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# Hogging the middle lane: How student performance heterogeneity leads Turkish schools to fail in PISA?

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**Abstract**

This study aims to analyse the relationship between students' mathematics achievement in Programme for International Student Assessment (PISA) 2012 and the instructional climate-related factors in the index of principals' perceptions (learning hindrance, teacher morale and teacher intention). As preliminary analysis procedure, the chi-squared automatic interaction detection analysis was performed with relevant independent variables. Teacher's achievement expectation from students and achievement-oriented behaviours were other significant predictive indicators on PISA mathematics achievement. Based upon these independent variables and standard deviation estimates of PISA mathematics scores, the present research developed a theoretical model by means of confirmatory factor analysis, explaining how students' PISA mathematics achievement is associated with classroom and within school homogeneity through teachers' expectation and achievement-oriented behaviours. Results showed that the developed model provided a great model-data fit. This model revealed that classroom achievement homogeneity and within school achievement homogeneity were the most important predictors on students' PISA mathematics achievement.

**Keywords:** PISA, CHAID, mathematics, homogeneity.

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## 1. Introduction

Turkish students have been taking Programme for International Student Assessment (PISA) since 2003. Following the report of Organisation for Economic Cooperation and Development (OECD), PISA 2012 has initiated debates among academics, practitioners and politics on the causes of Turkish students' failure. PISA in 2012 focused on mathematics literacy. The OECD average score for mathematics is 494 and Shanghai- China is at the top with the score of 613. Turkey is ranked 44 out of 65 countries with the average score of 448 (OECD, 2013a). These results have revealed a number of education problems in relation to the system, policies and the structure of schooling.

For many years, educators and researchers have debated which school variables influence student achievement. Some studies have suggested that 'schools bring little influence to bear upon a child's achievement who is independent of his/her background and general social context' (Coleman et al., 1966, p. 325). Other evidences suggest that factors like class size (Mosteller, 1995), teacher qualifications (Ferguson, 1991) and other school variables may play an important role in what students learn. Haahr Nielsen, Hansen and Jakobsen (2005, p. 4) analysed data from three international surveys of students' skills, PISA, namely, TIMSS and PIRLS, and concluded four levels:

> Systemic level, covering factors concerning the systemic characteristics of educational systems and the consequences for students' basic skills; Structural level, covering socio-economic background characteristics of students, the significance of these factors for students' basic skills and the capacities of education systems to adjust for differences in students' socio-economic background; School level, covering aspects of school management and school climate, and the significance of these factors for students' basic skills; and Individual level, concerning the significance of student attitudes, motivation and learning behaviour and their consequences for students' achievements.

The OECD PISA offers a unique opportunity to look at how the structure of schooling—including the grouping of students, segregation of schools, management and financing, school resources and the instructional climate—influence the quality and equity of educational outcomes (OECD, 2005). The structure of schooling affects the quality and equity of educational outcomes. Educational differentiation can take place at the system level, at the school level and at the class level. Some countries prefer to group students into different schools using their performance levels. Creemers and Scheerens (1988) stated that an intellectually homogeneous student body fosters the development of talent and enhances efficient teaching, thus improving the quality of educational outcomes. However, there has been heavy criticism of this approach in educational debates, and it has been argued that the selection and grouping of students into different institutions reinforces existing socio-economic disparities, and thus increases inequity in educational outcomes (OECD, 2005, p. 48). In addition to this, the results of PISA have shown that students educated in a school climate shaped by high expectations and good teacher–student relations, perform better than those who are not. On the contrary, schools with high proportion of students who arrive late, skip lessons and indulge in disciplinary problems tend to have worse performance (OECD, 2013b).

