were found to have greater compliance with homework directions (Lubbers, Van der Werf, Kuyper, & Hendriks, 2010), and better time management and effort regulation

(Bidjerano & Dai, 2007), characteristics that could explain the positive association with student achievement.

Neuroticism and student achievement.

A number of studies confirm a rather negative association of neuroticism and academic performance. Furnham, Moutafi and Chamorro-Premuzic (2005), for example, argue that neuroticism has been found to impair intellectual functioning in a variety of contexts, ranging from intelligence tests to school achievement. Chamorro-Premuzic and Furnham (2003) found significant negative correlations between academic performance and Neuroticism. Researchers indicate that this negative association can be explained in terms of anxiety especially under academic examinations or other stressful conditions (Hembree, 1988; Siepp, 1991; Zeidner & Matthews, 2000). Specifically, it has been shown that neurotic students were more likely to be absent in examinations as a result of medical illness (Chamorro-Premuzic & Furnham, 2002). Neuroticism has also been associated with poor attendance as well as physical problems like raising heart, gastric disturbances and perspiration (Matthews, Davies, Westerman, & Stammers, 2000). However, there is research that indicates no relations between Neuroticism and academic performance. Furnham, Chamorro-Premuzic and McDougall (2003), for example, found that Neuroticism was not significantly related to exam performance, though it was to absenteeism. Similar results are found in O'Connor and Paunonen's (2007) meta-analysis and the two authors concluded that this trait may not be highly connected to educational achievement.

Extraversion and student achievement.

Research findings seem to be in contradiction when it comes to Extraversion and its connection to academic success. Firstly, there are studies that reveal a rather negative association between Extraversion and academic performance (e.g., O'Connor & Paunonen, 2007). Chamorro-Premuzic and Furnham (2003b) also found a negative correlation between academic achievement and Extraversion. Lastly, negative association was found between Extraversion and many knowledge tests in a study made by Rolfhus and Ackerman (1999). The two researchers attributed this finding to the fact that extraverts spend more time socialising while introverts spend more time studying. Similarly, Entwistle and Entwistle (1970) argued that introverts, in contrast to extraverts, are more able to combine learning, have better study habits and are more focused. Sanchez-Marin, Rejano-Infante and

Rodriguez-Troyano (2001), in a study based on 130 failing university students at the University of Seville, argue that the reasons for the negative association of extraversion and academic performance can be attributed to the extraverts' distractibility, impulsiveness and sociability. On the other hand, however, there are research findings that reveal a rather positive correlation between extraversion and academic performance. Chamorro-Premuzic and Furnham (2003a), for example, found a partially positive connection of extraversion to academic performance, although, without finding significant relations between extraversion and exam marks. Poropat (2009) has found only moderate correlations with student achievement with the strongest relationship being the one between self-rated extraversion and academic performance in primary education (r = 0.18). Even lower are the correlations between other-rated extraversion and academic performance in primary (r = .11: Poropat, 2014a) and secondary and tertiary education (r = .05: Poropat, 2014b). However, Vadel and Poropat (2017) advise researchers to be cautious and avoid over-interpreting these modest associations. Finally, there are researchers that revealed no correlation between extraversion and academic performance. In Zhang's research (2003), for example, no distinct pattern was identified regarding the relationship of extraversion to any of the learning approaches. A lot of researchers tried to explain this vagueness in research results. Some scholars argue that the association between extraversion and academic performance seems ambiguous because the nature of this relation is affected by different variables such as age, level of education and type of assessment (Furnham, Chamorro-Premuzic & McDougall, 2003). More specifically, it is argued that the association between extraversion and academic performance is positive in primary school where the environment is sociable and not particularly competitive, while the association is negative in secondary school where the environment is more formal and competitive (Entwistle, 1972; Eysenck & Cookson, 1969; Petrides, Chamorro-Premuzic, Fredrickson & Furnham, 2005). Others argue that because extraverts were found to trade accuracy for speed when taking an ability test, the different results found can be attributed to the demands of the test; specifically, whether it is timed and how long it takes. Extraverts seem to have an advantage with short (2–5 minutes) and timed tests (Furnham, Moutafi & Chamorro-Premuzic, 2005).

Difficulties in researching personality traits

Research findings confirm the different relations that are developed between each personality trait and academic achievement. Thus, it appears that there is a positive correlation between achievement and three traits: conscientiousness, openness to experience

and agreeableness. Additionally, there is a negative correlation between neuroticism and academic performance. Research is inconclusive concerning the relationship between extraversion with academic achievement. However, it is worth mentioning that research in the area of personality traits has to deal with a number of theoretical issues. A first issue mainly derives from the fact that data in this field is usually obtained from self-report data. The disadvantage of using self-reports is that they are open to impression management and thus can be coachable and fakable (Trapmann, Hell, Hirn, and Schuler, 2007). A second issue has to do with arguments suggesting that the accuracy in the prediction of academic performance by personality could be increased significantly by employing primary rather than super-traits (Chamorro-Premuzic & Furnham, 2003). Narrow personality traits that enclose trait-specific variance may permit a more accurate prediction of particular instances of behaviours, such as those involved in academic performance (O'Connor & Paunonen, 2007). Last, it seems that the research concerning the connection between personality traits and academic achievement has so far focused on how achievement is directly influenced by certain personality traits. There is, however, a visible lack of evidence of whether personality traits affect factors that are also found to influence academic achievement such as the time on task and the relationship between them. This lack of evidence makes the investigation of whether personality traits affect time on task and through that the student achievement, worth of further examination. As it was argued above, ability and personality are two of the factors explaining variations in human performance. A third factor used by scholars in order to explain the observed variations are thinking styles. The term is further analysed below.

Thinking Styles

Introduction

Intellectual styles have been used as an additional factor to explain variations in human performance for more than half a century (Zhang, 2006). The idea of a style reflecting a person's typical or habitual mode of problem-solving, thinking, perceiving, and remembering was initially introduced by Allport (1937). The literature concerning styles includes a variety of theoretical models of styles. Among them are three distinctive categories, namely the cognitive styles, the learning styles and the thinking styles. The first category is cognition-centred (Bernardo, Zhang & Callueng, 2002). Styles included in this category are more similar to abilities and are measured by maximal performance test (Zhang, 2004b). The category that includes learning styles is personality-centred (Bernardo, Zhang

& Callueng, 2002). In this category styles are considered resembling personality traits and are measured by typical performance tests (Zhang, 2004b). Last, the third category is activity-centred and theories that are included in this approach tend to focus on styles of teaching and learning (Bernardo, Zhang & Callueng, 2002). These categories differ in the focus of their interest and in how they address the functional aspects of styles (Kyriakides, 2007). However, all three are based on the common ground that they are not abilities but they constitute people's preferred ways of processing information and of using the abilities that they already have (Zhang, 2004b, 2002). Despite of their different focus, cognition and the personality-centred approaches share further commonalities. These include the view that styles comprise steady constructs across various tasks and situations (Kyriakides, 2005, 2007) and the assumption that they can be modified very little during the life span (Kyriakides, 2005). Therefore, cognitive and personality styles are seen as not alterable in educational settings (Riding & Cheema, 1991). In addition, theories within these two approaches are based on the assumption that certain styles are better than others (Kyriakides, 2005). In contrast, in the activity-centred approach, styles are considered as processes that can be used in order to counterbalance or to amend weaknesses (Kyriakides, 2005). Following this interpretation, styles are seen as dynamic. Therefore, it can be argued that it is possible to design projects that attempt to assist students develop 'optimal' styles in order to improve their achievement (Kyriakides, 2021). Similarly, it can been argued that by supporting students to develop and use a variety of thinking styles, better cognitive learning outcomes can be achieved (Grigorenko & Sternberg, 1997; Hattie, 2009; Kyriakides, 2005c; Zhang, 2011; Zhang & Sternberg, 1998). In the context of this research, theories of thinking style included in the activity-centred framework are chosen for further analysis. The main reason of this choice is the argument that theories of thinking style in the activity-centred framework allow for change which is an aim of EER (Kyriakides, 2007). Thinking style approach includes a number of different theories. From the theories included, a theory has been proven to explain individual differences to performance that are not explained by abilities (e.g., Sternberg & Grigorenko, 1997; Zhang 2001a; Zhang & Sternberg, 1998). This theory is the theory of mental self-government developed by Sternberg (1988), which is briefly presented below.

Presentation the Theory of Mental Self-Government

The theory of mental self-government, from which the thinking styles have emerged, was first published in 1988 (Sternberg, 1988). The basic idea of this theory is that people, like

societies, have to organize or govern themselves; this is done by choosing certain ways to use their abilities (Sternberg & Grigorenko, 1995). These preferred ways of using one's abilities are interpreted as "thinking styles" (Zhang, 2006). According to the theory of mental self-government, people vary in their relative preferences for these styles, depending on the stylistic demands of a given situation; people also can use more than one style or flexibly switch from one to another as they adapt to changing task requirements (Bernardo, Zhang & Callueng, 2002, Zhang, 2002, 2004). Moreover, styles might be altered with time and with life demands (Zhang, 2001, 2005). This is because stylistic preferences are also viewed as being socialised and as functions of one's interactions within the sociocultural environment (Bernardo, Zhang & Callueng, 2002). One other view considers thinking styles as regulators between internal characteristics, such as ability and personality, and external situation (Kyriakides, 2005). Thus, the theory of mental self-government provides an insight into individually preferred ways of thinking in various activities (Kyriakides, 2005). Finally, thinking styles distinct themselves in any activity, and therefore can be measured (Kyriakides, 2005).

The theory of mental self-government addresses the question of how people govern and manage their everyday cognitive activities, within the school and outside of it (Sternberg & Grigorenko, 1995). As such, Sternberg's theory of mental self-government applies to both academic and non-academic settings (Zhang, 2001, 2006). According to Sternberg, there are 13 thinking styles which fall along 5 dimensions: (1) functions (including the legislative, executive, and judicial styles), (2) forms (hierarchical, monarchic, oligarchic, and anarchic styles), (3) levels (global and local styles), (4) scopes (internal and external styles), and (5) leanings (liberal and conservative styles). The 5 dimensions that include the 13 thinking styles are presented next.

Functions.

As government systems typically have different branches serving various functions, similarly, people also have different styles for focusing on different functions or tasks (Sternberg, 1988; 1997). There are three functions in mental self-government: legislative, executive, and judicial. The legislative function of the mind is concerned with creating, formulating, imagining, and planning. The legislative person prefers to formulate his or her own activities (Sternberg & Grigorenko, 1995) and tasks where using creative strategies and generating new approaches and solutions is required (Bernardo, Zhang & Callueng, 2002,

Zhang, 2005, 2001). The executive function is concerned with implementing and with doing (Sternberg & Grigorenko, 1995). The executive person prefers activities structured by others (Sternberg & Grigorenko, 1995) and is more concerned with the proper implementation of tasks within a set of guidelines (Bernardo, Zhang & Callueng, 2002, Zhang, 2005, 2001). The judicial function is concerned with judging, evaluating, and comparing (Sternberg & Grigorenko, 1995). People having judicial style are concerned with evaluating the work process and products of other people's activities (Bernardo, Zhang & Callueng, 2002, Zhang, 2005, 2001).

Forms.

As there are different forms of government, there are various ways in which individuals govern themselves; these forms include four styles: monarchic, hierarchic, oligarchic, and anarchic (Sternberg, 1988; 1997). In the monarchic form, a single goal or way of doing things predominates (Sternberg & Grigorenko, 1995). People with a monarchic style prefer engaging in activities that require them to focus on only one thing at a time (Bernardo, Zhang & Callueng, 2002, Zhang, 2001). Contrary to this, the hierarchic form allows for multiple goals, each of which may have a different priority (Sternberg & Grigorenko, 1995). People with a hierarchic style prefer distributing their attention and energies over several tasks that in a priority order (Bernardo, Zhang & Callueng, 2002, Zhang, 2001). The oligarchic form allows for multiple goals, all of which are equally important (Sternberg & Grigorenko, 1995). Those with an oligarchic style prefer working toward several objectives all at the same time without setting priorities on the tasks (Bernardo, Zhang & Callueng, 2002, Zhang, 2001). Finally, people with an anarchic style tend to avoid rules, procedures, and formal systems (Sternberg & Grigorenko, 1995). Individuals with an anarchic style prefer working on tasks that allow for greater flexibility and do not require having a system (Bernardo, Zhang & Callueng, 2002, Zhang, 2001).

Levels.

Just like governments have levels of society that are considered more local or more global, so do people (Sternberg & Grigorenko, 1995). Thus, there are two levels at which a person may prefer to work in terms of their concern for detail: local and global (Sternberg, 1988; 1997). People with a local style prefer activities that require them to attend to very specific and concrete details (Bernardo, Zhang & Callueng, 2002; Zhang, 2001; Kyriakides, 2005;

Sternberg & Grigorenko, 1995). People with a global style prefer dealing with problems that are general in nature and that require abstract thinking (Bernardo, Zhang & Callueng, 2002; Zhang, 2001; Sternberg & Grigorenko, 1995).

Scopes.

As governments typically have both domestic and foreign affairs, similarly, the human mind deals with internal and external matters (Sternberg, 1988; 1997). This dimension includes two styles: internal and external. Individuals with an internal style prefer tasks that require working independently of other people, while those with an external style prefer activities that allow for interaction with others and provide opportunities for developing interpersonal relationships (Bernardo, Zhang & Callueng, 2002, Zhang, 2001).

Leanings.

Just as in governance, political orientations can range from the most conservative to the most liberal, in the theory of mental self-government these two major inclinations, conservative and liberal are also identified (Sternberg, 1988; 1997). People with a liberal style prefer tasks that require them to go beyond existing rules and structures, tasks aiming at effecting substantial change and tasks that involve novelty and ambiguity (Bernardo, Zhang & Callueng, 2002; Zhang, 2001). On the other hand, an individual with a conservative style prefers traditions and stability (Sternberg & Grigorenko, 1995) and prefers familiar tasks that require the application of existing rules and structures (Bernard, Zhang & Callueng, 2002; Zhang, 2001).

These 13 styles have been reconceptualised into three types (Type I, Type II, Type III) based on empirical data (Zhang, 2004b, 2006). Type I thinking styles are the ones that tend to be more creativity-generating and represent higher levels of cognitive complexity. Thus, included in this Type, are the legislative (being creative), judicial (evaluative of other people or products), hierarchical (prioritizing one's tasks), global (focusing on the wholistic picture), and liberal (taking a new approach to tasks) styles. Type II thinking styles are styles that have tendency to norms and indicate lower levels of cognitive complexity. Included in this Type are the executive (implementing tasks with given orders), local (focusing on details), monarchic (working on one task at a time), and conservative (using traditional approaches to tasks) styles. Finally, Type III thinking styles include the anarchic (working on whatever

tasks that come along), oligarchic (working on multiple tasks with no priority), internal (working on one's own), and external (working with others) styles (Zhang, 2002, 2004, 2006). It is noteworthy though, that the internal and external styles seem to be relatively neutral (Zhang, 2002).

Relations between Thinking Style and student achievement in Education

Existing studies have indicated that thinking styles present a relation with academic performance. More specifically, research shows that styles which indicate conformity and loyalty to the rules, like executive, conservative, and monarchic styles have a positive connection to academic performance (Zhang, 2004b). Executive was also found to present a positive relation to student achievement by Kyriakides (2005). Additionally, positive relation to academic performance presents a style that indicates a sense of order, namely, the hierarchical style and in some cases the judicial style (Zhang, 2004b). On the contrary, styles that are more creative, like the legislative and liberal styles, present a negative association to academic performance (Zhang, 2004b; Zhang, 2001a, 2001b; Zhang & Sternberg, 1998). Similarly, some studies found that students with Type II intellectual styles outperform students with Type I intellectual styles. For example, studies on thinking styles in Hong Kong, Philippines, and Spain found that some Type II thinking styles (e.g., conservative, executive, and local styles) are positively related to academic achievement (Bernardo, Zhang, & Callueng, 2002; Cano-Garcia & Hughes, 2000; Varma & Thakur, 1992; Zhang, 2002, 2004a, 2007). Additionally, in some studies (Fan, Zhang, & Watkins, 2010; Grigorenko & Sternberg, 1997; Zhang, 2004b), Type I thinking styles (e.g., legislative, judicial, and hierarchical) were found to play more positive roles in academic achievement than Type II thinking styles (e.g., executive and conservative). Similar findings were reported by Kyriakides (2005), where liberal thinking style (Type I) was found to have a positive correlation to student achievement. These inconsistent results are believed to be due to the different cultures, different learning materials and different school levels involved in these studies (Zhang & Sternberg, 2006). In fact, Zhang (2001) taking into consideration the effect of cross-cultural differences in the relationship between academic achievement and thinking styles, argued that because each culture has its own values and each educational system has a different reward system, the particular thinking styles that can contribute to academic success may be different for each culture.

It is important to point out that the research done concerning the relation of thinking styles and academic achievement often includes measurements of personality traits. It is argued that when examining achievement, both personality traits and thinking styles should be taken into consideration, and there is a number of reasons why. Firstly, there are many studies which reveal that measures of thinking styles associated with this theory, explain individual differences in performance not attributable to ability (e.g. Grigorenko & Sternberg, 1997; Zhang, 2001, 2012; Zhang & Sternberg, 1998). Additionally, it has been shown that the overlap between thinking styles and personality is limited. Zhang (2018) found that overlaps between personality traits and most of thinking styles were only low to moderate. Messick (1996) suggested that style could be the construct that can be used to build a bridge between cognition and personality in education. Similarly, Sternberg (1994) claimed that thinking styles are at the interface between intelligence and personality. Moreover, the measurement of both thinking styles and personality traits and their correlation to academic performance can increase the percentage of the achievement variance that can be explained (Kyriakides, Creemers, Panayiotou & Charalambous, 2021; Zhang, 2004b). Recently, Zhang (2018), has argued that the findings of his study suggest that investigating thinking styles beyond personality is worthwhile for achieving a comprehensive understanding of individual differences in human performance. However, there have yet to be studies exploring the possibility of a relation between these two personal characteristics with time on task. This study takes into consideration this gap in the research and explores the possibility of relations between personality traits and time on task, as well as thinking styles and time on task.

Throughout the review of the existing literature, the lack of information regarding specific relations is highlighted and several questions arise. It is clear that there is a lack of research regarding direct and indirect effects (through time on task) of quality of teaching, personality traits and thinking styles on student achievement. Based on the review of the literature, the Theoretical Model of the study was created and is presented below.

The Theoretical Model

Theoretical Model – Student Level

The Theoretical Model of the present study assumes that certain direct and indirect relations exist among the variables examined. More specifically, as demonstrated in Figure 2.1a, it assumes that, at student level, certain factors of personality traits and thinking styles have a direct effect on time on task. The next section includes the assumptions of the present study's

theoretical model, based on the variables' characteristics as they are presented in the review of the literature presented above.

More specifically, regarding the personality traits variable, at student level, the Theoretical Model of the present study hypothesizes that there are specific personality traits that have a direct effect on students' time on task, a direct effect on students' final achievement, or both. Namely, with regards to time on task, conscientiousness and openness to experience, these are expected to have a direct effect on time on task. Conscientious individuals, as presented above (page 35), are often self-disciplined, achievement-oriented, dutiful, hard-working and organized. These are characteristics that may help them remain on-task for longer periods of time. Therefore, the Theoretical Model of the present study hypothesizes that conscientious students will present positive direct effect on student's time on task. Additionally, openness to experience trait includes individuals that are intellectually curious and accept new ideas. These characteristics may assist the individual to remain on-task in the classroom. Consequently, it is hypothesized that students with this personality trait will present a positive effect on student's time on task. Finally, agreeableness, neuroticism and extraversion include characteristics that do not appear to be immediately related to on-task behaviours. Therefore, the Theoretical Model hypothesizes that students with these personality traits will not present an effect on students' time on task.

In addition to a direct effect on time on task, certain personality traits are expected to have a direct effect on student achievement as well. Namely, conscientiousness, openness to experience and agreeableness are expected to have a direct effect on student achievement. As illustrated above, conscientiousness includes characteristics such as self-discipline, achievement orientation, dutifulness, hard work and organization. The above characteristics may possibly assist the individuals to attend school regularly, organize their time efficiently thus allowing enough time to study, hand in assignments on time, prepare for evaluations and study in an organized environment. All these actions may help them achieve better learning outcomes. Considering the above characteristics and the fact that conscientiousness is the trait most consistently associated with academic performance in the literature (page 36), the Theoretical Model expects that conscientiousness will have a positive direct effect on students' final achievement. Additionally, individuals who are included in the openness to experience trait often present acceptance of new ideas and curiosity, are more naturally motivated to know, think, and analyse, and are more interested in improving mental abilities and increasing competencies, which may assist the individuals to have better final

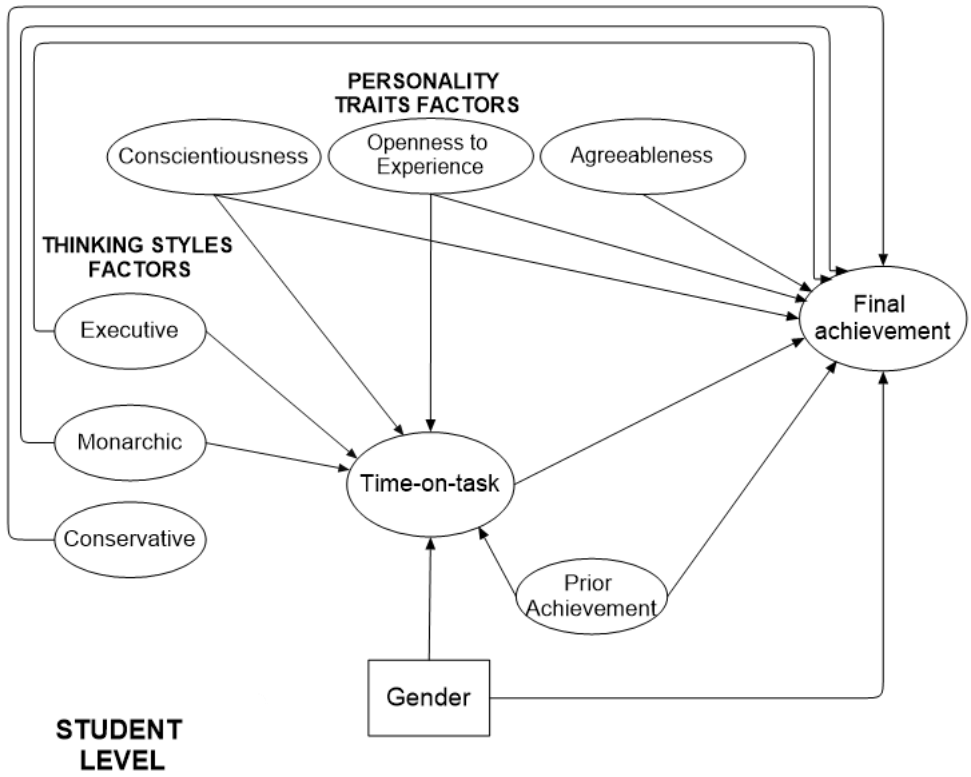
achievement. As presented in the review of the literature (page 38), many studies have found a positive relation between openness to experience and student achievement. Therefore, it is hypothesized that students with this personality trait will present direct effect on students' final achievement. Additionally, as presented above (page 35), agreeable individuals seem to have a need to confirm social requirements and have a good relationship with their teachers, a need that leads them to academic persistence motivation and grades orientation. Furthermore, some studies (e.g. Poropat, 2009; Richardson, Abraham & Bond, 2012) found a positive correlation between agreeableness and student achievement. Therefore, it is hypothesized that students with this personality trait will present direct effect on students' final achievement. Finally, neuroticism and extraversion include characteristics that do not appear to have a clear and immediate association to student achievement. Thusly, the Theoretical Model hypothesizes that students with these personality traits will not present an effect on a student's achievement.

Similarly to Personality Traits, the Theoretical Model makes assumptions for the Thinking Styles as well. More specifically, the theoretical model assumes that there are some Thinking Styles that have a direct effect on time on task, a direct effect on students' final achievement, or both effects. As there are no studies exploring the relationship between thinking styles and student achievement, the hypotheses included in the Theoretical Model are based mainly on the characteristics each trait possesses. More specifically, regarding the effect on time on task, two of Type II traits, namely executive and monarchic, are expected to have a direct effect on time on task as they are styles that benefit from clear instructions, guidelines, and tasks that require more complete focus on one thing at a time than multitasking; characteristics that are often found during a lesson. More specifically, as presented in the review of the literature (page 46) executive individuals like tasks that provide structure, clear instructions and established guidelines, they prefer to be told what to do and will make a great effort to complete a given task. As these are often found in a lesson, it may be easier for executive students to remain on task for longer periods of time. Thus, it is hypothesized that students carrying the executive trait will present positive direct effect on students' time on task. Monarchic individuals prefer to work on tasks that allow focus on only one thing at a time and this characteristic may help students remain on task. Therefore, monarchic individuals are expected to present positive effect on time on task. Finally, legislative, liberal, conservative, judicial, hierarchical, oligarchical, anarchic, global, local, internal and external thinking styles do not seem to have characteristics that are immediately and clearly related to time on task. Therefore, it is hypothesized that these thinking styles will not present a significant effect on students' time on task.