This study aims to analyse the relationship between students' mathematics achievement in PISA 2012 and the instructional climate-related factors in the index of principals' perceptions (learning hindrance, teacher morale and teacher intention). Real school factors are closely related to educational outcomes. In some countries, students are enrolled in different types of schools at different levels. School effectiveness approach analyses the relationship between school factors and educational outcomes. There is a fair coverage of school factors in PISA 2012 database. The PISA 2012 was designed to analyse student performance on mathematics literacy. It is obvious that the performance of students cannot be attributed to school factors totally. However, it is well known that meaningful relationships are to be set between school factors and students' performances in PISA. The school factors covered in PISA could be listed as structural characteristics of school systems (e.g., degree of selectivity), socio-economic status of students and socio-economic composition of schools, school resources, school/teaching processes and school climate/learning (instructional) environment.

This research study is restricted to analyse the relative impact of instructional climate on students' mathematics performances.

### *1.1. Literature review*

There have been numerous studies on events that would affect student's mathematics learning. Four basic learning theories that contribute to mathematics achievement can be listed. The first one is Walberg's (1981) Educational Productivity Theory. Walberg listed variables as age, motivation, prior achievement, quantity of instruction, quality of instruction, home environment, classroom environment, peer group environment and mass media. Coleman, Hoffer and Kilgore's (1982) Model of Student Achievement suggested that student's own background, other student's background, student's own behaviour, other student's behaviour, school type and school policy are directly affecting the mathematics achievement. Carroll's (1982) Model of School Learning suggested that the degree of student learning is affected by student aptitude, student ability to understand instructions, student's level of perseverance, opportunity for learning, quality of instruction. Bigg's (1985) General Model of Student Learning listed perseverance, ability, prior knowledge, personality and home/cultural background to actualise the learning.

Reviewing the literature on mathematics achievement, the potential factors affecting the performance of students can be put into a range of list including, individual variables, background variables and school variables.

Individual differences are the predictors of student performance in mathematics, such as the relationship between mathematics and anxiety (Cates & Rhymer, 2003) or mathematics and self-confidence (Ma, 1999). In addition, individual variables of each student has background variables. In other words, they live in different families, culture and educational environments. Thus, some have more opportunities in order to perform better academically compared to others. School factors can be listed as resource input variables, school organisational factors and instructional conditions (OECD, 2005, p. 15). School resources includes material and physical resources such as the quality of a school's physical infrastructure and school size, as well as human resources such as the proportion of teaching staff with a tertiary qualification and the number of teachers within the school compared to the number of students. School climate covers different aspects of a school's culture, including the disciplinary climate, how well students and teachers get along, how strongly students identify with their school and how motivated and committed the school's teachers are. School policies include the level of autonomy a school enjoys in decision making and various accountability issues (pp. 32–33). In the index of school climate, factors could be grouped into student-related factors and teacher-related factors. Student-related factors affecting school climate are student absenteeism, disruption of classes by students, students skipping classes, students lacking respect for teachers, the use of alcohol or illegal drugs and ability grouping. Teacher- related factors are the morale of the teachers, teachers work with enthusiasm: teachers take pride in this school, and teachers value academic achievement (pp. 102–103).

In our research, study we deal with learning environment covered in PISA 2012. The aspects of learning environment are student truancy and school climate. Student truancy can be put into arriving late for school and skipping school. School climate includes teacher–student relation, disciplinary climate, student- and teacher-related factor and teacher morale. In all of these variables, classroom achievement homogeneity and within school achievement homogeneity were found to be the most important predictors on stduents' PISA mathematics achievement (OECD, 2013b). Thus, ability grouping and teacher effect will be reviewed below.

### *1.2. Ability grouping*

Ability grouping is an educational method utilised to differentiate instruction as a way for students to obtain academic achievement. Slavin defined ability grouping as 'some means of grouping students for instruction by ability or achievement so as to reduce their heterogeneity' (Slavin, 1987, p. 294). Grouping students generally follow one of the three distinct traditions: the sociological tradition, the sociolinguistic tradition or the process–product tradition. Sociologists have assumed that classrooms are related to the functioning of socialisation while sociolinguists focus on the use of language in classroom interaction. However, process–product researchers have dealt with cognitive side of classroom activities that facilitate student achievement (Peterson & Wilkinson, 1984, p. 4–5). Peterson and Wilkinson (1984) proposed a model including student diversity (dynamic-static characteristics), variations in classroom organisations, teacher–student and student–student interactions and student achievement motivation-social skills (p. 8). Student diversity is subdivided into dynamic characteristics such as motivation, prior achievement and static characteristics such as gender and ethnicity. The concept of student diversity includes variables such as student ethnicity, linguistic cultural background, socioeconomic status, gender, age, ability, motivation, prior achievement and personality. Variations in the classroom organisation include such specific variables as heterogeneous versus homogeneous ability-grouping. The third variable is teacher–student, student–student interaction processes. These processes are described by observing the teacher interacting with the other students (p. 6).

### *1.3. Homogeneous and heterogeneous ability grouping*

The grouping of students in schools, classrooms and within classroom groups is potentially a key source of school effects. Ability-grouping usually tries to homogenise individuals based on achievement. Heterogeneous and homogenous grouping is typically formed on the basis of ability or achievement. Homogeneous grouping has been defined as 'placing students in classrooms based on their current academic ability level in a certain subject' (Davidson, 2009). McCarter (2014) defines heterogeneous grouping as educational practice of placing students of various capabilities in the same classroom for academic instruction.

### *1.4. Do students learn more in homogeneous or heterogeneous classes?*

According to Hallinan (1994), homogenous grouping by ability can maximise learning because of matching students' needs. In addition to this, teachers who work with this kind of grouped students worry less about leaving behind students performing worse. The typical claims that when students are placed into homogeneous classes, teachers can better adapt the materials, level and pace of instruction to the needs of individual students. In contrast, there are negative effects of homogenous grouping. It removes the advantage of assisting and stimulating of low-ability students by more able ones. It also causes teachers to avoid teaching lower ability groups (Hattie, 2002, p. 449–451). Slavin (1990) emphasised demoralisation, low expectations and poor behavioural models in low-ability groups. Similarly, bright students profit more while lower ones suffer (Findley & Bryan, 1971). Similarly, Reuman (1989) implies that homogeneous grouping has produced positive and negative effects on students academically, socially and emotionally. In education, ability grouping of students is controversial issue.

### *1.5. Teacher effect*

In PISA, school principals are also asked to report that how teachers' high morale, enthusiasm, pride and high expectation is related to the student learning. Although researchers have mentioned several factors related to student learning, teachers are to be thought at the centre of this controversial issue. Classroom factors such as ability grouping have been thought to influence teacher expectation. Good, Mulryan and McCaslin (1992) pointed out that low-ability groups are thought less than adequate compared to high-ability groups.

Several research results state that teacher expectations really affect student performance either in a positive or negative way (Cooper & Good, 1983; Weinstein, 2002). Simply, teacher expectations refer to inferences that teachers make about the future academic achievement of students (Cooper & Good, 1983). Teacher expectation effects may be categorised as sustaining expectation effects or self-fulfilling prophecy effects. Good and Brophy (1984) describes them as:

> Self-fulfilling prophecies are the most dramatic form of teacher expectation effects, because they involve changes in student behaviour. Sustaining expectations refer to situations in which teachers fail to see student potential, and hence do not respond in a way to encourage some students to fulfill their potential. In summary, self-fulfilling expectations bring about change in student performance, whereas sustaining expectations prevent change (p. 93).

There are numerous factors causing teachers to hold expectations for students, such as sex, ethnicity, socio-economic background, readiness and ability groups. In this study, we deal with the cause of ability grouping. Briefly, some teachers do interact with students for whom they hold low expectations in such a way as to limit their development. Similarly, Wright, Horn and Sanders (1997, p. 58) stated that teachers who have classes more heterogeneous than homogeneous in ability levels are at a distinct disadvantage in producing effects on student learning. In real, how they treat students within different ability groups? According to Cooper and Good (1983) and Good and Brophy (1984), they give fewer opportunities to low-expectation students compared to high-expectation ones, criticise them for failure more often than high-expectation students and pay less attention to low-expectation student. Shortly, students' achievement is largely related to how teachers expect. Teacher achievement-oriented behaviour is another factor affecting the student learning and achievement. Goal orientation is taking attention in the field of motivation. Achievement goal orientation is the desire of an individual to perform or learn better (Linnenbrink & Pintrich, 2002).