Respectively, regarding the effect of thinking styles on student achievement, certain thinking styles are expected to have a correlation with student achievement, based on each trait's characteristics, as well as the finding of the existing literature. These are specific Type II thinking styles: executive, monarchic and conservative. As mentioned above, executive individuals like tasks that provide structure, prefer to be told what to do and will make a great effort to complete a given task. The above characteristics may assist executive individuals to complete their assignments, prepare for lessons and for evaluations according to the teacher's instructions and consequently accomplish better student achievement. Conservative individuals prefer tasks with existing rules, a characteristic that may help them perform well at evaluations. Monarchic individuals prefer to work on tasks that allow full focus on only one thing at a time. This characteristic may help them study more efficiently, organize homework better, and perform well at evaluations. Additionally, there are studies that found one or more of these thinking styles to have a positive correlation to student achievement (e.g. Zhang, 2004a, 2007; Kyriakides, 2005; Bernardo, Zhang, & Callueng, 2002). Therefore, it is hypothesized that the executive, monarchic and conservative thinking styles will present a positive effect on students' final achievement.

Figure 2.1a

Theoretical Model - Student Level



In addition to personality traits and thinking styles that constitute the main variables of the present study at student level, the theoretical model also takes under consideration the effect of two background variables: students' gender and prior achievement, as well as the students' time on task. As far as gender is concerned, the relevant literature suggests that many countries have made major improvement in narrowing or closing long-standing gender gaps in many areas of education, including educational achievement (OECD, 2015). The report of the Organisation for Economic Cooperation and Development (OECD): The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence (OECD, 2015), states that boys are more likely to be low achievers than girls. More specifically, among PISA's target population in 2012, a higher percentage of boys (14%) failed to attain the PISA baseline proficiency in any of the three core subjects measured in PISA – reading, mathematics and science. The respective percentage for girls that failed to attain the baseline proficiency was 9%. Moreover, six out of ten students who did not attain the baseline level of proficiency in any of those subjects were boys. In fact, in all countries and economies that participated in PISA 2012, girls outperformed boys in reading by an average of 38 score points (across OECD countries) as they have done consistently throughout all the PISA cycles since 2000. The 38-score-point difference is the equivalent of one year of school. The OECD's report states that there are many possible reasons for the boys' low performance at school. A good illustration of this, is that boys spend one hour less per week on homework than girls – and each hour of homework per week translates into a four-point higher score in the PISA reading test. Outside school, boys spend more time playing video games than girls and less time reading for enjoyment. Therefore, this study's theoretical model assumes that girls will present higher positive effect on time on task, as well as on the students' final achievement. In addition to gender, this study also takes under consideration the effect of prior achievement on time on task and on the students' final achievement. Almost all educational studies conducted during the past few decades recognize the importance of prior knowledge in learning and performance (e.g., Alexander, Pate, Kulikowich, Farrell & Wright, 1989; Dochy, 1994; Dochy & Alexander, 1995; Portier & Wagemans, 1995; Thompson & Zamboanga, 2003). These studies acknowledge how significant prior knowledge in the construction of new knowledge is. Consequently, students who lack relevant prior knowledge encounter difficulties in learning new information (Ausubel, 2000; O'Donnell & Dansereau, 2000). Therefore, the present theoretical model assumes that prior achievement will present an effect, both on time on task and on final achievement. Finally, one very important variable examined in this study is time on task. It can be assumed that a student who is on-task, listens to what the teacher says, asks questions, attends tasks, s/he is better

prepared to achieve higher learning outcomes than a student who does not pay attention or does not participate in the teaching process. Additionally, as presented in the review of the literature, (page 32), many studies reported a positive association between time on task and student achievement. Therefore, the present theoretical model assumes that time on task will have a direct effect on student achievement.

Theoretical Model – Classroom Level

Based on the literature, as it was presented above, this theoretical model assumes that at classroom level, the teacher effectiveness factors as they are proposed by the dynamic model, have a direct effect on student achievement gains. Additionally, it is hypothesized that certain factors of quality of teaching not only do they have a direct effect on student achievement, but they also have an indirect effect on the final achievement through time on task. As can be seen in Figure 2.1b, factors: orientation, structuring, application, questioning techniques, teaching-modelling, teacher-student interactions, managing misbehaviour and management of time are expected to have an indirect effect on student achievement through time on task. As presented in the literature review (page 27), structuring is present in a lesson when a teacher begins the lesson with a review of the objectives, signalizes transitions between the different parts of the lesson, calls attention to the main ideas and reviews them at the end of the lesson. These structuring tasks help the student understand the information as a whole and recognize the relationships between the parts (Case, 1993); something that may assist the student to stay on task. Therefore, the theoretical model of the current study assumes that structuring has an indirect effect on student achievement through time on task. With regards to the questioning techniques, it is argued that effective teachers ask several questions and attempt to involve students in class discussion (Muijs and Raynolds, 2000). This seems to be an efficient method to maintain students alert and on task. Therefore, it is expected that the questioning techniques present an indirect effect on student achievement through time on task.

Additionally, as presented above, orientation is expected to make students understand why tasks take place and therefore motivate the students to participate more actively in the lesson. The engagement of students with orientation tasks may encourage them to actively participate in the classroom, as the tasks set by the teacher will be significant for them (De Corte, 2000; Paris & Paris, 2001). Therefore, factor orientation is included in the Theoretical Model as one of the quality-of-teaching factors expected to have an effect on time on task.

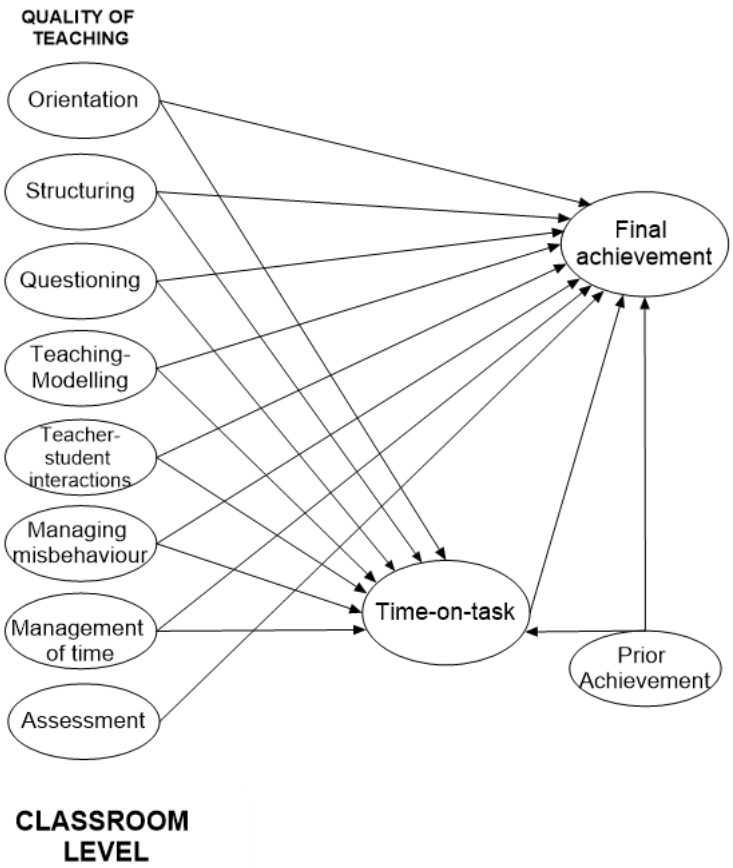
Another factor of quality of teaching that is included in the theoretical model of the current study is teaching-modelling. EER has shown that effective teachers encourage their students

to use strategies and develop their own strategies which can help them solve problems of different types (Creemers and Kyriakides, 2005a). Consequently, it is more likely that students will develop skills like self-regulation or active learning, skills that will help them organize their own learning (Kraiger, Ford and Salas, 1993). As a result, it can be assumed that this factor may influence a student's ability to remain on-task. Therefore, the theoretical model of the current study assumes that teaching-modelling has an indirect effect on student achievement through time on task.

Additionally, the application factor refers to the immediate exercise opportunities provided to the students regarding a topic they were taught. Therefore, it can be hypothesized that the application factor may assist students be on-task as it requires their active engagement.

Figure 2.1b

Theoretical Model - Classroom Level



Another factor of quality of teaching that is taken into consideration by the theoretical model is the classroom as a learning environment and more specifically, two of its elements; these are teacher-student interactions and the teacher's ability to manage misbehaviour. These two elements seem related to whether students are provided with the appropriate learning

environment that would encourage them to be on-task. In fact, Vanlaar et al. (2015) argued that this factor refers mostly to the extent to which teachers can create on-task behaviour through encouraging interactions and creating a supportive environment for learning in the classroom (Vandecandelaere et al., 2012). Therefore, the theoretical model of the current study assumes that teacher-student interactions and the teacher's ability to manage misbehaviour have an indirect effect on student achievement through time on task.

Management of time is one more factor of quality of teaching included in the theoretical model of the current study. According to the dynamic model of educational effectiveness, effective teachers can manage the classroom environment so that time used for organizing the lesson does not result in substantial loss of teaching time (Creemers and Kyriakides, 2008). Since this factor is clearly associated with teaching time, the theoretical model assumes that it has an indirect effect on student achievement through time on task.

As seen in Figure 2.1b, personality traits and thinking styles are not included at Classroom Level. This is because it is not expected that there will be a significant differentiation of personality traits or thinking styles among the different classrooms. Similarly, gender was not included at Classroom Level because in Cyprus, classrooms include both boys and girls. Had there been single-sex classrooms, then gender effects could have been studied. Finally, prior achievement is expected to affect time on task as previously discussed regarding the student level of the theoretical model. However, prior achievement is not expected to affect the teacher's quality of teaching. Since each Greek language teacher only teaches the Greek language lesson in one class, it would not be possible to determine whether prior achievement affects the teacher's quality of teaching. Therefore, the effect of prior achievement on quality of teaching is not included in the theoretical model.

Chapter Summary and Conclusions

In this chapter the main theoretical foundations of the research were presented and analysed. Specifically, this chapter began with the definition of educational effectiveness research and the historical development of the field. Next, the dynamic theory of educational effectiveness of Creemers and Kyriakides (2008) was analysed. This model turns the focus of research of educational effectiveness on key concepts of learning as it takes place in the classroom. From the components of effective learning, quality of teaching was chosen for further investigation in the following section. More precisely, Creemers and Kyriakides' (2008) teacher effectiveness factors used to evaluate the quality of teaching, were analysed. Among these teacher effectiveness factors, time management was included, which is directly related to the

construct of time in the classroom. Therefore, the construct of time on task was presented next. It is found in the literature that student-level factors may affect other student-level factors or even factors at other levels. Therefore, two student-level factors, namely personality traits and thinking styles were examined next. Both fields of personality traits and thinking styles incorporate a number of theories. In the context of this study the Five Factor Model of personality traits proposed by McCrae and Costa (1987) and the theory of mental self-government concerning thinking styles developed by Sternberg (1988) were adopted as it was argued that these theories permit a better investigation of the relationship of the two fields with academic achievement.

Research findings reported in this section allow for certain remarks to be made. A first remark involves the positive relation that time on task seems to have with academic achievement. Research on the relation between personality traits and academic success reveals a positive correlation between conscientiousness, openness to experience and agreeableness traits and academic success. With regards to thinking styles, mainly executive, conservative, monarchic and local styles have shown a positive connection to academic performance, but this association is not always consistent. Additionally, it was shown that the measurement of both personality traits and thinking styles and their correlation to academic performance appears to increase the percentage of the achievement variance that can be explained. However, this section has also revealed lack of the research concerning more complex relations of these four factors and academic achievement. More importantly, this section revealed the lack of previous research regarding the existence of indirect effect of quality of teaching on student achievement through time on task. Questions that emerge from this section involve the relation between quality of teaching and time on task and whether the quality of teaching has any indirect effect on student achievement gains through time on task. Additionally, questions emerge regarding whether personal characteristics of the students such as their personality traits and their thinking styles present indirect effects on student achievement gains through time on task. The questions that emerged from this section formed the Theoretical Model of the study which was presented in the last section of this Chapter. The assumptions of the Theoretical Model are addressed and tested throughout the design and implementation of this research and are presented in the following chapters.

CHAPTER 3: METHODOLOGY

Introduction

This chapter presents the methodology used to examine the research questions of the present study. It describes the methodology adopted and justifies the chosen research design. Following that, it describes in detail the process of sampling and data collecting. More specifically, it presents the creation and the use of data-collection instruments as well as the analyses made to check their validity. Finally, this chapter presents the statistical techniques employed to analyse the data and provide answers to the main research questions.

Justification of the method chosen

This study employs an approach that includes some characteristics of a longitudinal design. One of the most important characteristics of a longitudinal design is that it involves observations of a particular unit, at more than one point in time (Creemers, Kyriakides & Sammons, 2010). Accordingly, this study observes student achievement at two points in time: once at the beginning of the school year and once more at the end. Additionally, it observes the students' time on task at two points in time as well. Therefore, it differs from the cross-sectional design in which the units are only observed once. Even though longitudinal studies often include more than two observations, "there is general agreement among methodologists that a design with observations at two points still qualifies as longitudinal" (Creemers, Kyriakides & Sammons, 2010, p.78). However, even though this study would benefit from three or more measurements, only two were conducted due to reasons that will be explained shortly. Apart from the characteristics of a longitudinal design, this study includes characteristics of a cross-sectional design as well. Namely, the students' personality traits and thinking styles as well as the teachers' quality of teaching were observed only at one point in time.

This study could benefit from a longitudinal design that would include measurements in more time points during the following school years, but since it is a PhD study, such design would be very difficult to be achieved. An additional problem that would be encountered in a longitudinal design, is the fact that in the Cypriot school system, students normally change teachers or even schools when moving from one grade to another. Therefore, continuing the measurements for additional school years would prove problematic.

This study examines how some variables affect others; therefore, one could have chosen an experimental design for the research. This is not the case here as the study does not examine the effect of one variable exclusively. It examines how the five variables (time-on-task, personality, thinking style, quality of teaching and student achievement) affect each other

rather than strict cause-and-effect relations. Therefore, an experimental design would not benefit this study.

Participants

The participants for this study have been selected through stage sampling. Initially, from the 300 schools of Cyprus, the researcher excluded schools in Paphos and Famagusta due to distance reasons. The same applied with schools from Nicosia, Limassol and Larnaca which were harder to reach, again taking into consideration ease of access and distance. This resulted in a list of 110 schools in Nicosia, Limassol and Larnaca. From these schools, 40 schools were randomly selected and were contacted by the researcher. Out of these 40 schools, in 27 of them the head teachers granted the researcher permission to proceed. From these 27 schools, all teachers of grades four, five and six were selected, providing a total of 155 classes. This limitation of the grades is set because students of younger classes would not be able to complete at least one of the questionnaires, namely, the quality of teaching questionnaire, as the latter requires a level of understanding that younger students may not have acquired yet.

Permission from the teachers and the students' parents was requested in the relevant classes. In 48 out of the 155 classes, permission was not given either from the teacher or from the parents and therefore these were removed from the sample. The procedure resulted in a total of 27 schools and 107 teachers (32 from grade four, 41 from grade five and 34 from grade six). All students from these 107 classes were selected to participate and this produced a total of 1718 students (886 male and 883 female). From these, the 533 students are from grade four (277 male and 256 female), the 663 are from grade five (331 male and 332 female) and the other 522 are from grade six (278 male and 244 female).

Data collection instruments

The variables included in this study are the students' time on task, prior achievement, final achievement, personality traits and thinking styles and the teachers' quality of teaching. To measure these variables, a number of instruments were employed which are described in detail below. All questionnaires and achievement tests used in this study were named so that the data for each student could be matched, with the exception of the Quality of Teaching Questionnaire. The latter was anonymous so the students would feel free to report their true beliefs regarding their teacher.

Instrument for Student Observation measuring Time on Task (ISOTOT)

This instrument was created by the researcher to measure how much time students spend engaged with on-task activities during a lesson. In order to identify the categories that should have been included in the Instrument for Student Observation measuring Time on Task (ISOTOT), the researcher conducted four non-participating, unstructured lesson observations in different classes during Greek Language lessons. The researcher's goal was to identify as many student-behaviour examples that can be observed during a lesson as possible. This resulted in an extensive list which included over seventy possible behaviours that can be observed during a lesson. These behaviours were discussed with a group of teachers who added some behaviours and provided their opinion regarding the way these behaviours should be categorised. Following that, the behaviours were divided into twelve categories by taking into consideration the nature and the result of each behaviour. Afterwards, the categories were merged into six major categories with three of the categories having three subcategories each (see Appendix A). Table 3.1 presents the final categorization. The twelve categories are explained below.

Table 3.1

Categories of the Instrument for Student Observation measuring Time on Task (ISOTOT)

STUDENT BEHAVIOUR CATEGORIES
1. Active on task
2. Attending class
3. Attending an academic but non-relevant assignment
4. Off-task activities *a. Teacher's responsibility* *b. Student's responsibility* *c. School management's responsibility*
5. Distracting other students/teacher *a. Physical violence* *b. Verbal violence* *c. Other distraction*
6. Absent from class *a. Teacher's responsibility* *b. Student's responsibility* *c. School management's responsibility*

Category 1: Active On-Task includes behaviours which produce evidence that the student is actively on-task. An example of this behaviour can be observed when the student is

discussing with the teacher about academic content, answering a question, assisting another student or discussing with the latter regarding the lesson. As part of this category can also be considered a behaviour where the student is on the board working on an assignment, copying from the board, or working in his/her book/notebook on a written assignment.

Category 2: Attending Class includes behaviours which indicate that the student is attending the given learning task but in a rather passive manner. When a student is looking at the teacher while the teacher is talking or writing on the board, this can be considered as a behaviour that belongs in this category. Furthermore, a behaviour which is included in this category is when the student is looking at the assigned task in the book/notebook/exercise sheet. It is not clear if behaviours in this category are definitely on-task, or definitely off-task, as a student who is watching the teacher can be paying full attention or thinking of something entirely different. Acknowledging this grey area, this type of behaviours were included in this separate category.

Category 3: Attending an academic but non lesson-relevant assignment includes behaviours which show that the student is attending the task that was assigned to him/ her. However, the task itself is not related to the goals of the lesson, therefore this behaviour could be considered as a not on-task behaviour in terms of achieving the lesson's goals. For example, the student is assigned to cut and glue pictures in the notebook or colour a decorative picture to rest after finishing an exercise. In an observation where the researcher uses a two-category instrument (on task/ off task) to measure time-on-task, a student that behaves in a manner as explained above, would probably be considered as on-task. However, in this study, where the nature of the task is also examined, the behaviour falls under a different category, one which is more related to off-task categories rather than on-task ones.

Category 4: Off-task activities category includes off-task activities that are not related to learning. The behaviours of this category are divided into three subcategories based on the cause of the off-task behaviour.

Subcategory 4a is Teacher's responsibility and includes behaviours that can be limited by improved organization and policy by the teacher. For example, the student is waiting for the teacher to help him/ her with an assignment or is queuing to have his/ her assignment corrected. Another example of this category is if the student is handing out notebooks to the rest of the class or collecting working sheets from his/her classmates to hand to the teacher. Furthermore, behaviours that belong in this category are students waiting for the teacher to arrive in the classroom after a break, or waiting for the teacher to prepare his/ her notes or a presentation on the computer. In addition to this, a behaviour that also belongs in this category is when a student is discussing with the teacher about content unrelated to the lesson.

Therefore, this subcategory includes all student behaviours that occur while the teacher leaves the students without a task at hand, and therefore reducing the instructional time provided to the students.

Subcategory 4b is Student's responsibility and includes behaviours that are initiated by the student and are not related with learning. Some examples of this category are if the student is looking outside the window, writing on his/ her desk, sharpening their pencil, aimlessly going through their bag or pencil case etc.

Subcategory 4c is School management's responsibility and includes behaviours that can be limited by improved policy by the school management. Very often the teaching process is interrupted by either another teacher, a student or the head teacher to make an announcement or collect something. For example, if a student is looking at someone who came in the classroom to collect money for a fundraiser, then the student observed is off his/her task by school management's responsibility because the student is not being taught at this time. Another example of this category is when a student is not being taught because s/he is looking at the head teacher who came to inform the class about a field trip they will go on the following day. Finally, if the students are queuing to have their money collected by their teacher for a school event, this is also an example of this category because the student is not being taught at this time due to actions that can be attributed to school management's policy.

Category 5: Distracting other students/teacher includes behaviours where the student is off task, interacts with another person and presents misbehaviour. The behaviours of this category are divided into three subcategories based on the nature of the behaviour. Subcategory 5a is Physical Violence which includes behaviours of physical violence towards another person or self by any means, while subcategory 5b is Verbal Violence and includes verbal violence behaviours. Subcategory 5c is other distraction and includes all other types of disturbances that cannot be classified in any of the previous subcategories; for example, the student is talking with another student or passing notes. Behaviours included in this category can sometimes be confused with behaviours included in category 4b: Off-task by Student's responsibility, as they may be similar in nature. For example, if a student is talking to another student, the behaviour can be considered both Off-task by Student's responsibility (Category 4b) and other distraction (Category 5c). The factor that decides which category the behaviour belongs to, is whether the student is distracting another person with his/ her behaviour or not. Therefore, the above example clearly belongs in 5c: Other distraction behaviour. On the other hand, if the student is talking or singing quietly on his/ her own (behaviours often observed in young students), then this behaviour is categorised as 4b: Off-task by Student's responsibility since the behaviour is not disturbing another person.

The last category, Category 6: Absent from class, refers to the occasions when the student is present at school but absent from class during some of the time he/she is being observed. This category is divided into three subcategories based on the reason the student is absent. Subcategory 6a is Teacher's responsibility and includes behaviours that can be limited by improved organization and policy by the teacher. For example, the student is sent to make copies or bring something for the teacher. Subcategory 6b is Student's responsibility and includes behaviours that are initiated by the student and are difficult to be controlled by the teacher. We consider that the only behaviour included in this subcategory is when the student needs to use the restroom. All other behaviours that are initiated by the student such as going out of the classroom to drink water can be limited by teacher's policies and are therefore classified in category 6a: Teacher's responsibility. Subcategory 6c is School management's responsibility and includes behaviours that can be limited by improved policy by the school management. For instance, the student is sent by the principal to other classrooms to make an announcement or collect something.

The above instrument was used during structured classroom observations that took place from October 2011 until March 2012. More specifically, two classroom observations were conducted for each participating class during Greek Language lessons. The subject of Greek Language was selected for this study because it is the subject with the most hours on the curriculum. Since this study measures quality of teaching, the researcher selected the subject with the most teaching hours on the curriculum in order to effectively measure the teacher's effectiveness. The subject was held the same for all observations since the students' behaviour may vary across different subjects. All observers that took part in this study participated in a 5-hour seminar. There, they were trained to recognise the student behaviours, understand the theory behind the categorization and practice the use of the ISOTOT.

Two observers were present in each classroom at the same time. The two observers entered the classroom at the beginning of the lesson and each of them chose six different students to observe. Only six students and not all students were selected so that a sufficient amount of time would be spent observing each one. By the end of the lesson, each student had been observed approximately 36-40 times, depending on lesson duration. Two observers were assigned for every class so that a total of 12 students would be observed in each class, a number that is equal to or more than the 50% of the student population of each class in the sample. In fact, in smaller-population classrooms the 12 students were 70%-80% of the classroom population. In any case, the law in Cyprus states that the number of students in each classroom cannot exceed twenty-five, therefore there were not any classrooms bigger than this number. The six students were selected randomly, after excluding special needs

students and students who do not understand the Greek language at all (if they were any). This exclusion was made as it would not be useful to this study to observe the classroom behaviour of students who do not understand the language in which the lesson in conducted or are not able to follow the lesson due to heavy medical conditions. Inevitably, students who were absent the day the achievement test was conducted, were not included in the selection as we would not be able to match the student's behaviour to an achievement score. Therefore, the observers randomly selected 6 different students each, from the students available after the exclusions were made. During the lesson, the observers watched the students and noted their behaviour on the Instrument for Student Observation measuring Time on Task (ISOTOT) which can be found in Appendix B. Specifically, the observer watched the first student for five seconds and during the following five seconds he/she reported the observed behaviour on the ISOTOT. After that, the observer watched the second student for five seconds and during the following five seconds he/she reported the observed behaviour. This pattern continued until all six students were observed. Afterwards, the observer repeated the same procedure starting again from the first to the sixth student until the completion of the lesson. The various student behaviours are grouped into categories so that the observer would only report the category, not the specific behaviour. This categorization allows the observers to minimize the time needed to record each behaviour, thus minimizing the risk for mistakes due to time pressure.

Time on task is the main focus of this study. Therefore, the analysis regarding the Instrument for Student Observation measuring Time on Task (ISOTOT) will be presented and discussed in detail in the next chapter.

Personality Questionnaire

The personality traits of the students are measured with the use of the Personality Questionnaire for students. The questionnaire was developed based on the Big Five Personality Traits of Costa and McCrae (1997) which includes 4 items for each trait, while Likert scale was used to measure them. The questionnaire can be found in Appendix C and the specification table for the questionnaire can be found in Appendix D.

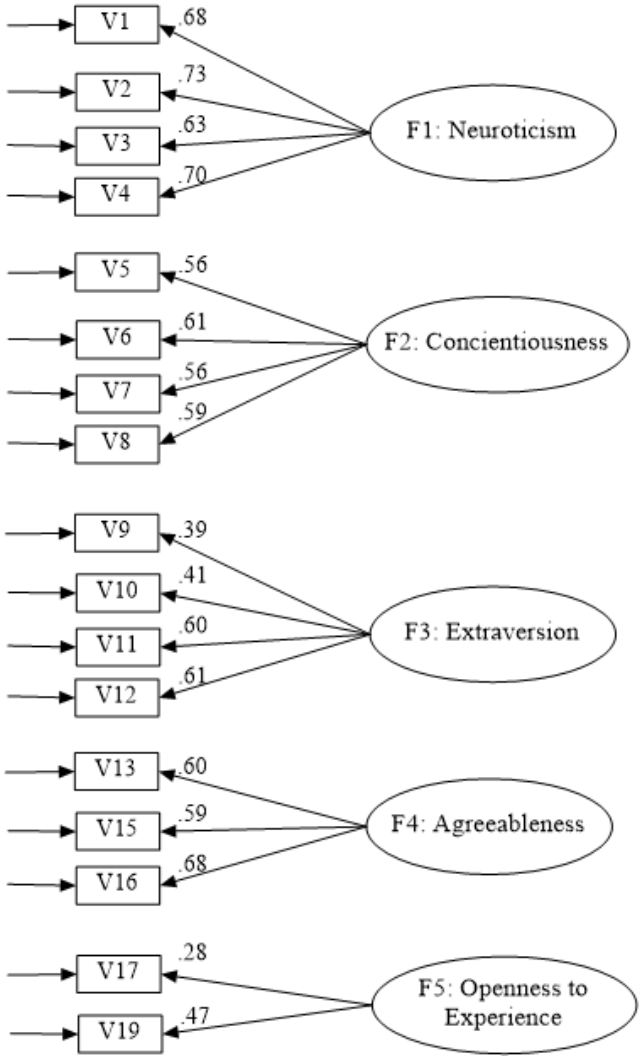
To check the construct validity of the personality questionnaire, Confirmatory Factor Analysis (CFA) using the EQS software (Bentler, 1995) was conducted for each one of the Big Five Personality Traits. The results of the CFA analysis are presented below. Structural equation modelling analysis (SEM) produced a model that contained all five personality traits: Neurotic, Conscientious, Extraversion, Agreeable and Openness to experience. The fit statistics for this questionnaire (scaled X^2= 365.280, d.f. =106, p=.000; RMSEA=0.037

and CFI = 0.957) were acceptable. The standardized factor loadings were all positive and moderately high. Out of the 20 items included in the questionnaire, 3 were dropped, one from factor Agreeable and two from factor Openness to Experience. Generally, the item loadings to the factors are relatively high except for item 9 and item 17. Item 9 from factor Extraversion and item 17 from factor Openness to Experience both have relatively low loadings. As it will be presented shortly, in addition to the Structural equation modelling analysis that was conducted by taking into consideration the data from grades 4, 5 and 6 collectively, three separate Multigroup CFA analyses, one for each grade was also conducted. The Multigroup CFA analyses revealed that the items 9 and 17 presented relatively low loadings across all three groups and therefore the low loadings cannot be attributed to one age group alone. Similarly, factor Openness to Experience proved to be a difficult factor to measure since from the four items originally included in the questionnaire to measure this factor, two were dropped due to the CFA results and one of the two items remaining, is item 17 which presents relatively low loading to the factor. If item 17 was also dropped, then the factor would not be measured and this is mainly why item 17 was kept, despite its low loading.

Figure 1 presents the model of the student questionnaire measuring Personality Traits. In line with the literature, the correlations between the five factors were relatively low and are omitted from the figure for brevity reasons but it can be found in Appendix G.

Figure 3.1

Personality Traits model as produced by Structural Equation Modelling Analysis (SEM)



Note: For brevity reasons, the relations between the factors are omitted from the figure but can be found in Appendix G.

Personality seems to be developed and set at a young age. In fact, in certain studies, teachers' ratings of the personalities of three-year-old and four-year-old children showed significant connection to behavioural assessments made in the laboratory a dozen years later (e.g., Funder & Block, 1989; Funder, Block & Block, 1983). Correspondingly, ratings of the Big Five traits made in elementary school correlate with self-reports of personality after 40 years (Hampson & Goldberg, 2006). However, since the personality questionnaire was administered to three different age groups (Grade 4, Grade 5 and Grade 6) to eliminate the possibility that the younger group did not yet form their personality and consequently compromise the personality questionnaire results, three separate Multigroup CFA analyses, one for each grade was conducted. The Multigroup CFA analyses revealed that results for

Grade 4 (x^2=261.720, d.f=109, p=.000, CFI= .925, RMSEA= .049) were as good as the results from Grade 5 (x^2=254.818, d.f=109, p=.000, CFI= .939, RMSEA= .043) and Grade 6 (x^2=261.720, d.f=109, p=.000, CFI= .925, RMSEA= .049). Therefore, it has been shown that the questionnaire works very well for all groups included in this study.

Thinking Style Questionnaire

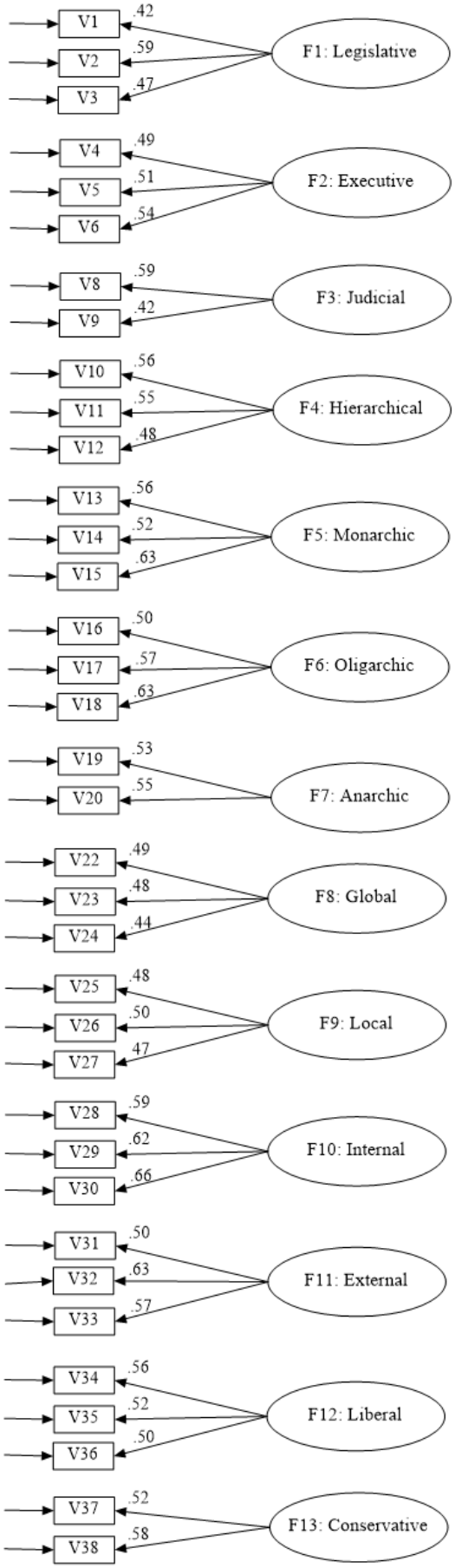
The students' Thinking Style is measured with the use of the Thinking Style Questionnaire for students (see Appendix E). The questionnaire was developed based on the Theory of Mental Self-Government as proposed by Sternberg (1988). Three items for each thinking style were included, while a Likert scale was used to collect data. The specification table for the questionnaire can be found in Appendix F.

To check the construct validity of the Thinking Style Questionnaire, Confirmatory Factor Analysis (CFA) was conducted for each one of the 13 Thinking Styles. The results of the CFA models are presented below and provide support to the construct validity of the questionnaire.

Structural equation modelling analysis (SEM) produced a model that contained all 13 Thinking Styles and the model was found to fit to the data (scaled x^2=1905.401, d.f=511, p=.000, RMSEA=.039, CFI=. 898). The standardized factor loadings were all positive and moderately high, all were near or over .50. Out of the 39 items included in the questionnaire, 3 were dropped, one from factor Judicial, one from Anarchic and one from Conservative. Figure 2 presents the model of the student questionnaire measuring Thinking Styles. The correlations between the 13 factors were either too high or low and are omitted from the figure for brevity reasons but can be found in Appendix H.

Figure 3.2

Thinking Styles model as produced by Structural equation modelling analysis (SEM)



Note: For brevity reasons, the relations between the factors are omitted from the figure but can be found in Appendix H.

Quality of Teaching Questionnaire

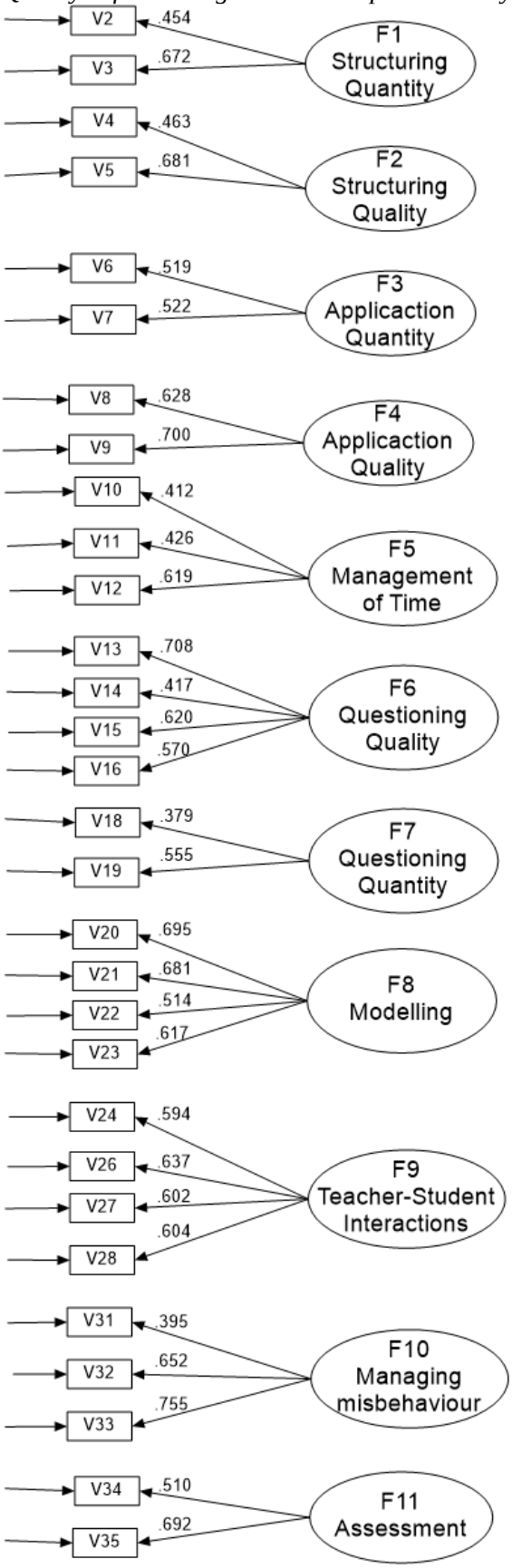
The Quality of Teaching is measured with the use of the Quality of Teaching Questionnaire for students. Specifically, students are asked to indicate the extent to which their teacher behaves in a certain way in their classroom, and a Likert scale was used to collect data. The questionnaire was originally developed by Kyriakides and Creemers (2008) and measures the classroom-level factors and their dimensions, based on the Dynamic Model of Educational Effectiveness and produced eleven first-order factors.The questionnaire was initially created to be used for grade 6 students. Since this study includes students from grades 4, 5 and 6, a pilot study was conducted to identify if the items were comprehensible by the students. The pilot study revealed that many items were not comprehensible to the younger students and therefore the questionnaire was altered in terms of vocabulary and syntax in order to be comprehensible to all the students of this study. Additionally, the Orientation variable was found to be difficult to comprehend by the younger students and was therefore removed from the questionnaire. The quality of teaching questionnaire was administered near the end of the school year, so that the students had sufficient experience regarding their teacher and therefore were able to complete the questionnaire.

To check the construct validity of the Quality of Teaching Questionnaire, Confirmatory Factor Analysis (CFA) was conducted for each of the 11 Quality of Teaching factors. The results of the CFA models are presented below.

Structural equation modelling analysis (SEM) produced a model that contained 11 factors and the model was found to fit to the data (scaled x^2=903.377, d.f=344, p= .000, RMSEA= .030, CFI= .956). The standardized factor loadings were all positive and moderately high. Out of the 36 items included in the questionnaire, 6 were dropped, one from factor Structuring, one from Questioning, two from Teacher-Student Interactions, one from Misbehaviour and one from Assessment. It is important to note that the 6 items that were dropped were not dropped only from one or two factors but belonged to 5 different factors and therefore the fact that they had to be dropped did not affect the factors. Figure 3 presents the model of the student questionnaire measuring Quality of Teaching. The correlations between the 11 factors were either too high or low and are omitted from the figure for brevity reasons. However, the correlations can be found in Appendix I.

Figure 3.3

Quality of teaching model as produced by Structural equation modelling analysis (SEM)



Note: For brevity reasons, the relations between the factors are omitted from the figure but can be found in Appendix I.

Additionally, for the quality of teaching questionnaire, a one-way ANOVA on the use of students' ratings was conducted to show whether the data could be generalized at the classroom level. As it can be seen on Table 3.2, the one-way ANOVA showed that all cases were statistically significant and therefore the results are generalizable.

Table 3.2

One-way ANOVA analysis for Quality of Teaching Questionnaire

Category	F	Sig
F1: Structuring: Quantity	2.833	.000
F2: Structuring: Quality	2.838	.000
F3: Application: Quantity	2.777	.000
F4: Application: Quality	2.603	.000
F5: Management: of time	2.573	.000
F6: Questioning: Quality	3.869	.000
F7: Questioning: Quantity	2.185	.000
F8: Modelling	3.414	.000
F9: Interactions	3.673	.000
F10: Misbehaviour	4.832	.000
F11: Assessment	4.011	.000

Achievement tests

To measure the students' prior and final knowledge and skills regarding the lesson of Greek Language, a battery of criterion-reference tests is used which were created based on the objectives of the national curriculum in Cyprus (Kyriakides & Creemers, 2008). More specifically, to measure the prior achievement of the students of grade 4, the students were administered a test which included material the students were taught in grade 3. To measure the students' final achievement, the students were administered a test which included material the students were taught in grade 4. Respectively, the students of grade 5 were administered a test with grade 4 material at the beginning of the school year and grade 5 material at the end of the school year. Therefore, the final test of grade 4 was the initial test of grade 5 and so on. Table 3.3 presents the administration procedure.

Table 3.3

Beginning and end of school year student test administration

Point in time	Grade 4 (D4)	Grade 5 (G5)	Grade 6 (G6)
Beginning of school year	G3 test	G4 test	G5 test
End of school year	G4 test	G5 test	G6 test

The achievement tests were equated using Item Response Theory modelling, in order to make the comparison of the test scores meaningful. The test scores were estimated with the use of the Extended Logistic Model of Rasch (Andrich, 1988). Rasch was used to analyse the emerging data at the beginning and at the end of the school year separately.

Regarding the Extended Logistic Model of Rasch, the model fit statistics are infit (weighted) and outfit (unweighted) mean square statistic. Fit statistics are used to assess whether a given person's performance (or a given item) is consistent with other persons' performances (or items) and are based on the differences between the expected and observed performances (Kyriakides, Kaloyirou & Lindsay, 2006). Outfit statistics are based solely on the difference between observed and expected scores whereas in calculating infit statistics extreme persons or items are downweighted. All weighted (i.e. infit) statistics in the Rasch model increase the weight of targeted responses (Kyriakides, Kaloyirou & Lindsay, 2006). It is customary for items to be considered to fit the Rasch model if they have item the infit mean squares and the outfit mean squares within the range of 0.77–1.30 (Adams & Khoo, 1996), although many researchers recommend a more restricted range of 0.83–1.20 (Keeves & Alagumalai, 1999). The normalized statistics, infit t and outfit t, have a mean near zero and a standard deviation near one when the data conform to the measurement model.

The Rasch model was applied on the sample (N=1718) and all 123 items using the computer program Quest (Adams & Khoo, 1996). A summary of the statistics is presented below.

For the beginning-of-school-year achievement tests, regarding the Items, the Standard Deviation was 0.99 and the Reliability of estimate was 0.99. The Mean Infit Mean Square was 0.99, the Mean Outfit Mean Square was 0.97, the Mean Infit t was -0.27 and the Mean Outfit t was -0.35. Regarding the Cases, the Mean was 0.29, the Standard Deviation was 1.30 and the Reliability of estimate was 0.94. The Mean Infit mean square was 1.02, the Mean Outfit mean square was 0.99, the Mean Infit t was 0.10 and the Mean Outfit t was -0.07. For the end-of-school-year achievement tests, regarding the Items, the Standard Deviation was 1.15 and the Reliability of estimate was 0.99. The Mean Infit mean square

was 1.00, the Mean Outfit mean square was 0.99, the Mean Infit t was -0.10 and the Mean Outfit t was -0.23. Regarding the Cases, the Mean was 0.44, the Standard Deviation was 1.17 and the Reliability of estimate was 0.92. The Mean Infit mean square was 1.02, the Mean Outfit mean square was 0.99, the Mean Infit t was 0.10 and the Mean Outfit t was -0.01. Additionally, as presented by Demetriou and Kyriakides (2006), Reliability is calculated by the Item Separation Index and the Person Separation Index. Separation indices represent the proportion of the observed variance considered to be true. A value of 1 represents high separability in which errors are low and item difficulties and pupil measures are well separated along the scale (Wright & Masters, 1981). As can be seen from the above summary, regarding the beginning-of-school-year achievement tests the reliability for items and cases is 0.99 and 0.94 respectively, which is considered to be an excellent score since reliability of 0.90 or higher is sought for an excellent scale (Wright, 1985). Equally good are the values for the end-of-school-year achievement tests, where the reliability for items is 0.99 and for cases 0.92. As mentioned earlier, the data is considered to fit the model if the Mean values of Infit Mean Square and Outfit Mean Square are near 1. As can be seen from the summary of the statistics presented above, the values are between 0.97 and 1.02. This implies that in each analysis, there is a good fit to the Rasch model. Additionally, the thresholds distances are satisfactory and the items of the beginning-of-school-year achievement tests are well targeted against the students' measures since students' scores range from -2,8 to 3,5 logits and item difficulties range from -2,4 to 3,6 logits. Respectively, regarding the end-of-school-year achievement tests, students' scores range from -3,7 to 3,0 logits and item difficulties range from -3,9 to 3,2 logits.

Data analysis

Several techniques are employed in this study in order to analyse the data and provide answers to the main research questions. As presented above, in order to check the construct validity of the personality questionnaire, a Confirmatory Factor Analysis (CFA) using the EQS program (Bentler, 1995) was conducted for each of the Big Five Personality Traits, as well as Structural Equation Modelling (SEM) Analysis to produce the final model. Similarly, in order to check the construct validity of the thinking styles questionnaire, a Confirmatory Factor Analysis (CFA) was conducted for each one of the 13 thinking styles and a Structural Equation Modelling (SEM) Analysis to produce the final model. The same techniques were applied for the quality of teaching questionnaire where a CFA was conducted for each of the factors taken into consideration in this study.

Additionally, for the quality of teaching questionnaire, a Generalizability Study on the use of students' ratings was conducted with the use of one-way ANOVA. Generalizability theory is a statistical theory for evaluating the reliability of behavioural measurements (Brennan, 2001). Therefore, in this case, it helps us identify whether the students of each class rated their teacher in a similar manner and a general tendency is visible for each class. The Generalizability Study showed that the data can be generalized at the classroom level.

With regards to the achievement tests, as presented above, these were equated using Item Response Theory modelling, in order to make the comparison of the test scores meaningful and the Extended Logistic Model of Rasch (Andrich, 1988) was used to estimate the test scores.

Regarding the time-on-task variable, two 40-minute lesson observations took place. More specifically, the students were repeatedly observed every minute during this 40-minute period. Therefore, it is necessary to examine whether the student's behaviour is related to time point in which he/she was observed. For example, does the student present consistently different behaviour in the first 10 minutes of the lesson in comparison to the last 10 minutes of the lesson? This is examined with the use of a Generalizability Study. The results of this analysis are presented in Chapter 4. Respectively, since two different-day observations took place, there is the need to examine whether the student's behaviour is related to the day in which he/she was observed. This is examined with the use of paired t-test to compare the effect of the lesson on each of the instrument's categories, the results of which are presented in Chapter 4. Finally, seven observers were involved with the observations due to the large number of participants. Therefore, it was necessary to examine whether the observed behaviours depended on the observer or not. Again, a one-way ANOVA was conducted, and its results are presented in Chapter 4.

The first question of this study is the extent to which a) the teacher effectiveness factors included in the dynamic model, b) the students' time on task, c) the students' personality traits and d) the students' thinking styles, can influence student achievement. To answer this question, data from a) the Quality of Teaching Questionnaire, b) the Instrument for Student Observation measuring Time on Task (ISOTOT), c) the Personality Traits Questionnaire and d) the Thinking Styles Questionnaire, respectively, is used. To analyse the data provided by the instruments above, Multilevel Regression Analysis is utilised.

In addition to the direct effects of the above variables to student achievement, indirect effects are also sought. More specifically, the second question of the study, examines if a) the teacher effectiveness factors included in the dynamic model, b) specific personality traits and c) specific thinking styles, have an indirect effect on student achievement through time

on task. To answer this question, again data from a) the Quality of Teaching Questionnaire, b) the Instrument for Student Observation measuring Time on Task (ISOTOT), c) the Personality Traits Questionnaire and d) the Thinking Styles Questionnaire, respectively, is used. Multilevel Regression Analysis cannot seek indirect effects, therefore this question is answered with the use of Multilevel Structural Equation Modeling (SEM). When using Multilevel Regression Analysis, a variable is always dependent, while with the use of Multilevel SEM Analysis, the same variable can be considered both dependent for one variable and independent for another variable. Therefore, Multilevel Structural Equation Modelling allows the researcher to explore indirect relationships while at the same time it takes into consideration the nested nature of the data (Goldstein & McDonald, 1988; Muthén & Satorra, 1989). For example, in the present study, time on task is considered independent from student achievement while at the same time it is considered dependent from the quality of teaching. This enables the researcher to search for indirect effects among the different variables and different levels.

CHAPTER 4: RESULTS

Introduction

Chapter 4 includes the validation of the Instrument for Student Observation measuring Time on Task (ISOTOT) which is a new instrument designed specifically for the present study. The other instruments, as they have been used in previous studies as well, have been presented in Chapter 3. However, the ISOTOT is new and it is one of the main purposes of this study. Therefore, it is presented extendedly in Chapter 4. Additionally, the results of the Multilevel Regression Analysis are presented, which illustrate how each of the variables (Personality Traits, Thinking Styles, Time on Task and Quality of Teaching) affects Student Achievement directly. Finally, the results from the Multilevel SEM Analysis are presented. This analysis enables us to examine relations between variables operating at different levels. Therefore, it helps us to examine whether the four factors operating at student level and classroom level are related directly or indirectly to student achievement. Additionally, it helps us identify relations among factors operating at the same level. Specifically, we searched for indirect effects of quality of teaching through time on task (research question 1). Using Multilevel SEM, we can also examine whether the four variables operating at student level and classroom level are related to each other.