## 2. Method

Respectively, the chi-squared automatic interaction detection (CHAID) analysis was employed to identify significant predictor on students' PISA mathematics achievement. After detecting relevant predictors, structural equation modelling (SEM) was used to test theoretical model explaining the relations between dependent and independent variables.

CHAID analysis relies on decision tree technique which is a segmentation method and firstly published by Kass (1980). It is rather useful technique to generate contingency blocks equipped with dependent variables by calculating maximum meaningful variance and combining most similar categories together into one single category (Gallagher, Monroe & Fish, 2000). Decision tree algorithm is an exploratory approach for segmenting a population to some subgroups by means of detecting most significant predictor variables on dependent variable (Kass, 1980). SEM is a comprehensive statistical approach to test the hypotheses about relations among observed and latent variables (Hoyle, 1995). For MacCallum and Austin (2000), SEM tests hypothesised patterns of directional and nondirectional relationships among a set of observed (measured) and unobserved (latent) variables. SEM has got two goals: to understand the patterns of correlation/covariance among a set of variables and to explain as much of their variance as possible with the model specified. SEM includes variation, covariation, confirmatory factor analyses and regression in order to analyse the relationship between variables (Kleine, 2005).

### *2.1. Research population*

As for data resource, 4,847 Turkish student data from 170 schools were extracted from 2012 PISA student dataset. Also, principal view data (the principals of the schools in which students were assessed provided information on their schools' characteristics by completing a school questionnaire) were accessible on 2012 PISA school questionnaire, so 170 school principals' view data were extracted from this dataset. It was found that in some schools, less than five students took part in 2012 PISA test, thus 20 schools were excluded from SEM analysis procedures to ensure adequate representation of target population. Survey items and latent variables are given in Table 1 (OECD, 2013a).

**Table1. Survey items and latent variables**

| Latent variables | Observed variables | | |
|---|---|---|---|
| Learning hindrance | SC22Q01 student truancy<br>SC22Q02 skipping classes<br>SC22Q03 students being late<br>SC22Q04 students skipping events<br>SC22Q05 students lacking respect<br>SC22Q06 students disruption<br>SC22Q07 students drug use | SC22Q08 students being bullied<br>SC22Q09 students not encouraged<br>SC22Q10 poor student-teacher relation<br>SC22Q11 heterogeneous classes<br>SC22Q12 diverse ethnic background<br>SC22Q13 teacher low expectation<br>SC22Q14 students needs not met | SC22Q15 teacher absenteeism<br>SC22Q16 staff resisting change<br>SC22Q17 teachers too strict<br>SC22Q18 teachers being late<br>SC22Q19 teachers being unprepared |
| Teacher morale | SC26Q01 high morale<br>SC26Q02 enthusiasm | SC26Q03 pride<br>SC26Q04 value achievement | |
| Teacher intention | SC27Q01 trying new methods<br>SC27Q02 stay with well known methods | SC28Q01 maximise achievement<br>SC28Q02 adapt standards | SC29Q01 social development<br>SC29Q02 development of maths skills |

## 3. Findings

The decision tree concluded from CHAID analysis pointed out that the best predictor independent variable on mathematic achievement was school principals' perception of heterogeneous classroom. CHAID decision-tree diagram below shows that mathematics achievement school means whose school principals perceive their schools' classroom structure as 'to some extent and a lot' heterogeneous ($n$ = 98) was predicted 414.821; on the other hand, the ones whose school principals selected 'very little and not at all' options ($n$ = 59) obtained 480.706 mathematics achievement score mean in PISA ($p$ < 0.01; $F$ = 33.462).