Instrument for Student Observation measuring Time on Task (ISOTOT)

As mentioned before, the Instrument for Student Observation measuring Time on Task is a new instrument designed specifically for the present study and therefore its validation will be presented in this chapter. This instrument was used during structured classroom observations that took place during Greek Language lessons. More specifically, two 40-minute classroom observations were conducted for each participating class. Two observers were present in each classroom at the same time and each observer observed 6 different students. Each observer devoted 10 seconds per student to study and record their behaviour before moving on to the next student. More specifically, each observer watched the first student for five seconds and during the following five seconds he/she reported the observed behaviour on the Classroom Observation Report. Then, the observer watched the second student for five seconds and during the following five seconds he/she reported the observed behaviour. This pattern continued until all six students were observed. Afterwards, the observer repeated the same procedure starting again from the first to the sixth student until the completion of the lesson. With this procedure, all 6 students were studied every minute of the lesson, but for 10 seconds each. By the end of the lesson, each student had been observed approximately 36-40 times, depending on lesson duration.

To record and analyze the data gathered, a 40-minute table was created. There, the category that each student was on, was noted for each of the 40 minutes of the first lesson (Table 4.1). The same procedure was followed for the second lesson as well.

Table 4.1

Recording the data – Phase 1

Student_ID	Lesson	min1	min2	min3	…	min39	min40
1	1	ACT(10)	ACT(10)	ATT(20)		OFFT(41)	ACT(10)
2	1	ACT(10)	OFFT(41)	ATT(20)		ACT(10)	OFFS(42)
3	1	ACT(10)	ACT(10)	ATT(20)		OFFS(42)	ACT(10)

The researcher wanted to examine whether the observed behaviours were different depending on the stage of the lesson. For example, did the students tend to be more on task at the beginning of the lesson? Did they tend to be more off task towards the end of the lesson? Therefore, the lesson was divided into four 10-minute periods (Index 1, index 2, index 3 and index 4) and a new table was created (Table 4.2) now including 12 columns, one for every category of the ISOTOT, and four rows, one for each 10-minute period (index). In each column, the researcher noted the number of times the category was observed during the specific 10-minute period (index). Again, the same procedure was followed for the second lesson.

Table 4.2

Recording the data – Phase 2

Student_ID	Lesson	Index	ACT(10)	ATT(20)	IRREL(30)	OFFT(31)	…
1	1	1	5	2	1	0	
1	1	2	4	2	0	0	
1	1	3	2	4	0	1	
1	1	4	5	4	0	0	
1	2	1	3	5	0	0	
1	2	2	2	4	1	0	
1	2	3	5	1	0	0	
1	2	4	4	2	0	0	

To confirm that the behaviours observed were independent from the Index, a one-way between subjects ANOVA was conducted to compare the effect of the Index on each one of the instrument's categories. Table 4.3 shows the results of the one-way ANOVA.

Table 4.3

One-Way ANOVA for ISOTOT Data – By Index

Category	F	Sig.
1. Active on task	17.639	.000
2. Attending class	178.638	.000
3. Attending an academic but non relevant assignment	13.814	.000
4. Off-task activities		
a. Teacher's responsibility	103.652	.000
b. Student's responsibility	12.372	.000
c. School management's responsibility	34.232	.000
5. Distracting students/teacher		
a. Physical violence	1.393	.243
b. Verbal violence	1.106	.345
c. Other distraction	4.403	.004
6. Absent from class:		
a. Teacher's responsibility	1.688	.167
b. Student's responsibility	.680	.564
c. School management's responsibility	.593	.620

The analysis showed that the behaviour type is independent from the Index. Therefore, the data is generalizable and data from all four Indexes can be merged. The only categories that are not statistically significant are categories 5.a. Distracting students/teacher-physical violence, 5.b. Distracting students/teacher-verbal violence and category 6. Absent from class. As a result, these categories cannot be aggregated. As can be seen from table 4.4, these categories were rarely observed. Caution should be taken when interpreting this information as this may be a result of the observers' presence in the classroom. Both students and teachers

knew they were being observed; therefore, this may have influenced their behaviour. For example, students may have been more careful not to engage in verbal or physical violence while having two strangers in the classroom watching them. Respectively, the teachers might have been more cautious not to send students outside the classroom to make copies and school management might probably not have chosen this time to ask a student to go to every classroom to raise money for a cause.

Table 4.4

Descriptive statistics for categories 5.a., 5.b.and 6.

	Mean	Std. Deviation
5.a. Distracting students/teacher - Physical violence	< .01	.083
5.b. Distracting students/teacher - Verbal violence	.01	.117
6.a. Absent from class – Teacher's responsibility	.01	.201
6.b. Absent from class – Student's responsibility	.02	.265
6.c. Absent from class – School management's responsibility	.03	.559

The ANOVA by index that was presented above indicates that a single score per lesson can be extracted (with the exclusion of categories 5.a., 5.b. and 6). Additionally, since two lesson observations were conducted for each class on different days, it was essential to confirm that the observed behaviour categories were not statistically different between the two lessons, in order to extract a single score per instructor. Hence, paired t-test was conducted to compare the effect of the lesson on each of the instrument's categories. No statistically significant difference was observed. This implies that there is no statistical significance of the lesson on the observed behaviour categories. Therefore, the data from both lessons could be merged into one and result in a single score per instructor. Since two lesson observations were conducted, pair t-test was implemented. If more than two observations were conducted, a one-way ANOVA generalization study would have been implemented. However, it was possible to conduct only two observations and therefore pair t-test was implemented.

Table 4.5

One-Way ANOVA for ISOTOT Data - By Observer

Category	F	Sig.
1. Active on task	247.646	.000
2. Attending class	242.262	.000
3. Attending an academic but non relevant assignment	25.570	.000
4. Off-task activities		
a. Teacher's responsibility	98.930	.000
b. Student's responsibility	120.736	.000
c. School management's responsibility	14.273	.000
5. Distracting students/teacher		
a. Physical violence	4.251	.000
b. Verbal violence	7.346	.000
c. Other distraction	116.764	.000
6. Absent from class:		
a. Teacher's responsibility	2.888	.008
b. Student's responsibility	.925	.476
c. School management's responsibility	12.108	.000

A total of 7 observers participated to complete the observations for all the participating students. Consequently, it was necessary to ensure that the results were independent from the observer. Therefore, a one-way between subjects ANOVA was conducted to compare the effect of the observer on each of the instrument's categories. Table 4.5 presents the one-way ANOVA results. From Table 4.5, it can be observed that all categories are statistically significant except for 6.a. Absent from class – Teacher's responsibility and 6.b. Absent from class – Student's responsibility. These two categories are not statistically significant, possibly due to the fact that they were rarely observed, as was earlier presented on Table 4.4, and they will not be used henceforth. Based on the results that emerged from the one-way ANOVA, it can be argued that the ISOTOT data is generalizable regardless of the observer. Concluding, since the results were found generalizable by the one-way ANOVA analyses as well as the paired t-test, the data could be merged into a single score regardless the index or

the lesson. Therefore, all the appearances of each category during the four indexes of the two lessons were summed and divided by the total number of indexes, namely eight. Therefore, one single mean score was created for each category and each student (Table *4.6*).

Table 4.6

Recording the data – Phase 3

Student ID	ACT(10) Mean score	ATT(20) Mean score	IRREL(30) Mean score	OFFT(31) Mean score	…
1	4.125	2.125	1.375	0.125	
2	2.875	1.375	1.625	2.125	
3	3.75	1.875	1.875	0.25	

As presented in Chapter 3, the ISOTOT includes a total of 12 categories and subcategories in which all possible observable student's behaviours can be classified into. However, some of the categories were rarely observed. The categories which presented a Standard Deviation value of .4 or higher were kept, while the rest were dropped. As seen on Table 4.7, the categories that met this criterion and therefore were kept, were the following: Category 1: Active on task, Category 2: Attending class, Category 4a: Off-task activities by teacher's responsibility and Category 4b: Off-task activities by student's responsibility.

Table 4.7

Minimum, Maximum, Mean and Standard Deviation for ISOTOT Categories (Mean value of appearances per 10-minute period)

Category	N	Min	Max	Mean	Standard Deviation
1. Active on task	1277	0.00	8.12	3.224	1.622
2. Attending class	1277	0.25	9.50	4.171	1.828
3. Attending an academic but non relevant assignment	1277	0.00	1.75	0.085	0.210
4. Off-task activities					
a. Teacher's responsibility	1277	0.00	1.75	0.085	0.210
b. Student's responsibility	1277	0.00	5.50	1.041	0.941

c. School management's responsibility	1277	0.00	3.75	0.100	0.272
5. Distracting students/teacher					
a. Physical violence	1277	0.00	0.62	0.004	0.035
b. Verbal violence	1277	0.00	0.88	0.008	0.051
c. Other distraction	1277	0.00	4.38	0.183	0.367
6. Absent from class:					
a. Teacher's responsibility	1277	0.00	2.75	0.008	0.098
b. Student's responsibility	1277	0.00	1.12	0.020	0.099
c. School management's responsibility	1277	0.00	4.50	0.034	0.370

Multilevel Regression Analysis

After validating the Instrument for Student Observation measuring Time on Task (ISOTOT) data, the impact of this study's four variables on student achievement was studied. More specifically, Multilevel Regression Analysis was conducted in order to measure the impact of personality, thinking style, time on task and quality of teaching, on student achievement. The results of the Multilevel Regression Analysis are presented in this part. MLwiN software was used to examine the extent to which personality, thinking styles, time on task and quality of teaching are associated with student achievement. Table 4.8 illustrates the parameter estimates and standard errors of the explanatory variables that were found to be associated with student achievement. Overall, 5 models were examined. The first model was the empty model (model 0), in which no explanatory variables were included. In model 1, context variables were added to the empty model. In model 2, the variables of Time on Task were added to model 1, while in model 3 the variables of Personality and Thinking Styles were added to model 2. Finally, in model 4 the variables of Quality of Teaching were added to model 3. The five models are presented in detail below.

The first model estimated in the study is the empty model (model 0) in which no explanatory variable (i.e., personality, thinking styles, time on task or quality of teaching) was included in the analysis. This was done to investigate how the total variance is allocated to the two levels (student level and classroom level). The empty model revealed that 78.3% of the total variance was situated at the student level and 21.7% of the variance at the classroom level. In subsequent steps, explanatory variables at different levels were added, starting from the student level (see Table 4.8). Explanatory variables, except grouping variables, were

centered as Z-scores with a mean of 0 and a standard deviation of 1. This is a way of centering around the grand mean (Bryk & Raudenbush, 1992) and yields effects that are comparable. Grouping variables were entered as dummies with one of the groups as baseline (e.g., boys = 0).

Table 4.8

Parameter estimates (and standard errors) for the analysis of language achievement

Factors	**Model 0**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Fixed part (Intercept)	0.92(.09)	0.66(.07)	0.39(.07)	0.24(.06)	0.19(.06)
Student Level					
Context					
Prior knowledge		.53(.08)	.59(.08)	.58(.08)	.58(.08)
Sex		.11(.05)	.11(.05)	.11(.05)	.11(.05)
Time on task					
Active on-task			.24(.07)	.23(.07)	.24(.07)
Off-task student's responsibility			-.11(.00)	-.12(.00)	-.11(.00)
Personality					
Conscientiousness				.10(.04)	.10(.04)
Openness to experience				.09(.04)	.09(.04)
Thinking style					
Executive				.12(.05)	.12(.05)
Local				-.08(.04)	-.08(.04)
Classroom Level					
Context					
Average prior knowledge		.23(.07)	.23(.07)	.23(.07)	.23(.07)
Percentage of girls		.09(.04)	.09(.04)	.09(.04)	.09(.04)
Quality of teaching					
Structuring: Quantity					.16 (.07)
Structuring: Quality					.17 (.08)
Application: Quality					.14 (.05)
Management of time					.17 (.06)
Questioning: Quality					.19 (.06)

Modelling					.14 (.05)
Managing misbehaviour					.12 (.05)
Assessment					.13 (.06)
Variance components					
Student	78.3%	55.3%	47.5%	42.9%	41.8%
Class	21.7%	14.2%	12.2%	12.0%	5.4%
Explained		30.5%	40.3%	45.1%	52.8%
Significance test					
X^2	1244.3	782.1	641.1	595.5	501.0
Reduction		462.2	141.1	55.6	94.5
Degrees of freedom		4	2	4	8
p-value		.001	.001	.001	.001

In model 1, the context variables at each level were added to the empty model. The following observations arise from the figures of the third column of Table 4.8. First, model 1 explained 30.5% of the variance, of which 23% was attributed at the student level and 7.5% was attributed at the classroom level. Second, the effects of both contextual factors (i.e., prior knowledge, sex) are significant at both the student level and the classroom level. In fact, adding gender background improves model 1 and girls achieve higher scores than boys in Greek Language; this is consistent with the literature (OECD). Prior knowledge was found to have the strongest effect in predicting the final achievement score at both levels.

In model 2, the explanatory variables at the student level related with the student's time on task were added to model 1. As it can be seen in the fourth column of Table 4.8, categories "1. Active on-task" and "4b. Off-task by Student's responsibility" are found to present statistically significant effects on student achievement. Category "1. Active on-task" is found to have a positive effect on student achievement while "4b. Off-task by Student's responsibility" is found to have a negative effect. Therefore, the effect of "4b. Off-task by Student's responsibility" is represented negatively on Table 4.8 because the higher the score on this category, the lower the score on student achievement. The other two categories, namely, "2.Attending class" and "4a: Off-task by teacher's responsibility" did not present statistically significant effects and therefore are omitted from the figure. The values here

regarding the measurement of time on task, represent the student's distance from the mean value. They are interval variables and they show that the more time a student was on-task, the better the final achievement. Additionally, the more time the student was off-task due to his own responsibility, the worse the final achievement. Categories "1. Active on-task" and "4b. Off-task by Student's responsibility" explain an additional 9.8% of the total variance which is a substantial percentage of the variance and implies that time on task has a significant effect on student achievement. Additionally, we can see that model 2 explains 40.3% of the variance and that 47.5% is unexplained at the student level and 12.2% at the classroom level.

In the next step, the impact of personality traits and thinking styles upon student achievement at the student level was investigated. More specifically, in model 3, the five personality traits (i.e. neuroticism, conscientiousness, extraversion, agreeableness, openness to experience) and the 13 thinking styles (i.e. legislative, executive, judicial, hierarchic, monarchic, oligarchic, anarchic, global, local, internal, external, liberal, conservative) were added to model 2. The two variables that were found to have a positive effect on achievement were "conscientiousness" and "openness to experience". In addition, from the variables of thinking style, "executive" has a positive effect on achievement while "local" has a negative effect. Therefore, the effect of "local" is represented negatively in Table 4.8 because the higher the score on this category, the lower the score on student achievement. These variables explain an additional 4.8% of the total variance. It is important to note that all the variables entered in model 1, model 2 and model 3 (contextual factors, time on task, personality traits and thinking styles) are student variables. Furthermore, from the total 45.1% explained variance, the 35.4% is explained at student level. Originally, the unexplained variance at student level was 78.3%. By adding student level factors, the unexplained variance left was only 42.9%, which means that 35.4% of the variance was explained. On the other hand, as far as classroom level is concerned, the original unexplained variance was 21.7%. After models 1 to 3, 9.7% of the variance was explained, leaving a 12% variance to be explained. Therefore, classroom level factors need to be added to model 3.

In model 4 the variables of Quality of Teaching (i.e. Structuring: Quantity, Structuring: Quality, Application: Quantity, Application: Quality, Management of time, Questioning: Quality, Questioning: Quantity, Modelling, Teacher-student interactions, Managing misbehaviour, Assessment) were added to model 3. From the sixth column of Table 4.8, it can be observed that eight of the variables (i.e. Structuring: Quantity, Structuring: Quality, Application: Quality, Management of Time, Questioning: Quality, Modelling, Managing misbehaviour and Assessment) have a positive effect on student achievement. These

variables explain an additional 8.7% of the total variance. Not surprisingly, most of this variance is explained at classroom level (6.6%) since the variables added in the current model operate at classroom level. Only 1.1% of the variance is explained at student level. Although 6.6% may seem like a small percentage, it is important to note that it is 6.6% from the 12% of unexplained variance at classroom level. Therefore, the variables added in model 4 explain more than half of the unexplained variance at classroom level. The likelihood statistic (X^2) reveals a statistically significant reduction from model 3 to model 4, which justifies the selection of model 4. Finally, model 4 explains 53.8% of the total variance, of which 36.5% was attributed at the student level and 16.3% was attributed at the classroom level. Since the final Model explained 16.3% of the 21.7% of the variance at Classroom Level, it leaves only a percentage of 5.4% unexplained.

Multilevel Structural Equation Modelling (SEM)

As presented in the previous section, multilevel regression analysis was used to measure the impact of personality, thinking styles, time on task and quality of teaching on student achievement. However, multilevel regression analysis does not meet our needs to search for not only direct, but also indirect effects of the above variables on student achievement through time on task. On the other hand, multilevel Structural Equation Modelling (SEM) allows for exploring indirect effects while at the same time accounting for the nested nature of the data (e.g. Goldstein & McDonald, 1988; Muthén & Satorra, 1989). Since this study investigates the impact that certain student-level factors and classroom-level factors have on student achievement, a two-level model (students within classrooms) was employed by using the Mplus 7 software (Muthén & Muthén, 2001). It should be acknowledged that the data of the current study regards three levels, namely, the student level, the classroom level and the school level. However, this study considers only the two lower levels, namely, the student level and the classroom level. This occurred mainly because the variables taken into consideration involve only the student level and the classroom level, while there are no variables regarding the school level. Additionally, the school level is the upper level, thus this study considers the two lower levels and does not consider only the upper lever; therefore this is not a very significant methodological issue. Finally, this study's participants include/involve/come from only 27 schools, which is a relatively small number when one wants to study three levels. Nevertheless, one should be aware that the nested character of the data was not fully considered. Multilevel Structural Equation Modelling allows us to investigate whether the factors of Quality of Teaching have an indirect effect on student achievement through time on task in addition to the direct effect previously found with

Multilevel Regression. Additionally, this study seeks to find if Personality Traits and Thinking Style factors affect time on task and through that, student learning outcomes. Such relations cannot be examined with the use of Multilevel Regression. Therefore, in order to examine the relations of the Theoretical Model of the present study, Multilevel Structural Equation Modelling was employed.

Results of the Multilevel Structural Equation Modelling analysis

Even though the original Theoretical Model includes only the variables of Personality Traits and Thinking Styles described in Chapter 2, the remaining personality traits and thinking styles were included in the multilevel SEM analysis as well. The model was found to fit the data very well (i.e., x^2=497.8 df=454, p=0.11; CFI=0.98, TLI=0.97; RMSEA=0.03; SRMR(B)=0.11, SRMR(W)=0.06). Specifically, the p-value for the chi-square test of the model shown in figures 4.3a and 4.3b was found to be higher than 0.05. Moreover, both the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) were higher than 0.95. As far as the value of the Root Mean Square Error of Approximation (RMSEA) is concerned, it was lower than 0.05. These results reveal that the model presented in figures 4.3a and 4.3b fitted the data well (see Hu & Bentler, 1999). The Standardized Root Mean Square Residual for the within-model (SRMR-W) and the SRMR for the between model (SRMR-B), available in MPLUS, were also estimated. According to Hu and Bentler (1999), a value of SRMR less than .08 is considered to indicate good model fit and a value of .10 to indicate moderate fit. The values of SRMR indicate that the model is well fitting at the lowest level but that it does not fit that well at the class level. The relatively high value of SRMR-B could also be attributed to the relatively small number of classrooms participating in this study (see Hox et al., 2014).

The results of the Multilevel Structural Equation Modelling analysis are presented below and are demonstrated in figures 4.1a (student level) and 4.1b (classroom level) due to the large number of variables included.

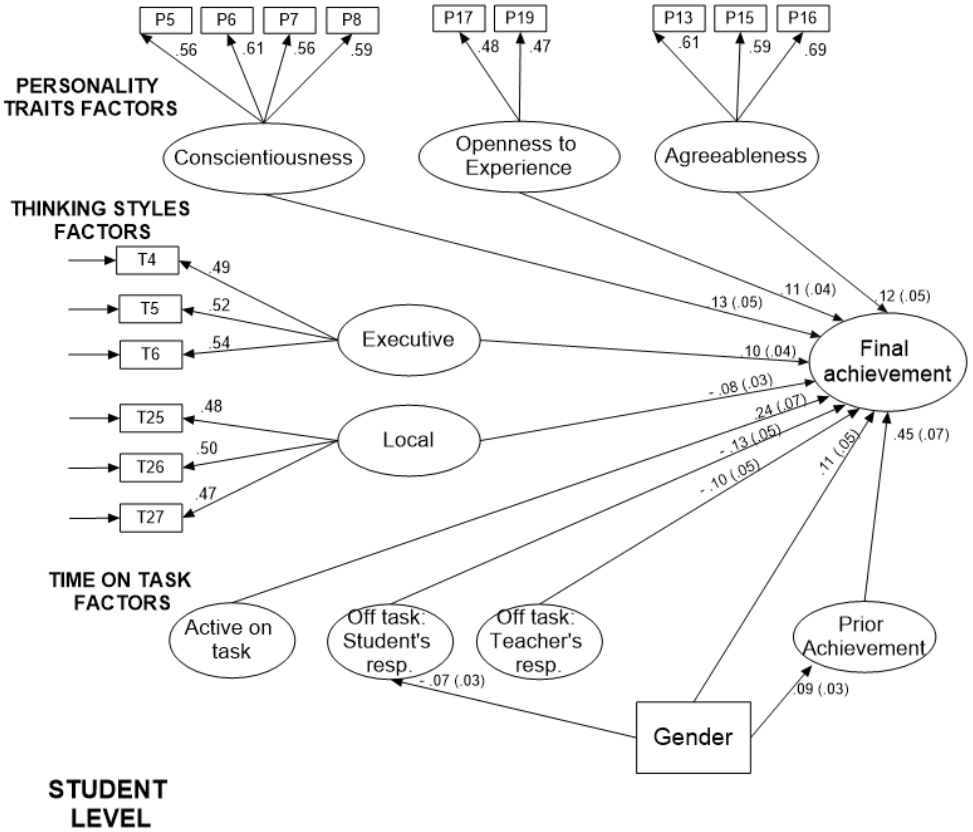
At student level, Personality trait, Thinking style and Time-on-Task factors were examined. As shown in Figure 4.1a, with the use of Multilevel Structural Equation Modelling analysis, it was found that three factors from the five personality trait factors present an effect on the students' final achievement. The factors presenting an effect are Conscientiousness, Openness to Experience and Agreeableness. Neuroticism and Extraversion did not present a statistically significant effect on students' final achievement and were omitted from the

diagram. The findings here agree with the findings emerging from the Multilevel Regression Analysis where again Conscientiousness and Openness to Experience presented a positive effect on student achievement. Additionally, here, with the use of Multilevel Structural Equation Modelling analysis, Openness to Experience was found to have a positive effect on student achievement as well.

Regarding the Thinking Style factors, two factors, Executive and Local, present an effect the students' final achievement. Executive has a positive effect while Local has a negative effect on student achievement. The other factors, namely, Legislative, Judicial, Hierarchical, Monarchic, Oligarchic, Anarchic, Global, Internal, External, Liberal and Conservative did not present a statistically significant effect and are omitted from the diagram. These findings are consistent with the findings emerging from the Multilevel Regression Analysis where again Executive and Local presented a positive and negative effect respectively on student achievement.

Figure 4.1a

Multilevel Structural Equation Modelling Analysis - Student Level



From the four factors of time on task, three were found to have an effect on the students' final achievement, namely, categories "1. Active on-task", "4b. Off-task by Student's responsibility" and "4a: Off-task activities by teacher's responsibility". Category "1. Active on-task" has a positive effect on student achievement, while "4a: Off-task by Teacher's responsibility" and "4b. Off-task by Student's responsibility" have a negative effect.

Category “2. Attending class” did not present a statistically significant effect and was omitted from the figure. Categories “1. Active on-task” and “4b. Off-task by Student’s responsibility” presented the same positive and negative effect respectively during the Multilevel Regression Analysis. In the current study, with the use of Multilevel Structural Equation Modelling analysis, an additional category presented an effect on student achievement, that being category “4a: Off-task by Teacher’s responsibility”.

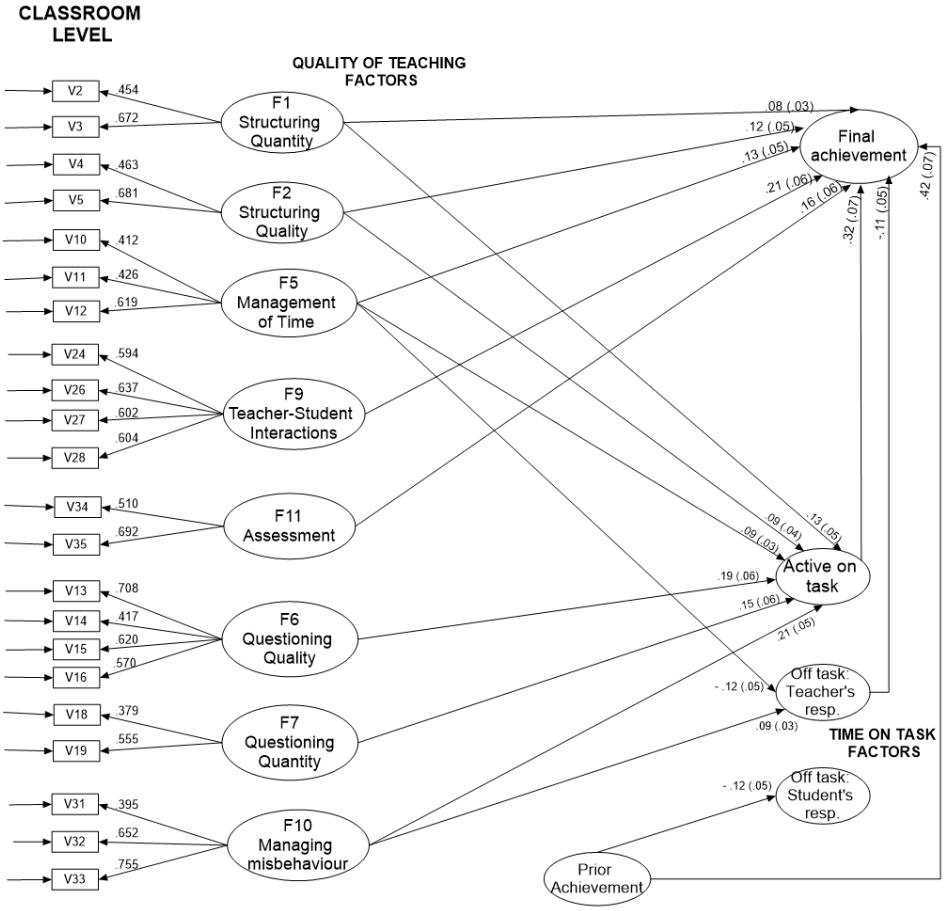
Additionally, when it comes to student level, gender was found to have an effect on time on task and student’s prior achievement. Specifically, gender has a negative effect in category “4b. Off-task by Student’s responsibility”, which means that the specific time-on-task category is more commonly observed for boys than for girls. Similarly, gender was found to have an effect on student’s prior achievement, with the girls presenting higher prior achievement than the boys. Therefore, gender has an indirect effect on the final achievement through the prior achievement. What is more, the girls were found to have made bigger progress throughout the school year compared to the boys. Gender effect on final achievement was also observed during the Multilevel Regression Analysis where again, girls presented higher final achievement in comparison to the boys.

As illustrated in Figure 4.1b, with the use of Multilevel Structural Equation Modelling analysis, at classroom level, from the eleven Quality of teaching factors examined, two present only a direct effect on student achievement, three have both a direct and an indirect effect through time on task, three present only an indirect effect through time on task, and three do no present any effect. Specifically, Teacher-student interactions and Assessment present only a direct effect on student achievement. Additionally, Structuring: Quantity, Structuring: Quality and Management of time present both a direct effect on student achievement, as well as an indirect effect through time on task. Specifically, Structuring: Quantity and Structuring: Quality were found to have an indirect effect on student achievement through the “Active on task” factor of time on task. Management of time has an indirect effect on student achievement through two factors of time on task, namely “Active on task” and “Off-task by Teacher’s responsibility”. Furthermore, three factors, Questioning: Quality, Questioning: Quantity and Managing misbehaviour present only an indirect effect on student achievement through time on task. Specifically, Questioning: Quality and Questioning: Quantity were found to have an indirect effect on student achievement through the “Active on task” factor of time on task. Managing misbehaviour has an indirect effect on student achievement through two factors of time on task, namely “Active on task” and “Off-task by Teacher’s responsibility”. Factors Application: Quantity,

Application: Quality and Modelling, do not present a statistically significant effect on student achievement.

Figure 4.1b

Multilevel Structural Equation Modelling Analysis - Classroom Level



All factors that presented an indirect effect on student achievement through time on task, were found to be related to the "Active on task" and/or "Off-task by Teacher's responsibility" factors of time on task. As expected, no Quality of Teaching factor was found to be related to the "Off-task by Student's responsibility" factor of time on task. Both findings are logical since Quality of Teaching is related to the teacher's actions and is not expected to be related to actions that are considered student's responsibility.

Additionally, at classroom level, it was found that the average students' prior achievement affects the average classroom final achievement. This means that classrooms with low average prior achievement are more likely to present low final achievement as well. Furthermore, a compositional effect was also observed. In fact, the prior achievement was found to be negatively associated with "Off-task by Student's responsibility". This means that in classrooms with lower average prior achievement, the students tend to be off-task by their own responsibility more often than in classrooms with higher average prior achievement.

The use of both Multilevel Regression and Multilevel SEM was found to beneficial for the examination of the study's variables. Consistent with the multilevel regression, multilevel SEM confirmed that time on task has an effect on student achievement gains. Additionally, the use of multilevel SEM revealed another time-on-task factor related to student achievement, one that was not detected by multilevel regression. More specifically, "Off-task by teacher's responsibility" was found to have a negative effect on student achievement; therefore the more time a student is off-task by his/her teacher's responsibility, like waiting for help or discussing with the teacher about off-task content, the worse the results on his/her achievement. Moreover, "Off-task by student's responsibility" was found to be affected by gender. Girls seem to be less off-task by their own responsibility when compared to the boys. Multilevel SEM analysis revealed that the factor that has a strong effect on time on task is quality of teaching. As mentioned earlier, one could hypothesize that certain time-related variables of quality of teaching such as management of time or managing misbehaviour could affect time on task. With the multilevel SEM analysis, it was found that both the variables that are related to the quantitative aspect of time and the variables that are related to the appropriate use of time, have an effect on time on task. In fact, most of the quality of teaching variables were found to affect time on task and therefore have an indirect effect on student achievement gains. The importance of this finding will be discussed in Chapter 5. In addition to the indirect effects, multilevel SEM analysis showed that quality of teaching has direct effects on student achievement gains as well and revealed some quality of teaching variables, not previously found by multilevel regression. In conclusion, either with the use of multilevel regression analysis, or with the use of multilevel SEM, or both, nearly all quality of teaching factors examined in the study were found to have an effect on student achievement. The only factor that neither analyses found to have any effect on student achievement was Application: Quantity. After examining the variance of this factor in relation to the variance of the other quality of teaching factors, no differences were detected. Additional research is needed to explore whether this factor continues to present no effect on student achievement. In that event, perhaps researchers should mainly be concerned with the quality aspect of this factor rather than with its quantity aspect.

CHAPTER 5: DISCUSSION

Introduction

This chapter aims to discuss the findings of this study and to draw implications for theory, policy, and practice. To be able to do so, a brief summary of the main findings is provided at the beginning. Following that, the final theoretical model is presented and any differences there may be in relation to the original theoretical model are discussed. The next sections describe time on task's multidimensionality and discuss what affects it. At a subsequent stage, it is described how this study further develops the Dynamic Model of Educational Effectiveness. Later, the existence of more mediators between quality of teaching and student achievement gains is considered. Furthermore, the arguments as to why national policy should promote time on task are presented. Following that, the index of the national guidelines is discussed. More specifically, the next section highlights the necessity for these guidelines to be clear and specific, to underline the multidimensionality of time on task and to provide the teachers with the Instrument for Student Observation measuring Time on Task (ISOTOT). Following that, the future national policy of teacher training is examined, the role of the supporter is emphasized and the inclusion of time on task in teachers' summative evaluation is discussed. Next, the need for school policy regarding time on task is stressed and how teachers' professional development should incorporate time on task. Additionally, the applications of the multilevel ISOTOT are reviewed and finally, the limitations of this study are acknowledged.

Summary of the findings

This study is concerned with time on task. It explores which variables affect it and if time on task affects student achievement gains. More specifically, the study examines whether teachers' quality of teaching affects time on task and through that, affects the student achievement. At the same time, the study explores whether personality traits and thinking styles have a direct effect on student achievement gains, as well as an indirect effect on the latter through time on task. As presented in Chapter 3, to examine the above relations, data was collected during one school year, from 1718 primary school students from grades four, five and six. To collect data regarding the students' time on task, a classroom observation instrument (ISOTOT) was developed (see Appendix B), which is extensively analyzed in Chapter 3. In addition to this, two observations were conducted during the school year. As can be seen on Table 3.1 (Chapter 3), the ISOTOT included six main categories of possible student behaviour. After a series of tests that can be found in Chapter 4 (pages 75-81), the ISOTOT was found to be valid and suitable to measure students' time on task during lesson

observation. Additionally, in order to measure the students' personality and thinking styles, data was collected with the use of a Personality Questionnaire (see Appendix C) and a Thinking Style Questionnaire (see Appendix E). Both instruments were found valid and details regarding the analyses used can be found in Chapter 3 (pages 63-67). To measure the teachers' quality of teaching, a Quality of Teaching Questionnaire (Creemers & Kyriakides, 2012) was administered to the students towards the end of the school year so that the students had sufficient experience regarding their teacher and therefore were able to complete the questionnaire. As can be seen in Chapter 3, the questionnaire was found to be valid and the data generalizable. Finally, to measure the students' achievement, a battery of criterion-reference tests was used which were created based on the objectives of the national curriculum in Cyprus. The prior and final student achievement for each student was measured at the beginning and end of the school year respectively and as presented in Chapter 3, the tests were equated using Item Response Theory modelling in order to make the comparison of the test scores meaningful and the Extended Logistic Model of Rasch (Andrich, 1988) was used to estimate the test scores.

To search for factors that influence student achievement gains, multilevel regression was used. As can be seen on Table 4.3 (Chapter 4), time on task was found to affect student achievement. Namely, categories "1. Active on-task" and "4b. Off-task by Student's responsibility" were found to be associated with student achievement gains. Quality of teaching was also found to affect student achievement gains. Namely, the factors that had an effect were the following: Structuring: Quantity, Structuring: Quality, Application: Quality, Management of time, Questioning: Quality, Modelling, Managing misbehaviour and Assessment. Finally, from the personality traits Conscientiousness and Openness to experience were found to have an effect on student achievement gains, and from Thinking Styles, Executive and Local were found to have an effect on student achievement gains. Additionally, Multilevel Regression revealed direct effects of time on task, quality of teaching, personality traits and thinking styles on student achievement gains. As mentioned earlier, this study is not only concerned with the impact certain factors have on student achievement gains. It is also concerned with factors that may affect time on task and through that, the student achievement gains. This cannot be examined with the use of multilevel regression as the latter does not allow a variable to be treated both as a dependent and an independent variable at the same time. To identify which variables influence time on task while at the same time examine the impact of time on task on student achievement gains, multilevel Structural Equation Modelling (SEM) analysis was used. Consistent with the multilevel regression, multilevel SEM confirmed that time on task has an effect on student

achievement gains. More specifically, as can be seen in Figure 4.1a (Chapter 4), "Active on-task" was found to have a positive effect and "Off-task by student's responsibility" was found to have a negative effect on student achievement gains. Additionally, the use of multilevel SEM revealed another time-on-task factor related to student achievement. "Off-task by teacher's responsibility" was found to have a negative effect on student achievement; therefore the more time a student is off-task by his/her teacher's responsibility like waiting for help or discussing with the teacher about off-task content, the worse the results on his/her achievement. Additionally, Multilevel SEM revealed that Quality of teaching has an effect on time on task. As presented in detail in Chapter 4 (see also Figure 4.1b), factors Structuring: Quantity, Structuring: Quality, Management of time, Questioning: Quality, Questioning: Quantity, and Managing misbehaviour, have an effect on time on task and more specifically, on categories "Active-on-task" and "Off-task due to teacher's responsibility". Therefore, it was shown that quality of teaching has an indirect effect on student achievement gains through time on task. Moreover, many of the quality-of-teaching factors were also found to have a direct effect on student achievement. With multilevel SEM analysis, it was found that personality traits and thinking styles do not present an effect on time on task. Additionally, consistent with the results of multilevel regression, multilevel SEM analysis found personality trait and thinking style to have an effect on student achievement gains. Multilevel SEM revealed an additional personality trait that has an effect on student achievement gains which was not previously found by multilevel regression analysis, namely Agreeableness.

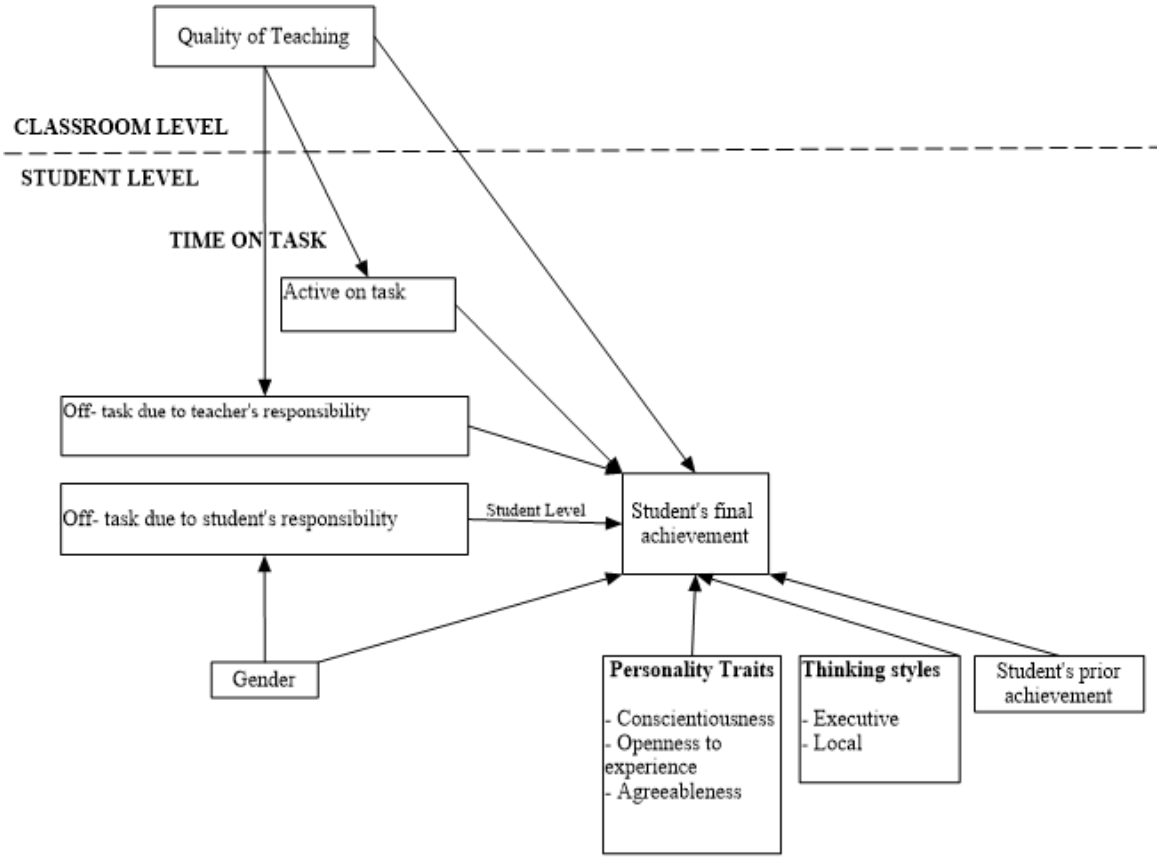
The Final Model

The results of this study form a model connecting time on task, quality of teaching, personality traits, thinking style and student achievement (Figure 5.1).

The model produced, validates the original theoretical model to a great degree. The most significant finding of the study and the most important relation in the model, is the fact that quality of teaching was found to have not only a direct effect on student achievement, but also an indirect effect through time on task. Until now, studies have only measured the direct effect of quality of teaching on student achievement. Therefore, this finding suggests that researchers have been underestimating the effect of quality of teaching. For researchers to estimate quality of teaching more accurately, the indirect effect of quality of teaching on student achievement through time on task should also be taken into consideration. To do so, studies need to measure the students' time on task.

Figure 5.1

Factors Operating at the Student and Classroom Level



As far as the time on task is concerned, as can be seen in Figure 5.1, the model demonstrates that three of the instrument's categories present an effect on students' final achievement. These categories are "Active-on-task", "Off -task by teacher's responsibility" and "Off-task by student's responsibility". It is important to stress that the category "Attending class" is not included in Figure 5.1 because it was not found to affect the students' final achievement. But this does not mean that the category has nothing to contribute to the model. Its absence from the figure reveals very important information regarding time on task. The fact that that category "Attending Class" is absent from the figure, suggests that it is not enough for the students to be quiet and observe the teacher to achieve learning. This finding highlights how important it is for the students to be active during the teaching process for them to achieve learning. As presented earlier, most of the quality-of-teaching factors have an effect on the time-on task category "Active-on-task" which is also the category with the most effect on student achievement. This confirms this study's hypothesis that the teachers' actions play a significant role on the students' on-task time. In fact, one could assume that quality-of-teaching factors "Management of time" and "Managing misbehaviour", would be the factors that affect time on task as they are factors associated with time and quantity. However, the

findings reveal that this is not the case. Indeed “Management of time” and “Managing misbehaviour” affect “Off-task by teacher’s responsibility”. Nevertheless, for a student to be “Active on-task”, most of the quality-of-teaching factors are essential. Therefore, it is implied that the teachers’ quality of teaching is crucial in supporting students to be actively involved in the teaching process and therefore achieve learning. As can be seen in Figure 5.1, there is one time-on-task category that does not seem to be affected by quality-of-teaching factors and this category is “Off-task by student’s responsibility”. Thus, when a student is occupied with an activity that is off task, like looking outside the window, or drawing on his/ her desk, it seems that the student holds the responsibility for this act. In the current study, the student’s gender (at student level) and student’s prior achievement (at classroom level) were found to have an effect on this category. Therefore, there must be other factors that affect this category that are yet to be identified. This study demonstrated that the factors that do not affect this category are quality of teaching, personality traits and thinking styles. As this is a variable closely related to the student, it can be assumed that other student-level factors influence this category. More specifically, it can be assumed that motivation and expectations may affect “off-task due to student’s responsibility”. Future research can examine these two student-level factors and determine if they affect “off-task due to student’s responsibility”. Relevant suggestions are provided in the final section of this chapter.

However, quality of teaching does affect two out of the three time-on-task categories and this is very important because quality of teaching is something that can be improved. Consequently, by improving quality of teaching, the off-task time by teacher’s responsibility can be decreased which in turn will lead to better student achievement. Improved quality of teaching can also assist students to decrease their “Attending class” time, which does not contribute to their academic success, and increase their “Active on-task” time that does.

Additionally, the original theoretical model is considerably validated regarding the effects of personality traits and thinking styles on student achievement. Specifically, regarding the personality traits, as hypothesised by the theoretical model, Conscientiousness, Openness to Experience and Agreeableness were indeed found to have an effect on student achievement. With regards to the thinking styles, as hypothesised by the theoretical model, Executive was indeed found to have an effect on student achievement. However, Monarchic and Conservative thinking styles were not found to have an effect on student achievement. It seems that the characteristics typically found in Monarchic individuals (e.g. preference for tasks that allow full focus on only one thing at a time) and the characteristics typically found in Conservative individuals (e.g. preference for tasks with existing rules) may not affect

student achievement as one would have expected. Perhaps with the way learning is constructed in this particular context, the students need more flexibility with the rules and the ability to multitask, characteristics that are not found in these thinking styles**.** The final model also revealed that Local thinking style had an effect on student achievement (negative effect). This effect was not expected by the original theoretical model; however, as presented in Chapter 2, local thinking style is not a trait that presents a consistent correlation throughout studies. Furthermore, as thinking styles may be affected by cultural differences (Zhang, 2001), this finding may suggest that the learning process in Cyprus hinders individuals working with concrete details, such as students with local thinking style.

On the other hand, the original theoretical model assumed that Personality Traits and Thinking Styles affect student's Time on Task. Namely, as can be seen in Chapter 2 regarding personality traits, conscientiousness and openness to experience were expected to have a direct effect on time-on-task. Respectively, regarding thinking styles, executive, conservative and monarchic styles were expected to have a direct effect on time-on-task. Notably, such a relation has not been revealed. This finding suggests that students are not on task because their personality trait aids them. Nor do they get off task because their thinking style hinders their efforts. Therefore, Personality Traits and Thinking Styles do not contribute to the further understanding of time on task. Concluding, it can be argued that this finding, by indicating that personality traits and thinking styles do not affect time on task, it essentially emphasizes the importance that teachers' quality of teaching has on the students' time on task.

Treating Time on Task as a multidimensional construct

One of the key aspects of this study was time on task. Time on task received great attention with the work of Caroll (1963) and later Bloom (1974). However, the attention ceased as the main questions regarding time on task and its effect on student achievement were answered. There was no new information since there were no new questions.

One of the aims of this study was to provide a broader and better understanding of the term time on task and explore unknown characteristics of it. This could not be achieved with the existing instruments that measure time on task, as they usually employ a simplistic way of categorizing student behaviour. To study new, more elaborate questions, the field would benefit from an improved and more systematic way of measuring time on task. Therefore, to explore the research questions of this study, student actions could not be perceived as simply on-task or off-task. A detailed time-on-task instrument was created which included an elaborate categorization of all possible student behaviours. The Instrument for Student

Observation measuring Time on Task included 6 major categories, three of which have three subcategories each. A brief presentation of the categories is presented below. Category 1: Active on-task, includes behaviours which produce evidence that the student is actively on-task, such as answering a question. Category 2: Attending Class, includes behaviours which indicate that the student is attending the given learning task but in a rather passive manner, such as looking at the teacher. Category 3: Attending an academic but non lesson-relevant assignment includes behaviours which show that the student is attending the task that was assigned to him/ her. However, the task itself is not related to the goals of the lesson, therefore this behaviour could be considered as an off-task behaviour in terms of achieving the lesson's goals. For example, the student is assigned to cut and glue pictures in the notebook or colour a decorative picture to rest after finishing an exercise. Category 4: Off-task activities, includes off-task behaviours that are not related to learning and are divided into three subcategories based on the cause of the off-task behaviour. Subcategory 4a is Teacher's responsibility and includes behaviours that can be limited by improved organization and policy by the teacher. For example, the student is queuing to have his/ her assignment corrected, or if the student is discussing with the teacher about content unrelated to the lesson. Subcategory 4b is Student's responsibility and includes behaviours that are initiated by the student and are not related with learning such as if the student is looking outside the window or writing on his/ her desk. Subcategory 4c is School management's responsibility and includes behaviours that can be limited by improved policy by the school management. A good illustration of this is when a student is looking at someone who came in the classroom to collect money for a fundraiser. Category 5: Distracting other students/ teacher, includes behaviours where the student is off task, interacts with another person and presents misbehaviour. The last category, Category 6: Absent from class, refers to the occasions when the student is present at school but absent from class during some of the time he/she is being observed.

This instrument assumed two different categories for what is usually perceived as "on-task behaviour". The categories were "Attending class" and "Active on-task". The separation of these two categories was based on the assumption that the behaviours in "Attending class" are not as much on-task as the behaviours in "Active on-task". Respectively, it was assumed that the behaviours in "Attending class" would not have an effect on student achievement, while the behaviours in "Active on-task" would. This was indeed validated by this study. This finding provides new understanding to time on task, behaviour categories and relations with student achievement. Before this finding, if, for example, a student presented behaviour A: looking at the teacher quietly, this behaviour would be categorized in studies as an "on-

task" behaviour, and be expected to have an effect on student achievement. If a student presented behaviour B: Talking to the teacher regarding the lesson, this behaviour would fall under the same "on-task" category and be expected to have the same effect on student achievement. In light of the new findings, behaviour A would now be categorized as "Attending class" and would not be expected to have an effect on student achievement, while behaviour B would be categorized as "Active on-task" and would be expected to have an effect on student achievement.

Respectively, this study had a more elaborate view on the "off-task" category as well. It was questioned if all off-task behaviours should be in the same category. Many questions were taken into consideration when forming the off-task categories. Does it make any difference whose responsibility the off-task behaviour is, the teacher's, the student's, or the school management's? Is it affected by different factors? Does it make a difference if the off-task behaviour is violence? The study wanted to explore these and other questions and thus created a detailed time-on-task instrument to collect information. As was presented in Chapter 4, some of the categories were rarely observed and therefore were dropped. However, the data revealed significant information for some of the categories. More specifically, it was found that the category "Off-task by teacher's behaviour" is affected by the teacher's quality of teaching. This is important to know, as this is a category that presents effect on student achievement. Therefore, it can be expected that if one wants to decrease the "Off-task by teacher's behaviour" time, one should improve the teacher's quality of teaching. Additionally, the category "Off-task by student's behaviour" is not affected by the teacher's quality of teaching but by prior achievement. It can be concluded that this study sheds light to previously unknown aspects and relations of time on task and thus it contributes to the enrichment and expansion of the present theory. Time on task is perceived as a multidimensional construct for the first time. This is very important because student behaviour is usually characterized as being on-task or not. This was a narrow and single-dimensional perspective of time on task. This study showed that time on task is multidimensional and these dimensions were measurable with the Instrument for Student Observation measuring Time on Task. This study demonstrated that not all seemingly on-task student behaviours are truly on-task. Hence, they do not all have the same effect on student achievement gains. It was shown that the seemingly on-task behaviours that fall in dimension "Attending class" do not affect student achievement gains at all. Only the behaviours that are included in the "Active on-task" dimension affect student achievement. Similarly, as presented before, not all off-task student behaviours are the same. Not all off-

task student behaviours are affected by the same variables and not all affect student achievement gains.

Which factors influence time on task?

Having established that time on task matters, our search turned to uncovering which factors influence time on task. As presented earlier, multilevel SEM analysis did not reveal any effect of personality traits or thinking styles on student achievement gains. What was revealed however, was the effect of the teacher's quality of teaching. Quality of teaching is considered an important factor for student achievement (Creemers and Kyriakides, 2008). Until now, most effectiveness studies, and even large meta-analyses (Seidel & Shavelson, 2007; Scheerens, Luyten, Steen & Luyten-de Thouars, 2007, Kyriakides, Christoforou & Charalambous, 2013) have examined only the direct effect of quality of teaching on student achievement, not the indirect effect through time on task. The existence of indirect effect is not even discussed in the literature, let alone sought for. Additionally, there has not been much research conducted to examine the possibility that a certain factor may act as a mediator on student achievement. The current study does exactly that, as it examines if time on task functions as a mediator of the effect the quality of teaching has on student achievement. The fact that such relations were found by this study, suggests that the teacher's quality of teaching is not important only because it assists the students to comprehend the lesson, and therefore attain more achievement gains, but also because it helps the students be on-task and therefore achieve higher achievement gains. These findings showed that quality of teaching is even more important than one thought since it affects student achievement, not only directly, but also indirectly through time on task. Consequently, the effect of quality of teaching might have been underestimated until now since its indirect effect on student achievement was not taken into consideration. Therefore, the importance of quality of teaching is now highlighted, as its indirect effect on student achievement through time on task has now been revealed.

Further development of the Dynamic Model of Educational Effectiveness

The current study is one of the few studies that examine the relation between quality of teaching and student level factors that can change. As presented earlier, this study draws from the theoretical framework of the Dynamic Model of Educational Effectiveness. The dynamic model takes into consideration factors operating at the student level and makes a distinction among the student-level factors as a) factors that are unlikely to change, including SES, ethnicity, gender and personality traits, b) factors that change over time, including

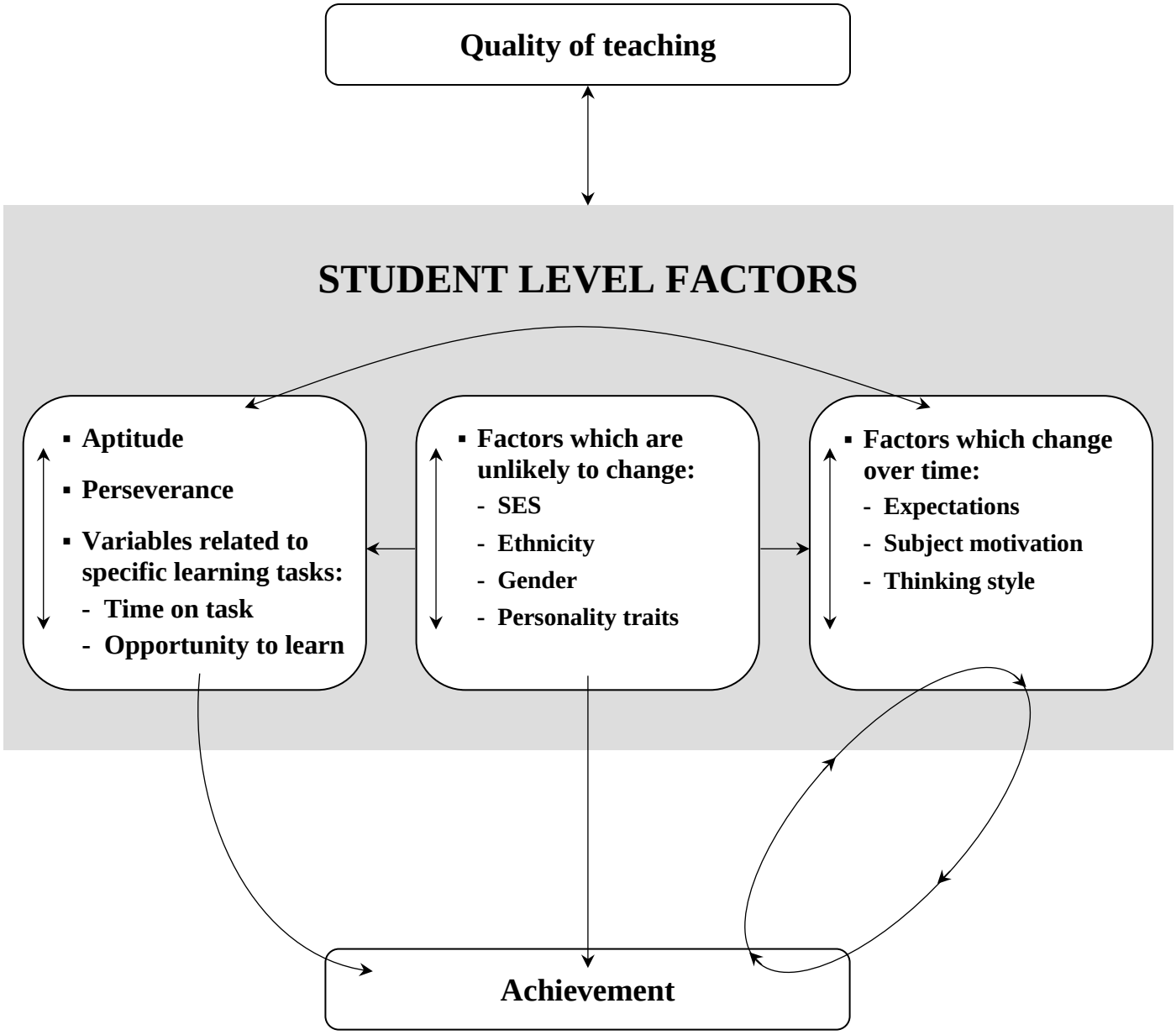
expectations, subject motivation and thinking style, and c) aptitude, perseverance, time on task and opportunity to learn. The dynamic model suggests that these student-level factors from all three categories affect student achievement, may affect each other, and may affect and be affected by quality of teaching. However, it does not specify which factors interact with which and how. Therefore, the dynamic model does not provide in-depth information regarding the operation of student-level factors among either themselves or factors operating at different levels, such as classroom-level factors. Thus, there is a need for studies to further examine these interactions and provide valuable insight. The current study meets this need as it examines student-level factors in more depth and provides new information that the dynamic model has yes to provide; thus, further developing the Dynamic Model. More specifically, it explores three student-level factors, namely, time-on-task, thinking styles and personality traits. It also explores classroom-level factor, quality of teaching and provides new information about their interaction. Therefore, this study examines the interaction effects of factors operating at different levels. In fact, this study has found that time on task is an important factor for student achievement. As can be seen in Figure 4.1a (Chapter 4), three categories were found to have an effect on student achievement, namely "Active on-task", "Off-task by teacher's responsibility" and "Off-task by student's responsibility", with "Active on-task" being the most important category since it presents the highest effect on student achievement. The dynamic model discusses the effect of time on task on student achievement but does not specify which factors affect it. Figure 5.2 that depicts the factors of the dynamic model operating at the student level, suggests that as a student-level factor, time on task may be affected by other student-level factors such as personality traits and thinking styles. This study examined the above assumption and found that neither personality, nor thinking style affects the students' time on task. It also took into consideration the student's gender and prior achievement and the findings of this study suggest that students who are actively on-task do not come from a specific personality trait, thinking style or gender. They are not even the ones who have higher prior achievement. However, what was found by this study to affect time on task, is the teacher's quality of teaching. As can be seen in Figure 4.1b (Chapter 4), quality of teaching was found to affect the categories Active on-task and Off-task by teacher's responsibility. Therefore, it is the teacher who plays a significant role to whether the student will be Active on-task or Off-task by teacher's responsibility, and not the student. It was found that sufficient quantity of structuring activities, good quality structuring activities, proper management of time, the amount and quality of questions and successful management of misbehaviour is linked to more active on-task students. Respectively, proper management of time and misbehaviour results in

students spending less time off-task by teacher's responsibility. Hence, students from any personality, thinking style, gender and prior achievement can have the opportunity to improve their active on-task time, reduce their off-task by teacher's responsibility time and consequently improve their final achievement if the quality of teaching improves. This information regarding the effects of personality, thinking style and quality of teaching on time on task is not provided by the dynamic model. In figure 5.2, the highlighted factors, depict the factors examined in this study. The current study is one of the first studies that examine interaction effects between two levels as they are proposed by the dynamic model (student and classroom levels). Therefore, it can be argued that this study further develops the dynamic model as it sheds new light on the relations among student-level factors, as well as factors operating at different levels.

Additionally, the current study also found that certain student-level factors included in the dynamic model are associated with student achievement gains and therefore their inclusion in the dynamic model is correct. Firstly, personality trait and thinking style were found to affect student achievement, as can be seen in Figure 4.1a (Chapter 4). Regarding the personality traits, it was found that Conscientiousness, Openness to experience and Agreeableness have an effect on student achievement while the thinking styles, Executive and Local were also found to have an effect. Therefore, this study highlights the importance of these student-level factors as predictors of student achievement and confirms that their inclusion in the Dynamic Model of Educational Effectiveness is well justified.

Figure 5.2

Factors of the Dynamic Model Operating at the Student Level (adjusted from Creemers and Kyriakides, 2008)



More mediators between quality of teaching and student achievement gains?

Even though this study focuses on time on task, it has significant implications for the field of quality of teaching. In the current study, it is examined whether time on task acts as a mediator on the effect that the quality of teaching has on student achievement gains; a relation that was indeed detected. One can assume that perhaps more variables exist that mediate the relationship between the quality of teaching and student achievement gains. Therefore, in the field of quality of teaching, in addition to researching what constitutes quality of teaching, one can search for more mediators that may facilitate the effect of quality

of teaching on student learning outcomes. The current study can be considered the first step to this search.

In this study, the first step was the recognition that the management of time is included in the quality of teaching factors, because teachers with poor time management skills cannot provide their students with adequate time necessary for learning. It is clear that if the teachers have poor time-management skills, their students are left off task for longer periods of time. This can be expected to influence the students' learning outcomes. Therefore, one can see the link between quality of teaching, time on task and student achievement gains. The variable of management of time is easy to be associated with time on task, but on further investigation, more variables appear to have an effect on time on task and from that on student achievement. For example, how the teacher manages misbehaviour also seems to be a factor that could affect students' on-task time. Additionally, the structure of the lesson could be something that would keep students interested and actively involved in the lesson. Respectively, similar observations can be made with other variables. For instance, one can explore the mediating role of motivation. More specifically, one can claim that orientation, which is a factor of quality of teaching, is related with motivation, because if a student knows the reason a lesson takes place, this increases the student's motivation towards the lesson. This can result in higher achievement gains. From this initial assumption, a researcher can further examine more quality of teaching factors and their relations with motivation and student achievement and explore if motivation acts as a mediator between quality of teaching and student achievement gains. Similar research can be conducted for other variables besides motivation, like expectations. Relevant suggestion for further research in provided in the last section of this chapter. It is apparent that even though this study focuses on time on task, it has significant implications for the field of quality of teaching.

National Policy: Why promote take time on task?

This study found that time on task is an important factor for student achievement gains. Time on task was found to be multidimensional and three of those dimensions, namely "Active on task", "Off-task due to teacher's responsibility" and "Off-task due to student's responsibility" were found to affect student achievement gains. The importance of teacher's quality of teaching is strongly highlighted by these findings as "Active on task" and "Off-task due to teacher's responsibility" are dimensions that are affected by the teacher's quality of teaching (see Chapter 4, figure 4.1b). The teacher is responsible to keep students actively on-task by providing them with sufficient quantity of structuring activities, good quality structuring activities, proper management of time, appropriate amount and quality of questions and

successful management of misbehaviour. Respectively, if the teacher has poor management of time and misbehaviour, the students consequently spend more time off-task due to teacher's responsibility. In addition to that, the dimension "Attending class" was not found to affect student achievement gains, which suggests that simply sitting quietly in the classroom and observing the lesson does not promote learning. Hence, the teacher can modify his/ her teaching to alter the Attending-class time into active-on-task time. It is clear that the teacher holds a significant amount of responsibility with regards to the student's time on task. Therefore, it is vital for National Policy to officially promote time on task as it has been shown that it is greatly affected by the teacher's actions and it affects student achievement gains.

Time-on-task guidelines: Clear and specific

Out of all the variables examined by the current study, time on task was the most important student-level factor in terms of its association with student achievement gains. Additionally, quality of teaching was the factor that presented the greatest effect on time on task. Therefore, at the system level, policies that take the above findings into consideration, can promote better time on task and consequently better student achievement gains. National policymakers should use the results of this study to raise awareness regarding time on task and provide guidelines to schools as to how time on task affects student achievement and how quality of teaching affects time on task. Policymakers should send guidelines to schools that require the schools to promote time on task. This alone however does not suffice. Every year a large number of guidelines are sent to schools, overwhelming teachers and making it impossible to follow all of them. Guidelines and announcements that may include anything from student competitions, to "tree of the year" emphasis information, to lesson curriculum alterations. There are too many guidelines but are not necessarily related to academic achievement. Therefore, including the findings of the current study in one more announcement or transforming them into guidelines, is not enough in order to improve student achievement gains. A national-level guideline selection process must first take place. All guidelines should be reviewed and only the ones that are vital and linked to improved student achievement should remain. Otherwise, most guidelines will be overlooked because schools do not have enough time or personnel to go through all the guidelines, let alone to implement them. Therefore, simply incorporating the findings of this study to a guideline document and sending it to the school, will not improve student achievement gains. First and foremost, a policy for Quality of Teaching as well as a policy for Time on Task should be created. These are variables that are proven to have an effect on student achievement gains. These policies are crucial and are the ones that should be promoted if an improvement on

student achievement gains is sought. There should have already been an explicit National Policy for Quality of Teaching that highlights the specific teaching skills that have been proven to affect student achievement gains. It is bewildering for an educational system to have policies for insignificant matters and to lack policies for vital matters such as quality of teaching and time on task. There should be a shift on the fundamental aspects of learning, a sort of "back to basics" approach. A novel viewpoint where the focus is on things that really matter regarding learning. In addition to the guidelines being focused on vital matters, they should also be short, specific and clear. Enormous documents make it difficult to implement the suggested guidelines. Thus, to promote time on task, guidelines need to be clear.

Time-on-task guidelines: The importance of the multidimensionality of time on task

The guidelines should inform teachers about the multidimensionality of time on task. As presented before, time on task consists of multiple dimensions and teachers needs to be able to identify the different dimensions because not all dimensions have the same effect on student achievement gains. More specifically, they should be able to identify which behaviour is considered "actively on-task" and which is considered merely "attending class" since the first has positive effect on student achievement gains while the latter does not. The teachers should be given examples of student behaviours for each dimension and techniques on how to minimize "attending class" time and maximize "actively on-task" time. Respectively, the guidelines should explain the dimension "off-task due to teacher's responsibility" and how it negatively affects the student achievement gains. The guidelines should provide examples regarding the possible student behaviours that fall along this dimension so they can notice it easily and change their own behaviour. Teacher's quality of teaching was found to influence student's off-task time due to teacher's responsibility time. Therefore, the guidelines should make clear that the teacher needs to have good management-of-time skills as well as management-of-misbehaviour skills to reduce his/her students' off-task time due to teacher's responsibility.

Time-on-task guidelines: Access to the Instrument for Student Observation measuring Time on Task (ISOTOT)

As explained in the previous section, teachers need to be able to identify their students' behaviour. It is important for teachers to be able to determine how much teaching time is spent on each time-on-task dimension, as in this way the teachers know what proportion of

the teaching time will actually improve their students' achievement gains. The most accurate way for teachers to assess the students' multidimensional time on task is with the use of the ISOTOT. Guidelines need to provide the ISOTOT to the teachers and explain how teachers are expected to use it. The guidelines also need to make provisions as to how teachers will be trained to use the ISOTOT.

National policy for teacher training

It is clear that a national policy should be developed that will promote teacher training regarding the effects of time on task on student achievement gains and the impact of quality of teaching on time on task. The policy should specify that the training includes information regarding the importance of time on task and quality of teaching on student achievement. However, the training cannot be a simple gathering of teachers for 2-3 hours where they are informed about time on task relations and effects, which is the format many seminars have, especially in Cyprus. This type of seminar will neither promote time on task nor improve student achievement gains. For a seminar to have an impact and improve student achievement gains, serious consideration needs to be put into its design. It needs to include the appropriate quantity of knowledge, to the proper extend. It must provide sufficient time for the teachers to comprehend the material taught. But still this is not enough. Teachers need to have the opportunity to try the techniques and return to discuss and reflect. This cannot be achieved with a one-time seminar. This study highlighted the importance quality of teaching has on student achievement gains. More importantly, it showed that time on task acts as a mediator between the quality of teaching and student achievement gains. More specifically, it showed that certain quality of teaching factors affect certain time-on-task factors and through that the student achievement. Therefore, teachers should be aware of their quality of teaching as well as whether their students are on-task during lesson. It seems that a theoretical seminar cannot equip teachers with such skills. Therefore, the seminar may include training on the Quality of Teaching Questionnaire which will help teachers become more aware of their quality of teaching level. Certainly, simply knowing their quality of teaching level, will not improve student achievement gains. Teachers need to improve their quality of teaching, in order to improve the student achievement gains. Thus, teachers should be provided with the necessary knowledge, practice and support to improve their quality of teaching. In addition to awareness with regards to quality of teaching, which should have already been the main focus of national policy by now, the seminars clearly need to raise awareness regarding time on task. In-service teachers need to be educated about the importance time on task has on student achievement. They should be taught which time on

task categories have a greater impact on student achievement gains. Once again, merely the knowledge about time on task is not enough to improve student achievement gains. In order to promote the time-on-task categories that have an effect, teachers first need to identify in which category their students' behaviours fall during the teaching process. It is apparent that the Instrument for Student Observation measuring Time on Task (ISOTOT) developed by this study, can assist teachers tremendously to meet this need. The instrument should be released and become widely available so professionals can have access to it. Teachers need to be trained to use the instrument, they should be given the opportunity to try it and be offered the appropriate support to do so. Apparently, the procedure cannot stop here. Teachers should be trained to evaluate the results regarding the time-on-task categories that will emerge from the observation. This instrument can assist the teacher uncover problematic areas, understand which students tend to be off-task and why while recognizing whether the students are actively on-task or just attending class. This is information that is very difficult to acquire without the ISOTOT and it is information that can assist the teacher to take one more step towards the improvement of the students' achievement gains. This information can enable teachers to better reflect on their teaching. Teacher reflection is a common technique used by teachers to improve their teaching. This Instrument for Student Observation helps teacher perform a more focused and systematic reflection, as it gathers important data about the teaching process and the students, data the teacher can reflect on. In addition to learning how to gather student data, teachers should be educated during training on how to proceed from gathering this student data to taking appropriate actions to correct the problematic areas. Teachers need to be equipped with techniques to assist their students achieve improved time on task related behaviours, such as converting their "Attending" time into "Active on-task" time. Additionally, some teachers may need support during their attempts to implement some of the new knowledge and techniques. There must be a system able to provide the support needed and assist the teachers achieve their goals and this will be presented in a following section. As with every change implemented, evaluations of the process and of the results should take place, so that the teachers know if their actions have the desired effect. It is recognized that even with excellent training and support, some teachers are still resistant to change or unwilling to implement new ideas. Therefore, in a decentralized educational system where teacher incentives, rewards and consequences are utilized, a form of accountability would be useful as a way to ensure the changes will be implemented, a concept that will be further explained in a following section.

National policy for Higher education

In addition to in-service teacher training, the findings of this study can be used in higher education as well. Instead of waiting for teachers to start working at schools and then educate them about quality of teaching and time-on-task effects, it could be considered that such training should begin earlier, during their university education. Students studying to become teachers could be given the opportunity to learn about the importance of time on task and quality of teaching on student achievement gains. There, it is the ideal environment for future teachers to understand both the theoretical aspects of these relations as well as the practical components that will assist them in the classroom. They can get acquainted with the ISOTOT, use it to gather data, and examine various scenarios on how to use that data to improve student achievement gains. If this training takes place during their studies, it will be easier for the future teachers to attempt to implement it. They will also have sufficient support from their professors during their effort. Therefore, it would be useful if National Policy promoted time on task and quality of teaching subjects in tertiary education.

The role of the supporter – crucial for success

On the other hand, it is recognized, that even if clear guidelines are sent, even if the multidimensionality of time on task is highlighted, even if the ISOTOT is provided, some people will still have difficulty to implement the change. Therefore, support needs to be provided. The role of the supporter is very important as it will ensure the implementation of the policy and the success of the endeavour to improve student achievement gains. The role of the supporter should be assigned to a person that has a lot of knowledge regarding education, s/he is fully aware of this study's findings and their implications, and is trained both theoretically and practically regarding the philosophy and use of the ISOTOT.

One person that could assume the role of the supporter is the school inspector. School inspectors in Cyprus usually observe teachers three times per school year and evaluate them. Every year, the school inspectors have several meetings with the school head teachers where among other things, the former informs the latter regarding the emphasized goals of the current school year as well as what aspects of the teaching they consider important and therefore play a significant role in the teacher evaluation. This information is usually passed on to the teachers during a staff meeting and teachers try to implement the directions of the inspector. Therefore, the inspectors can clearly explain the importance of time on task, promote it to the teachers, explain that they expect to see them implementing the changes, and monitor the results. However, with the role that the inspectors currently have, it is questionable if their input will bring the desired change. Therefore, the role of the inspectors needs to be upgraded so that they have more time to devote to each school and more time to support the teachers with the implementation of new techniques. If the role of the inspector

cannot be upgraded to include the qualities of a mentor, then someone else needs to assume this role. Perhaps the head teachers can be released from some of their current responsibilities (e.g. teaching hours), so they can devote time to the significant support of their teachers. Alternatively, a new position should be created within schools. That of a person, who possesses simultaneously the academic knowledge of quality of teaching and time on task, the methods and techniques needed to implement the change, and the skills to support the teachers in their attempt to implement the change. The support can likewise be provided by a team of experts that hold the above-mentioned knowledge, methods and skills, who will share their expertise with teachers and help them develop strategies and action plans that are in line with the knowledge-base. Similar work has been done by the Dynamic Approach to School Improvement (DASI) (Creemers & Kyriakides, 2012) with great success. With DASI the Advisory and Research Team works with the school unit they establish clarity and general consensus about the aim of school improvement, conduct school self-evaluation, design improvement strategies and action plans considering the knowledge base about the factors addressed, while monitoring the implementation (formative evaluation) and measuring the impact of DASI (summative evaluation). DASI is based on the Dynamic Model of Educational Effectiveness and promotes the improvement of teacher's quality of teaching. Perhaps DASI could be updated to include this study's findings regarding time on task, and expand the focus of teacher professional development courses in order to address issues related to maximizing time on task and improving quality of teaching.

In any case, one cannot be as naïve as to assume that only because the importance of time on task is highlighted by this study's findings, that the student achievement gains will improve, simply because the knowledge is announced to the policymakers or the head teachers or the teachers. A detailed and complex plan needs to be designed that improves some of the current education system's flawed policies and procedures and develops innovative ones that truly promote learning.

Time on task and Teacher's Evaluation

Time on task is an important factor and was found to be related with student achievement. Accordingly it should be included in the teachers' summative evaluation. The inclusion of time on task in the summative evaluation will help teachers understand the importance of time on task and will urge them to take the implementation of the change more seriously. Additionally, the Multidimensional Time-on-Task Observation Instrument can be used by

the school inspectors to measure the students' time on-task. As presented earlier, this is an instrument that was found valid and suitable to measure students' time on task during lesson observation. Therefore, every time the school inspectors observe a lesson, they will have the opportunity to measure the students' time on-task as well. And throughout the course of the school year, the inspectors will be able to see if the teachers incorporated the time-on-task directions, and if the students' time on-task has improved. It is acknowledged however that these suggestions may not be implemented in Cyprus as it creates turbulence between the existing power relations. In Cyprus, for things to change in Education, a consensus is often required, hence reforms rarely happen. Nevertheless, the suggestions are evidence-based and if implemented they will improve student achievement gains.

Schools need time-on-task policy as well

In line with the national policy, schools should develop policies regarding the importance of time on task as well. For instance, the school may develop policies which include raising awareness among students and parents regarding the significant association of time on task and student achievement gains. By raising awareness, it may help students to take responsibility for their own actions and improve their time on task. School should also develop policies to raise awareness among teachers regarding the effect of time on task on student achievement gains and how teachers can keep their students actively on-task for longer. Schools should also incorporate in their policies the findings regarding the direct and indirect effects of quality of teaching on student achievement gains. Policies developed should provide guidelines for teachers to help them take into consideration the quality of teaching aspects that can maximize their students' on-task time. Finally, schools could develop policies promoting teacher training regarding the effects of time on task on student achievement gains and the impact of quality of teaching on time on task. The trainings should include both the theoretical knowledge regarding time on task and quality of teaching, but also practical guidelines on how this knowledge can be put into practice. As discussed in the previous section, simple lecture-type seminars will not bring an improvement on student achievement gains. A more elaborate type of training is required. Clearly, for schools to develop policies regarding the importance of time on task, it is very important that first and foremost, the National Policy promotes time on task. Then, the schools will follow. If the National Policy does not promote time on task, it is illusive to expect schools to develop and implement policies regarding time on task.

Teacher professional development

As mentioned previously, this study highlights the importance of quality of teaching even more than before, as it has shown that it affects student achievement not only directly, but also indirectly through the time on task. It was also pointed out that certain quality-of-teaching factors improve students' active on-task time and minimize their off-task time by teacher's responsibility. Therefore, teachers' professional development programmes are essential. Currently, the seminars offered by the Pedagogical Institute of Cyprus, either for in-service teachers, head teachers or new teachers, include nothing about time on task. The results of this study should be incorporated into teachers' professional development programmes. Nonetheless, these programmes cannot be simple seminars where the knowledge is passed on to the teachers or head teachers and assume that education will improve. As discussed before, the design of such programmes should be a serious and complex endeavour. The programmes must focus on the quality of teaching and specifically on the factors that were found to affect students' on-task time and off-task time by teacher's responsibility. Teachers should be trained to improve their structuring activities, from both quantitative and qualitative point of view, as these are linked to higher active on-task time. To assist students spend more time actively on-task, teachers should be trained to improve their questioning techniques, again from both quantitative and qualitative point of view. Special attention should be given to train teachers to improve their management of time skills and the way they manage misbehaviour as these two factors are linked to both improving the students' active on-task time and reducing their off-task time by teacher's responsibility. Consequently, it is clear that there is a need for seminars that are based on the dynamic approach and are focused on time on task. Additionally, the Instrument for Student Observation measuring Time on Task is a very valuable tool for the training of teachers and head teachers as it will enable them to be aware of the time on task status of their students; or in the case of the head teachers, the time on task status of their teachers' students.

The need for professional development programmes is urgent. This is also highlighted by the mean values documented in the measurement of the quality of teaching. The quality of teaching questionnaire was comprised by statements measured with a 1 to 5 agree-disagree scale. Unfortunately, the results are less than encouraging since the mean values for all quality of teaching factors ranged from 1.5 to 2.6. These low mean values indicate that teachers need professional development to improve their quality of teaching. However, school inspectors tend to evaluate most teachers with very high scores. The available evaluation scale ranges from 1 to 40, yet most teachers receive a score of 36 or higher. These scores may be misleading since the findings tell a different story. More seminars are needed

to assist teachers improve their teaching skills, especially seminars focusing on the skills mentioned earlier.

In addition to the focus of the professional development programmes, special attention should be given to their evaluation. The impact of the programme should be measured. Usually, these evaluations measure the impact of the programme on the quality of teaching and the student achievement. In the light of the new data, the programme evaluation should also measure time on task. Specifically, the evaluation should examine whether the students' on-task time increased and their off-task time by teacher's responsibility decreased. The teachers' professional development programmes are very important and not only must they be theoretical but they should also be linked with the practice. They should assist the teachers to develop their own action plans to improve their quality of teaching skills and their students' time on task. Through the programmes, teachers' self-evaluation should be promoted; specifically, teachers should be trained to be more systematic observers. Teachers should notice their students during the teaching process and be aware when their students are on-task or off-task. They should be able to assess if a student is actively or passively on-task or why a student is off-task. They should not take for granted that an off-task behaviour is the student's responsibility but assess whether it is a result of their own behaviour. Therefore, the teachers will become able to improve themselves and develop techniques that will maximize their students' on-task time.

Instrument for Student Observation measuring Time on Task (ISOTOT): A powerful tool

This study created a Multidimensional Instrument for Student Observation measuring Time on Task which is much more advanced than other instruments utilized to measure time on task until this point. As presented in chapter 4, the instrument has undergone a number of tests to examine its validity. It was found valid and suitable to measure the dimensions of time on task. The ISOTOT was created to measure dimensions not found before regaining time in task, hence, an inventory of 60 student behaviours and their categorization (see Appendix A) was created as well. Additionally, a set of detailed instructions has been produced, that guide the observer through every step of the observation procedure and the instrument use. Therefore, the ISOTOT and the accompanying documents can be easily used from researchers and non-researchers alike since the accompanying documents clearly explain the procedure for a successful lesson observation.

The ISOTOT brought to light new information about unknown dimensions of time on task. The analysis of the data gathered with the use of the instrument has demonstrated that simply

observing the teaching process does not affect student achievement gains. Only active on-task behaviours affect student achievement gains. Respectively, it was found that not all off-task behaviours have the same effect on student achievement gains, nor are affected by the same variables (see chapter 4, page 89). It is clear that the Multilevel Instrument for Student Observation measuring Time on Task has a lot to offer. First, it can be used by researchers examining time on task as the instrument is ready for use, includes a categorization of all types of behaviours and a set of clear instructions regarding the observation and reporting process. At the same time, researchers can use the generalization method used to test the generalizability of the instrument regarding the observer, the lesson, and the time-point at which the behaviours occurred (see Chapter 4). It is, therefore, a useful instrument for researchers that examine time on task.

Furthermore, the ISOTOT can be used by teachers. Based on the fact that time on task affects student achievement gains and the finding that time on task is affected by teachers' quality of teaching, it is clear that teachers should be able to measure and improve their students' time on task. The use of the ISOTOT will enable teachers to have a clear image of their classroom's time on task. From there, the teachers can evaluate the results and take actions that will maximize their students' active on-task while minimizing time off-task due to teacher's responsibility as well as attending-class time.

Head teachers can also use the ISOTOT as part of their school's policy to promote time on task. More specifically, they can use it to measure the time on task of the school's classes and take actions to improve it. They could even use it to gain a better understanding with regards to which classes are under risk and to investigate which of their teachers need immediate support. Additionally, as presented earlier, the national policy should provide adequate teacher training. The observation instrument should be used at those seminars so that teachers can practise its use and feel comfortable to use it themselves in a classroom. Respectively, as discussed in a previous section, the national policy should provide a support system to help teachers implement new techniques regarding the promotion of time on task. This instrument could be utilized by the supporters to help the teachers achieve their goals. More specifically, the supporters may observe the teachers during a lesson and discuss the data collected to help them understand how their teaching time is allocated in terms of time on task. Once the project plan for improving time on task is put into action, the supporters may use the ISOTOT to observe additional lessons and see if the new actions bring the desired result. Afterwards, they can use this data to give feedback to the teachers and help them improve their plan. Ultimately, at the final stage of the project, the supporter can use the observation instrument to see if the students' time on task has improved and if the project

was a success. Similarly, the Instrument for Student Observation measuring Time on Task can be used by school inspectors (or any type of teacher evaluator) as a part of the teachers' summative evaluation. The inclusion of time on task in the summative evaluation will motivate the teachers to implement the necessary changes in their teaching while the instrument will enable the evaluator to calculate if there was an improvement in the students' time on task.

Limitations

This study examines time on task and seeks to find whether or not it has an effect on student achievement and how. It examines if time on task functions as a mediator of the effect that quality of teaching has on student achievement. Therefore, it searches for indirect effects that quality of teaching has on student achievement through time on task; evidently, such effects were indeed found. The study also seeks indirect effects of personality traits and thinking styles on student achievement through time on task; effects that were not found. However, even though these two student-level factors were not found to have an effect on time on task, there may be other student-level factors that do affect time on task. Such factors can be the student's expectations and motivation. These factors were not taken into consideration by the present study and this can be considered as one of its limitations. It can be hypothesised that the higher the expectations a student has for his achievement regarding a subject, the more s/he may stay actively on-task. Respectively, a student with high motivation regarding a subject may present a greater interest in that subject and may remain more actively on-task. A relevant suggestion for further research is provided in the last section of this chapter.

Another limitation is the fact that the data for the quality of teaching were gathered with the use of just one source of data, namely, a student questionnaire, instead of a combination of student questionnaire and classroom observation. If a classroom observation was selected as one of the measurement methods for the quality of teaching variable, two options would be available. The first option would be that after the classroom had been observed two times by two observers for the time-on-task measurement, another observation would take place to measure the quality of teaching. The second option assumed that while the two observers were conducting the time-on-task measurement, a third observer would be added to measure quality of teaching. While in the process of deciding which option to implement, the researcher presented the two options to fifteen teachers chosen using convenience sampling. More than 75% of the teachers were negative to both options. Regarding the first option, teachers claimed that a third visit would be overly inconvenient for them as the study already

included too many visits to the classroom. The same reaction was encountered for the second option as the teachers claimed that three observers in the classroom at the same time would be too distracting for the students and too stressful for the teachers. Therefore, the researcher had to find a different option, one that would not disturb the school to such an extent. Additionally, both options would raise the cost of the research significantly. On the other hand, Creemers and Kyriakides (2008), after using both classroom observation and student questionnaires to measure the quality of teaching, they found that the method variance was quite low and therefore the method effects do not strongly influence the measures. Additionally, they did not find any consistent method bias for student questionnaires and observation, something that provides additional support for the convergent validity of the measures, making the student questionnaire an acceptable option for the quality of teaching measurement. Therefore, after considering the advantages and disadvantages of all the available options, the researcher selected the student questionnaires for the quality of teaching measurement. Additionally, a Generalizability Study on the use of students' ratings showed that the data can be generalized at the classroom level. The Structural equation modelling analysis (SEM) regarding the quality of teaching questionnaire produced a model that contained 11 factors and the model was found to fit to the data (scaled x^2=903.377, d.f=344, p= .000, RMSEA= .030, CFI= .956). As was presented in Chapter 3, the problematic items were removed.

An additional limitation is the fact that this study did not measure the students' Socioeconomic Status (SES). Had it measured the SES, more information may have been available regarding the relations among the study's variables. For instance, the SES could be related to the category "off-task by student's responsibility" because the student feels alienated from the school; and since research should make a shift towards equity, this is an important aspect to take into consideration. A relevant suggestion for further research is provided below.

Another limitation is the fact that this study measures quality of teaching, time on task and student achievement based on the Greek language subject. One could argue that the reason this study found a significant indirect effect of quality of teaching to student achievement through time on task, is the fact that Greek language is a core subject and is therefore considered important by all parties, those being the teacher, the students and their parents. It cannot be said with certainty that the teacher would have had the same effect on time on task if the study measured a non-core subject such as Geography or a foreign language. A suggestion for further research regarding this aspect is provided below.

Finally, a limitation of this study is the limited number of classroom observations measuring time on task. Only two observations took place for each classroom. Provided unlimited resources, one should choose to carry out observations at more time points to enhance the reliability of the data. However, the large sample size and the large number of variables of the present study made it difficult to conduct more than two observations as this would require more time and resources and this would significantly increase the cost of the study. However, as presented in Chapter 4, the Generalizability Study demonstrated that the data was generalizable. Additionally, this study's duration was only one year. A longitudinal design with measurements of student achievement, time on task and quality of teaching during the second year, would allow the researcher to check for reciprocal relations. Having limited resources makes it challenging to make additional observations the following years. Unfortunately, a longitudinal design is not adopted here, as this is a PhD study and both time and budget are very important factors in the completion of the study. However, this study follows a typical design usually adopted by PhD studies. This study hypothesised that quality of teaching has an effect on time on task, which acts as a mediator, and through that has an effect on student achievement. A second year of measurements could help to rule out other relations that a researcher may have contemplated. A relevant suggestion is provided in the last section of this chapter.

Suggestions for Further Research

As mentioned in the previous section, this study examined if student-level factors, personality traits and thinking styles affect time on task, and such relations were not revealed. However, there are other student-level factors that could have an effect on time on task, namely, motivation and expectations. One can assume that the higher the expectations a student has for his/her achievement regarding a subject, the more s/he may stay actively on-task. Correspondingly, a student with high motivation regarding a subject may present a greater interest in that subject and may remain more actively on-task. Perhaps, if future studies examine these student-level factors, they may provide additional information as to which factors influence time on task. As presented in detail earlier, in this study, the first step in the search for indirect effects was the identification that certain characteristics of quality of teaching may share a connection with time on task. For instance, management of time that is included in the quality of teaching factors may affect time on task and through that student achievement gains. The variable of management of time is easily associated with time on task; however, with further investigation more variables appear to have an effect on

time on task and from that on student achievement. Respectively, similar observations can be made with other variables. For instance, one can explore the mediating role of motivation. More specifically, one can claim that orientation is related to motivation because if a student knows the reason a lesson takes place, s/he will be more motivated towards the lesson. This can result in higher achievement gains. From this initial assumption, a researcher can further examine more quality of teaching factors and their relations with motivation and student achievement and explore if motivation acts as a mediator between quality of teaching and student achievement gains. The same procedure can be used to search if expectations can act as a mediator of the effects that quality of teaching has on student achievement gains. Furthermore, this study did not explain much of the variance for "off-task by student's responsibility". Thus, future studies could examine more factors in an attempt to find what explains this category except prior achievement. Perhaps, if future studies include more student-level factors such as the student's expectations and motivation, the "off-task by student's responsibility" category can be further explained. In addition to that, it should be examined if "off-task due to student's responsibility" can be affected by the other two time-on-task factors, for instance, whether "off-task due to student's responsibility" is higher when "off-task due to teacher's responsibility" is also high. Or if any of the three time-on-task factors are related with each other. In the present study, using Multilevel SEM analysis, these three variables were not found to be related. As presented in Chapter 3 this study used data from Primary School students, from grades four, five and six. It would be beneficial to see if the results are the same when data is used from Secondary Education or if the sample is larger. It could be hypothesised that the student's expectations and motivation will present greater effect as we move towards the last years of secondary education when students need to make crucial decisions about their academic and professional future. This is something that further research can explore.

As mentioned earlier, this study measures quality of teaching, time on task and student achievement based on a core-subject, the Greek language. It would be beneficial if future studies measured quality of teaching, time on task and student achievement in a non-core subject, such as Geography or a foreign language, in order to examine whether the effect of the teacher remains the same. Additionally, the study examined only grades 4, 5 and 6 of Primary Education. Therefore, this could also be examined across both primary and secondary education and draw comparisons between results occurring from subjects the students must take a final examination for and from subjects that a final examination is not required. It could be hypothesised that the teacher will present higher effect on time on task on subjects that require a final examination. Additionally, further research should measure

the students' SES, as it could provide additional information. For instance, the SES could be related to the category "off-task by student's responsibility" because the student feels estranged from the school. Therefore, researchers should take into consideration the students' SES, to gain more information regarding relations while at the same time promote equity. Finally, this study took place in the context of Cyprus. It would be very interesting to see if the results can be replicated in another context or if different findings emerge. This study can be considered as a starting point for more research regarding time on task and quality of teaching.

Moreover, further research could employ longitudinal design with measurements of student achievement, time on task and quality of teaching, during the second year, in order to check for reciprocal relations. This study hypothesised that quality of teaching has an effect on time on task, which acts as a mediator, and through that has an effect on student achievement. A second year of measurements could allow the examination of additional hypotheses. One can hypothesise, for example, that if a teacher has students that tend to stay on-task, then this helps the teacher provide better quality of teaching. More specifically, this would mean that the classroom context affects the teacher's quality of teaching. Therefore, the time on task is not the mediator of quality of teaching on student achievement gains. In this case the hypothesis is that the quality of teaching is the mediator of time on task on student achievement gains. Having two years of measurements would allow for the examination of such hypotheses. Additionally, a second year of measurements, would allow the examination of reciprocal relations of student-level factors, time on task and student achievement gains. For example, is it possible that an increase in student achievement gains can cause an increase in time on task? Could it be that if a student's learning outcomes improve, the student will be driven to pay more attention to the lesson and spend more time on task? Future research can further investigate these questions.

Time on task is a concept that has not been the centre of attention for researchers for the last few years. However, this study showed that time on task can still provide new and useful information. Therefore, it is important for future research to include this factor when examining relations among effectiveness factors. This study has also developed a new, more advanced instrument for the measurement of time on task. This instrument was found to be valid and suitable to measure students' time on task during lesson observation. Hence, this instrument can be used in future studies and provide valuable information regarding the distribution of the students' time during lessons, as it is an instrument much more detailed compared to the ones used to date. In this study, some of the categories were rarely observed

and consequently dropped. Four of the instrument's categories were kept and three of them were found to have an effect on student achievement. Additionally, as presented in chapter 4, some categories were rarely observed. These categories were: 5.a. Distracting students/teacher-physical violence, 5.b. Distracting students/teacher-verbal violence and category 6. Absent from class. The reason for the absence of behaviours related to these dimensions may be the observers' presence in the classroom. As the teachers and the students were aware that they were being observed, they may have been more careful to present socially appropriate behaviour. If the observers visited the class more frequently, for instance once a week throughout the school year, then they would be perceived more as "insiders" and less as "strangers" by students and teachers. In this case, perhaps the four categories mentioned above would be observed more often. Future studies can examine this aspect and determine if behaviours from these dimensions do occur more often when more frequent observations take place. In that case, these studies can examine if these dimensions are affected by the teacher's quality of teaching, as well as if they affect student achievement gains. The results from additional studies would determine if these categories should remain, be merged, or be removed from the observation instrument and the dimensions of time on task.

This study measured time on task with two classroom observations, with the assistance of 7 different observers. When such procedures take place, Generalizability Studies can help us examine whether the data is generalizable. In the present study, as extensively presented in Chapter 4, it was checked that data was generalizable regarding the observer, the time (the first or second time of the observation) and also the 10-minute period of the lesson itself (first, second, third or fourth 10-minute period). Future studies with similar data measurement structure can benefit from the use of Generalizability Studies as was described above.

Finally, this study points out the importance of using both multilevel regression and multilevel SEM to analyse data from more than one levels. They are two analyses that complete each other and provide a more detailed picture of the relations examined. Here, the multilevel regression was able to highlight which factors had an effect on student achievement but was not able to provide any information regarding the existence of indirect effects as such analysis is not possible with the use of multilevel regression. The use of multilevel SEM confirmed with great consistency the effects found from multilevel regression and additionally revealed which effects were direct and which were indirect. Therefore, it is beneficial for future studies when examining relations at different levels to

use both multilevel regression and multilevel SEM to analyse data, as the combination of the two provides more information and strengthens the validity of the findings.

Concluding, time on task was found by this study to be an important factor as it influences students' achievement gains. It was shown that it is a multilevel construct, more complicated than previously known. Throughout this study, more information became known regarding which factors influence time on task. Namely, quality of teaching was found to influence time on task. Therefore, researchers, policymakers and practitioners know that the improvement of certain quality-of-teaching factors, will improve the students' time-on-task and consequently, the students' achievement gains. Therefore, the study has provided new and valuable information for the improvement of student achievement gains. This thesis has presented the findings of the study and has proposed ways for the policymakers to utilise the findings of the study and promote time on task. This study has also created a very powerful tool that can measure the students' time on task. This classroom observation instrument can be used by researchers who wish to explore time on task, by trainers that need to train teachers to use it in the classroom, by evaluators who wish to evaluate teachers, and finally by teachers who would like to improve their students' achievement gains. The study had certain limitations that have been presented earlier. Nevertheless, the study has surely highlighted the importance of time of task and if the suggestions of the thesis are taken into consideration, then student achievement gains will certainly be improved.

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APPENDICES

APPENDIX A

BEHAVIOR CATEGORIES	BEHAVIOR EXAMPLES
1. Active on task	Discussing with the teacher about academic content Helping other student Answering a question Asking a question (relevant to the lesson taught) Participating in a (public) student-student dialogue (relevant to the lesson taught) Looking something up in the dictionary/ or other media (as part of an assignment) Being on the blackboard to solve an exercise Working on a written assignment
2. Attending class	Looking at the book/notebook/worksheet that was assigned to him/her Looking at the teacher while she/he is talking Looking at the board as the teacher is writing Listening to teacher's question Copying from the board Opening a book/notebook (as part of an assignment)
3. Attending an academic but non relevant assignment	Gluing pictures (as part of an assignment) Coloring (as part of an assignment) Drawing (as part of an assignment) Using their scissors (as part of an assignment)
4. Off-task activities	
a. Teacher's responsibility	Erasing the board Waiting for help Raising his/her hand

	Handing out/collecting books/ notebooks/ working sheets to the rest of the class
	Discussing with the teacher about non-academic content
	Erasing the blackboard
	Queuing
b. Student's responsibility	Writing on his/her desk
	Erasing aimlessly
	Sharpening aimlessly
	Coloring (not as part of an assignment)
	Drawing (not as part of an assignment)
	Searching in his/her pencil case
	Playing with an object (toy car, cards with football players etc)
	Looking out of the window
	Talking/ singing alone
	Eating
	Drinking
	Cutting an eraser into pieces
	Making darts out of paper
	Using their scissors (not as part of an assignment)
	Browsing book/ notebook / dictionary or other media (not as part of an assignment)
	Being out of the seat without justification
	Turing around in seat
	Looking away from their work/ teacher
	Asking a question (non relevant to the lesson taught)
c. School management's responsibility	Is looking at someone who came in the classroom (for announcement, fund raising etc)
5. Distracting other students/ teacher	
a. Physical violence	Hitting or causing physical damage to another student or self
b. Verbal violence	Making fun of other students
c. Other distraction	Playing with another student
	Talking with another student
	Throwing pieces of eraser to another student

	Making unnecessary noise Passing notes
6. Absent from class:	
a. Teacher's responsibility	Went outside the classroom to drink water Went outside the classroom to bring something for the teacher Went outside the classroom to make copies for the teacher
b. Student's responsibility	Went to the toilet
c. School management's responsibility	Is looking at someone who came in the classroom (for announcement, fund raising etc) Is queuing to have their money collected for a school event, school trip, fundraiser etc

APPENDIX B

Instrument for Student Observation measuring Time on Task (ISOTOT)

Observer:

Date:	
School:	
Time:	
Class:	
Lesson:	

BEHAVIOR CATEGORIES	**CODE**
1. Active on task	ACT
2. Attending class	ATTEND
3. Attending an academic but non relevant assignment	IRREL
4. Non-academic activities	
a. Teacher's responsibility	OFF-TEAC
b. Student's responsibility	OFF-STUD
c. School management's responsibility	OFF-MAN
5. Distracting other students/ teacher	
a. Physical violence	PHYS
b. Verbal violence	VERB
c. Other distraction	OTH
6. Absent from class:	
a. Teacher's responsibility	ABS-TEAC
b. Student's responsibility	ABS-STUD
c. School management's responsibility	ABS-MAN

Minute ***Behaviour***

	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
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APPENDIX C

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΥΠΡΟΥ

ΤΜΗΜΑ ΕΠΙΣΤΗΜΩΝ ΤΗΣ ΑΓΩΓΗΣ

ΟΝΟΜΑΤΕΠΩΝΥΜΟ: ……

ΣΧΟΛΕΙΟ:…… ΤΑΞΗ: …… ΕΙΜΑΙ: ΑΓΟΡΙ ☐

ΚΟΡΙΤΣΙ ☐

ΜΕΡΟΣ Α'

ΟΔΗΓΙΕΣ

Αγαπητέ μαθητή/ αγαπητή μαθήτρια,

Σκέψου τη συμπεριφορά σου κατά τους τελευταίους 12 μήνες. Αφού διαβάσεις προσεκτικά κάθε πρόταση που ακολουθεί, κύκλωσε τον αριθμό που **ταιριάζει καλύτερα** στη συμπεριφορά σου. Θα **κυκλώσεις** τον αριθμό:

1, αν το χαρακτηριστικό **δεν** σου ταιριάζει **καθόλου**

2, αν το χαρακτηριστικό σου ταιριάζει **λίγο**

3, αν το χαρακτηριστικό σου ταιριάζει **αρκετά**

4, αν το χαρακτηριστικό σου ταιριάζει **πολύ**

5, αν το χαρακτηριστικό σου ταιριάζει **πάρα πολύ**

Σε παρακαλούμε να απαντήσεις σε **όλες** τις ερωτήσεις.

		Καθόλου	**Λίγο**	**Αρκετά**	**Πολύ**	**Πάρα πολύ**
1.	Θυμώνω εύκολα.	1	2	3	4	5
2.	Είμαι προσεχτικός και επιμελής σε ό,τι κάνω.	1	2	3	4	5
3.	Το διάλειμμα μου αρέσει να κάνω παρέα με άλλα παιδιά.	1	2	3	4	5
4.	Είμαι καλόκαρδο άτομο.	1	2	3	4	5
5.	Μου αρέσει να δοκιμάζω καινούρια φαγητά.	1	2	3	4	5
6.	Είμαι νευρικό άτομο.	1	2	3	4	5
7.	Είμαι πεισματάρης/α.	1	2	3	4	5

		Καθόλου	**Λίγο**	**Αρκετά**	**Πολύ**	**Πάρα πολύ**
8.	Τσακώνομαι με άλλα παιδιά.	1	2	3	4	5
9.	Μου αρέσει να συμμετέχω σε συζητήσεις.	1	2	3	4	5
10.	Βάζω ένα πρόγραμμα σε ό,τι κάνω, δηλαδή είμαι ένα οργανωμένο άτομο.	1	2	3	4	5
11.	Προσφέρω πρόθυμα τη βοήθειά μου.	1	2	3	4	5
12.	Προτιμώ να πηγαίνω για βόλτα σε τόπους που έχω ξαναπάει.	1	2	3	4	5
13.	Είμαι επιθετικό άτομο.	1	2	3	4	5
14.	Όταν έχω να κάνω κάτι, το τελειώνω στη ώρα μου.	1	2	3	4	5
15.	Κάνω φίλους/ες εύκολα.	1	2	3	4	5
16.	Νιώθω ωραία όταν βρίσκομαι σε κάποιο χώρο που δεν έχω ξαναβρεθεί.	1	2	3	4	5
17.	Δείχνω αγάπη και στοργή προς τους άλλους.	1	2	3	4	5
18.	Είμαι συγυρισμένο άτομο.	1	2	3	4	5
19.	Έχω πολλούς φίλους/φίλες.	1	2	3	4	5
20.	Νιώθω άβολα όταν πρέπει να κάνω πράγματα που δεν ξαναέκανα.	1	2	3	4	5

APPENDIX D

Specification Table: Items of the students' questionnaire by factor

PERSONALITY QUESTIONNAIRE	
FACTORS	ITEMS
Neurotic	1, 6, 8, 13
Conscientious	2, 10, 14, 18
Extraversion	3, 9, 15, 19
Agreeable	4, 7, 11, 17
Openness to experience	5, 12, 16, 20

APPENDIX E

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΥΠΡΟΥ

ΤΜΗΜΑ ΕΠΙΣΤΗΜΩΝ ΤΗΣ ΑΓΩΓΗΣ

ΟΝΟΜΑΤΕΠΩΝΥΜΟ: ……

ΣΧΟΛΕΙΟ:…… **ΤΑΞΗ:** …… **ΕΙΜΑΙ: ΑΓΟΡΙ** ☐

ΚΟΡΙΤΣΙ ☐

ΟΔΗΓΙΕΣ

Αγαπητέ μαθητή/ αγαπητή μαθήτρια,

Παρακαλώ να διαβάσεις προσεκτικά την κάθε δήλωση και να κυκλώσεις εκείνο τον αριθμό που ταιριάζει στην περίπτωσή σου. Αφού διαβάσεις προσεκτικά κάθε πρόταση, κύκλωσε τον αριθμό που σου **ταιριάζει καλύτερα**. Θα **κυκλώσεις** τον αριθμό:

1, αν η πρόταση **δεν** σου ταιριάζει **καθόλου**

2, αν η πρόταση σου ταιριάζει **λίγο**

3, αν η πρόταση σου ταιριάζει **αρκετά**

4, αν η πρόταση σου ταιριάζει **πολύ**

5, αν η πρόταση σου ταιριάζει **πάρα πολύ**

Παρακαλούμε να απαντήσεις σε **όλες** τις δηλώσεις, με βάση το τι **πραγματικά** ισχύει στην περίπτωσή σου.

		Δεν ισχύει καθόλου	**Ισχύει λίγο**	**Ισχύει αρκετά**	**Ισχύει πολύ**	**Ισχύει πάρα πολύ**
1.	Όταν έχω να κάνω διάφορα πράγματα, πριν ξεκινήσω να τα κάνω, μου αρέσει να τα βάζω σε σειρά, ανάλογα με το πόσο σημαντικά είναι.	1	2	3	4	5
2.	Όταν έχω να αντιμετωπίσω ένα πρόβλημα, χρησιμοποιώ τις δικές μου ιδέες για να το λύσω.	1	2	3	4	5
3.	Με ευχαριστεί να ασχολούμαι με πράγματα τα οποία μπορώ να κάνω ακολουθώντας συγκεκριμένες οδηγίες.	1	2	3	4	5
4.	Μου αρέσει να συγκρίνω τους διαφορετικούς τρόπους με τους οποίους μπορεί να γίνει κάτι και να διαλέγω τον καλύτερο.	1	2	3	4	5

		Δεν ισχύει καθόλου	Ισχύει λίγο	Ισχύει αρκετά	Ισχύει πολύ	Ισχύει πάρα πολύ
5.	Προτιμώ να συγκεντρώνομαι σε ένα πράγμα κάθε φορά.	1	2	3	4	5
6.	Μπορώ εύκολα να αφήσω κάτι που κάνω για να αρχίσω κάτι άλλο, γιατί όλα όσα κάνω μου φαίνονται το ίδιο σημαντικά.	1	2	3	4	5
7.	Όταν μας βάλει ο δάσκαλος διάφορες εργασίες, ξεκινώ από οποιαδήποτε εργασία, χωρίς να έχει σημασία από ποια.	1	2	3	4	5
8.	Με ενδιαφέρει πιο πολύ το τελικό αποτέλεσμα μιας εργασίας που έχω να κάνω, παρά οι λεπτομέρειές της.	1	2	3	4	5
9.	Μου αρέσει να συγκεντρώνω λεπτομερείς πληροφορίες για τις εργασίες που κάνω, αντί να γράφω γενικά πράγματα.	1	2	3	4	5
10.	Για μένα, οι ατομικές εργασίες είναι καλύτερες από τις ομαδικές.	1	2	3	4	5
11.	Όταν ξεκινώ μια εργασία, μου αρέσει να ανταλλάζω ιδέες με τους φίλους μου.	1	2	3	4	5
12.	Όταν αντιμετωπίζω κάποιο πρόβλημα, προσπαθώ να χρησιμοποιώ νέους τρόπους για να το λύσω.	1	2	3	4	5
13.	Μου αρέσει να συμμετέχω σε δραστηριότητες στις οποίες μπορώ να συνεργαστώ με άλλους ως μέλος μιας ομάδας.	1	2	3	4	5
14.	Όταν λύνω ένα πρόβλημα, μου αρέσει να χρησιμοποιώ τον τρόπο που χρησιμοποιούσα πάντα.	1	2	3	4	5
15.	Μου αρέσουν τα προβλήματα και οι ασκήσεις όπου μπορώ να δοκιμάζω δικούς μου τρόπους για να τα λύνω.	1	2	3	4	5
16.	Μου αρέσουν οι εργασίες στις οποίες μπορώ να μελετήσω αυτά που έκαναν άλλοι και να αποφασίσω αν είναι σωστά.	1	2	3	4	5
17.	Μου αρέσει να δοκιμάζω καινούριους τρόπους για να κάνω διάφορα πράγματα, οι οποίοι δεν έχουν χρησιμοποιηθεί από άλλους στο παρελθόν.	1	2	3	4	5
18.	Μου αρέσουν οι ασκήσεις που έχουν συγκεκριμένο τρόπο που λύνονται.	1	2	3	4	5
19.	Όταν έχω να κάνω πολλά πράγματα, ξέρω πιο πρέπει να κάνω πρώτο, πιο δεύτερο πιο τρίτο και τα λοιπά.	1	2	3	4	5
20.	Μου αρέσει να κάνω διάφορα πράγματα την ίδια ώρα.	1	2	3	4	5
21.	Όταν έχω να κάνω πολλές δουλειές, προτιμώ να τελειώνω πρώτα τη μια, και μετά να ξεκινώ μια άλλη.	1	2	3	4	5
22.	Προτιμώ να χρησιμοποιώ τους συνηθισμένους τρόπους με τους οποίους γίνονται τα πράγματα.	1	2	3	4	5
23.	Μου αρέσει να ασχολούμαι με παλιά προβλήματα και να βρίσκω καινούριους τρόπους για να τα λύσω.	1	2	3	4	5

		Δεν ισχύει καθόλου	**Ισχύει λίγο**	**Ισχύει αρκετά**	**Ισχύει πολύ**	**Ισχύει πάρα πολύ**
24.	Μου αρέσει όταν ο δάσκαλος μας βάζει εργασία όπου πρέπει να συνεργαστώ με άλλα παιδιά για να την κάνω.	1	2	3	4	5
25.	Προτιμώ να δουλεύω σε εργασίες που μπορώ να κάνω από μόνος μου.	1	2	3	4	5
26.	Μου αρέσουν τα προβλήματα στα οποία πρέπει να δίνω προσοχή στις λεπτομέρειες.	1	2	3	4	5
27.	Μου αρέσει να κάνω εργασίες που αφορούν γενικά θέματα και όχι μικρολεπτομέρειες.	1	2	3	4	5
28.	Μου αρέσει να κάνω πράγματα όπου μπορώ να χρησιμοποιήσω τις δικές μου ιδέες.	1	2	3	4	5
29.	Μου αρέσει να ακολουθώ οδηγίες όταν λύνω ένα πρόβλημα ή όταν κάνω μια δουλειά.	1	2	3	4	5
30.	Μου αρέσει να διορθώνω τους συμμαθητές μου όταν κάνουν λάθος.	1	2	3	4	5
31.	Όταν πρέπει να γίνουν πολλά σημαντικά πράγματα, κάνω αυτά που είναι τα πιο σημαντικά.	1	2	3	4	5
32.	Όταν έχω να κάνω πολλές ασκήσεις, μου αρέσει να προσπαθώ να τις κάνω ταυτόχρονα.	1	2	3	4	5
33.	Όταν έχω να κάνω πολλά πράγματα, δεν έχει σημασία ποιο θα ξεκινήσω να κάνω πρώτο.	1	2	3	4	5
34.	Πρέπει να τελειώσω με κάτι για να ξεκινήσω κάτι άλλο.	1	2	3	4	5
35.	Όταν γράφω μια έκθεση, γράφω τις ιδέες μου, όπως μου έρχονται στο μυαλό.	1	2	3	4	5
36.	Μου αρέσουν οι εργασίες όπου μπορώ να μιλήσω γενικά για ένα θέμα, χωρίς να μπω σε λεπτομέριες.	1	2	3	4	5
37.	Μου αρέσουν οι εργασίες που μπορώ να τις κάνω μόνος μου, χωρίς να πρέπει να συνεργαστώ με συμμαθητές μου.	1	2	3	4	5
38.	Δίνω περισσότερη προσοχή στις λεπτομέρειες ενός προβλήματος ή μιας άσκησης, παρά στο συνολικό αποτέλεσμα του.	1	2	3	4	5
39.	Όταν λύνω ασκήσεις, προτιμώ να χρησιμοποιώ τον τρόπο που χρησιμοποιούν όλοι.	1	2	3	4	5

APPENDIX F

Specification Table: Items of the students' questionnaire by factor

THINKING STYLE QUESTIONNAIRE	
FACTORS	ITEMS
Legislative	2, 15, 28
Executive	3, 18, 29
Judicial	4, 16, 30
Hierarchical	1, 19, 31
Monarchic	5, 34, 21
Oligarchic	6, 20, 32
Anarchic	7, 33, 35
Global	8, 27, 36
Local	9, 26, 38
Internal	10, 37, 25
External	11, 13, 24
Liberal	12, 17, 23
Conservative	14, 22, 39

APPENDIX G

Personality Traits Correlation Matrix

	F1	F2	F3	F4	F5
F1	-	-.328	-.108	-.315	-.045
F2	-.328	-	.630	.809	.629
F3	-.108	.630	-	.621	.711
F4	-.315	.809	621	-	.809
F5	-.045	.629	.711	.809	-

CORRELATIONS AMONG INDEPENDENT VARIABLES

V F

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I F2 - F2 -.328*I

I F1 - F1 I

I I

I F3 - F3 -.108*I

I F1 - F1 I

I I

I F4 - F4 -.315*I

I F1 - F1 I

I I

I F5 - F5 -.045*I

I F1 - F1 I

I I

I F3 - F3 .630*I

I F2 - F2 I

I I

I F4 - F4 .809*I

I F2 - F2 I

I I

I F5 - F5	.629*I
I F2 - F2	I
I	I
I F4 - F4	.621*I
I F3 - F3	I
I	I
I F5 - F5	.711*I
I F3 - F3	I
I	I
I F5 - F5	.809*I
I F4 - F4	I
I	I

APPENDIX H

Thinking Styles Correlation Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
F1	-	.839	.870	.872	.758	.237	.501	.707	.754	.439	.714	1.000	.731
F2	.839	-	.857	.950	.868	.331	.489	.767	.917	457	.763	.836	.879
F3	.870	.857	-	.773	.699	.643	.586	.697	.918	.528	.676	.973	.808
F4	.872	.950	.773	-	.941	.185	.296	.667	.724	.401	.726	.880	.734
F5	.758	.868	.699	.941	-	-.071	.366	.630	.650	.337	.725	.757	.792
F6	.237	.331	.643	.185	-.071	-	.576	.558	.571	.472	.288	.495	.444
F7	.501	.489	.586	.296	.366	.576	-	.662	.585	.389	419	.530	.580
F8	.707	.767	.697	.667	.630	.558	.662	-	.585	527	.619	.746	.799
F9	.754	.917	.918	.724	.650	.571	.585	.585	-	.652	.585	.839	.670
F10	.439	457	.528	.401	.337	.472	.389	.527	.652	-	-.140	.424	.394
F11	.714	.763	.676	.726	.725	.288	419	.619	.585	-.140	-	.798	.662
F12	1.000	.836	.973	.880	.757	.495	.530	.746	.839	.424	.798	-	.725
F13	.731	.879	.808	.734	.792	.444	.580	.799	.670	.394	.662	.725	-

CORRELATIONS AMONG INDEPENDENT VARIABLES

V	F
I F2 - F2	.839*I
I F1 - F1	I
I	I
I F3 - F3	.870*I
I F1 - F1	I
I	I
I F4 - F4	.872*I
I F1 - F1	I
I	I
I F5 - F5	.758*I
I F1 - F1	I
I	I
I F6 - F6	.237*I
I F1 - F1	I
I	I
I F7 - F7	.501*I
I F1 - F1	I
I	I
I F8 - F8	.707*I
I F1 - F1	I
I	I
I F9 - F9	.754*I
I F1 - F1	I

I	I
I F10 - F10	.439*I
I F1 - F1	I
I	I
I F11 - F11	.714*I
I F1 - F1	I
I	I
I F12 - F12	1.000*I
I F1 - F1	I
I	I
I F13 - F13	.731*I
I F1 - F1	I
I	I
I F3 - F3	.857*I
I F2 - F2	I
I	I
I F4 - F4	.950*I
I F2 - F2	I
I	I
I F5 - F5	.868*I
I F2 - F2	I
I	I
I F6 - F6	.331*I
I F2 - F2	I
I	I
I F7 - F7	.489*I
I F2 - F2	I
I	I
I F8 - F8	.767*I
I F2 - F2	I
I	I
I F9 - F9	.917*I
I F2 - F2	I
I	I
I F10 - F10	.457*I
I F2 - F2	I
I	I
I F11 - F11	.763*I
I F2 - F2	I
I	I
I F12 - F12	.836*I
I F2 - F2	I
I	I
I F13 - F13	.879*I
I F2 - F2	I
I	I
I F4 - F4	.773*I
I F3 - F3	I
I	I
I F5 - F5	.699*I
I F3 - F3	I
I	I
I F6 - F6	.643*I
I F3 - F3	I
I	I
I F7 - F7	.586*I
I F3 - F3	I
I	I
I F8 - F8	.697*I
I F3 - F3	I
I	I
I F9 - F9	.918*I
I F3 - F3	I

I	I
I F10 - F10	.528*I
I F3 - F3	I
I	I
I F11 - F11	.676*I
I F3 - F3	I
I	I
I F12 - F12	.973*I
I F3 - F3	I
I	I
I F13 - F13	.808*I
I F3 - F3	I
I	I
I F5 - F5	.941*I
I F4 - F4	I
I	I
I F6 - F6	.185*I
I F4 - F4	I
I	I
I F7 - F7	.296*I
I F4 - F4	I
I	I
I F8 - F8	.667*I
I F4 - F4	I
I	I
I F9 - F9	.724*I
I F4 - F4	I
I	I
I F10 - F10	.401*I
I F4 - F4	I
I	I
I F11 - F11	.726*I
I F4 - F4	I
I	I
I F12 - F12	.880*I
I F4 - F4	I
I	I
I F13 - F13	.734*I
I F4 - F4	I
I	I
I F6 - F6	-.071*I
I F5 - F5	I
I	I
I F7 - F7	.366*I
I F5 - F5	I
I	I
I F8 - F8	.630*I
I F5 - F5	I
I	I
I F9 - F9	.650*I
I F5 - F5	I
I	I
I F10 - F10	.337*I
I F5 - F5	I
I	I
I F11 - F11	.725*I
I F5 - F5	I
I	I
I F12 - F12	.757*I
I F5 - F5	I
I	I
I F13 - F13	.792*I
I F5 - F5	I

I	I
I F7 - F7	.576*I
I F6 - F6	I
I	I
I F8 - F8	.558*I
I F6 - F6	I
I	I
I F9 - F9	.571*I
I F6 - F6	I
I	I
I F10 - F10	.472*I
I F6 - F6	I
I	I
I F11 - F11	.288*I
I F6 - F6	I
I	I
I F12 - F12	.495*I
I F6 - F6	I
I	I
I F13 - F13	.444*I
I F6 - F6	I
I	I
I F8 - F8	.662*I
I F7 - F7	I
I	I
I F9 - F9	.585*I
I F7 - F7	I
I	I
I F10 - F10	.389*I
I F7 - F7	I
I	I
I F11 - F11	.419*I
I F7 - F7	I
I	I
I F12 - F12	.530*I
I F7 - F7	I
I	I
I F13 - F13	.580*I
I F7 - F7	I
I	I
I F9 - F9	.585*I
I F8 - F8	I
I	I
I F10 - F10	.527*I
I F8 - F8	I
I	I
I F11 - F11	.619*I
I F8 - F8	I
I	I
I F12 - F12	.746*I
I F8 - F8	I
I	I
I F13 - F13	.799*I
I F8 - F8	I
I	I
I F10 - F10	.652*I
I F9 - F9	I
I	I
I F11 - F11	.585*I
I F9 - F9	I
I	I
I F12 - F12	.839*I
I F9 - F9	I

I	I
I F13 - F13	.670*I
I F9 - F9	I
I	I
I F11 - F11	-.140*I
I F10 - F10	I
I	I
I F12 - F12	.424*I
I F10 - F10	I
I	I
I F13 - F13	.394*I
I F10 - F10	I
I	I
I F12 - F12	.798*I
I F11 - F11	I
I	I
I F13 - F13	.662*I
I F11 - F11	I
I	I
I F13 - F13	.725*I
I F12 - F12	I
I	I

APPENDIX I

Quality of Teaching Correlation Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
F1	-	.659	.857	.573	-.038	.730	-.188	.718	.649	-.093	.627
F2	.659	-	.782	.522	.070	.723	-.057	.653	.690	-.092	.817
F3	.857	.782	-	.509	-.064	.634	-.231	.569	.660	-.065	.645
F4	.573	.522	.509	-	.248	.848	.216	.640	.847	.105	.703
F5	-.038	.070	-.064	.248	-	.170	.915	.019	.212	.659	.179
F6	.730	.723	.634	.848	.170	-	.214	.844	.925	.002	.901
F7	-.188	-.057	-.231	.216	.915	.214	-	.067	.183	.588	.160
F8	.718	.653	.569	.640	.019	.844	.067	-	.724	-.045	.667
F9	.649	.690	.660	.847	.212	.925	.183	.724	-	.087	.853
F10	-.093	-.092	-.065	.105	.659	.002	.588	-.045	.087	-	-.017
F11	.627	.817	.645	.703	.179	.901	.160	.667	.853	-.017	-

CORRELATIONS AMONG INDEPENDENT VARIABLES

V F
--- ---
I F2 - F2 .659*I
I F1 - F1 I
I I
I F3 - F3 .857*I

I F1 - F1 I
I I
I F4 - F4 .573*I
I F1 - F1 I
I I
I F5 - F5 -.038*I
I F1 - F1 I
I I
I F6 - F6 .730*I
I F1 - F1 I
I I
I F7 - F7 -.188*I
I F1 - F1 I
I I
I F8 - F8 .718*I
I F1 - F1 I
I I
I F9 - F9 .649*I
I F1 - F1 I
I I
I F10 - F10 -.093*I
I F1 - F1 I
I I
I F11 - F11 .627*I
I F1 - F1 I
I I
I F3 - F3 .782*I

I F2 - F2 I
I I
I F4 - F4 .522*I
I F2 - F2 I
I I
I F5 - F5 .070*I
I F2 - F2 I
I I
I F6 - F6 .723*I
I F2 - F2 I
I I
I F7 - F7 -.057*I
I F2 - F2 I
I I
I F8 - F8 .653*I
I F2 - F2 I
I I
I F9 - F9 .690*I
I F2 - F2 I
I I
I F10 - F10 -.092*I
I F2 - F2 I
I I
I F11 - F11 .817*I
I F2 - F2 I
I I
I F4 - F4 .509*I
I F3 - F3 I
I I
I F5 - F5 -.064*I
I F3 - F3 I
I I
I F6 - F6 .634*I
I F3 - F3 I
I I
I F7 - F7 -.231*I
I F3 - F3 I
I I
I F8 - F8 .569*I
I F3 - F3 I
I I
I F9 - F9 .660*I
I F3 - F3 I
I I
I F10 - F10 -.065*I
I F3 - F3 I
I I
I F11 - F11 .645*I
I F3 - F3 I
I I
I F5 - F5 .248*I
I F4 - F4 I
I I
I F6 - F6 .848*I
I F4 - F4 I
I I
I F7 - F7 .216*I
I F4 - F4 I
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I F8 - F8 .640*I
I F4 - F4 I
I I
I F9 - F9 .847*I

I F4 - F4 I
I I
I F10 - F10 .105*I
I F4 - F4 I
I I
I F11 - F11 .703*I
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I I
I F6 - F6 .170*I
I F5 - F5 I
I I
I F7 - F7 .915*I
I F5 - F5 I
I I
I F8 - F8 .019*I
I F5 - F5 I
I I
I F9 - F9 .212*I
I F5 - F5 I
I I
I F10 - F10 .659*I
I F5 - F5 I
I I
I F11 - F11 .179*I
I F5 - F5 I
I I
I F7 - F7 .214*I
I F6 - F6 I
I I
I F8 - F8 .844*I
I F6 - F6 I
I I
I F9 - F9 .925*I
I F6 - F6 I
I I
I F10 - F10 .002*I
I F6 - F6 I
I I
I F11 - F11 .901*I
I F6 - F6 I
I I
I F8 - F8 .067*I
I F7 - F7 I
I I
I F9 - F9 .183*I
I F7 - F7 I
I I
I F10 - F10 .588*I
I F7 - F7 I
I I
I F11 - F11 .160*I
I F7 - F7 I
I I
I F9 - F9 .724*I
I F8 - F8 I
I I
I F10 - F10 -.045*I
I F8 - F8 I
I I
I F11 - F11 .667*I
I F8 - F8 I
I I
I F10 - F10 .087*I

I F9 - F9	I
I	I
I F11 - F11	.853*I
I F9 - F9	I
I	I
I F11 - F11	-.017*I
I F10 - F10	I
I	I