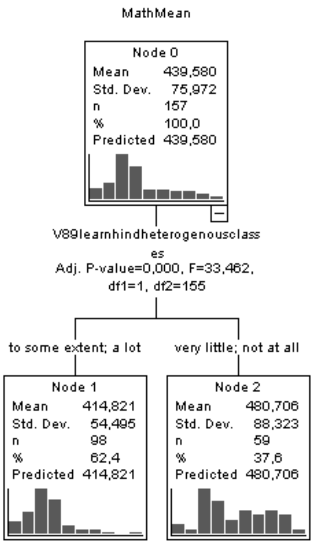


**Figure 1. CHAID decision-tree diagram**

Once heterogeneous classroom variable was detected as the most significant predictor, this variable was inserted to decision-tree procedure as 'influence variable' to present achievement variance in the influence area of classroom heterogeneity. Figure 4 shows second CHAID decision-tree diagram after influence variable selection.

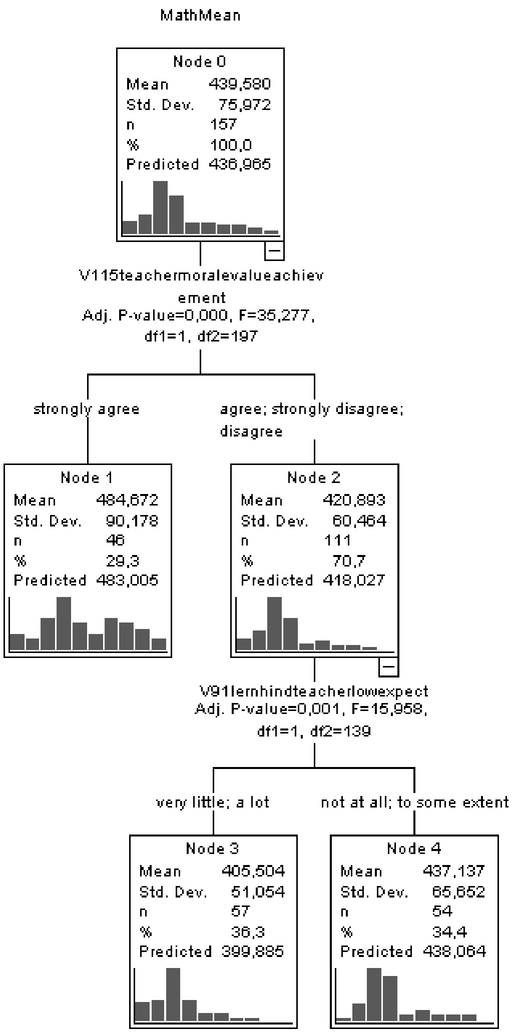


**Figure 2. CHAID decision-tree diagram with influence variable**

As is seen from the second diagram, two new predictor variables that came out after classroom heterogeneity were selected as influence variable. Those are achievement-oriented teacher behaviour and teacher's low-achievement expectation from students. In 46 school whose principals 'strongly agree' that teachers who work in their schools are achievement-oriented ($n$ = 46), PISA mathematics achievement scores reached 484.672; however, when they 'agree, disagree and strongly disagree' on this case ($n$ = 111), mathematics achievement scores dramatically slipped down value of 420.893.

Teacher's low expectation from students was another predictor variable when school principal does not 'strongly agree' on teachers' achievement-oriented behaviour. In schools whose principal 'very little and a lot' thinks that teachers have low-achievement expectation from students ($n$ = 57), mathematics achievement remained at value of 405.504; however, achievement score means increased 437.137 in schools whose teachers have low expectation with 'not at all' and 'to some extent' ($n$ = 54). Indeed, this last finding seems rather ambiguous since 'not at all' is a negative consideration but 'some extent' is a positive one somehow. It stands to reason that CHAID analysis detects meaningful predictors by computing chi-square coefficients and maximising the significance of categories, not continuous variable. Now, we determined the most significant predictors, to compensate concerned statistical weakness of CHAID analysis with more robust method, SEM was performed with identified predictor variables. Thus, exogenous (homogenous classroom) and endogenous (low-achievement expectation and achievement-oriented teacher) variables were examined under one structural model for their influence on mathematics achievement. Figure 5 shows the standardised SEM analysis results.

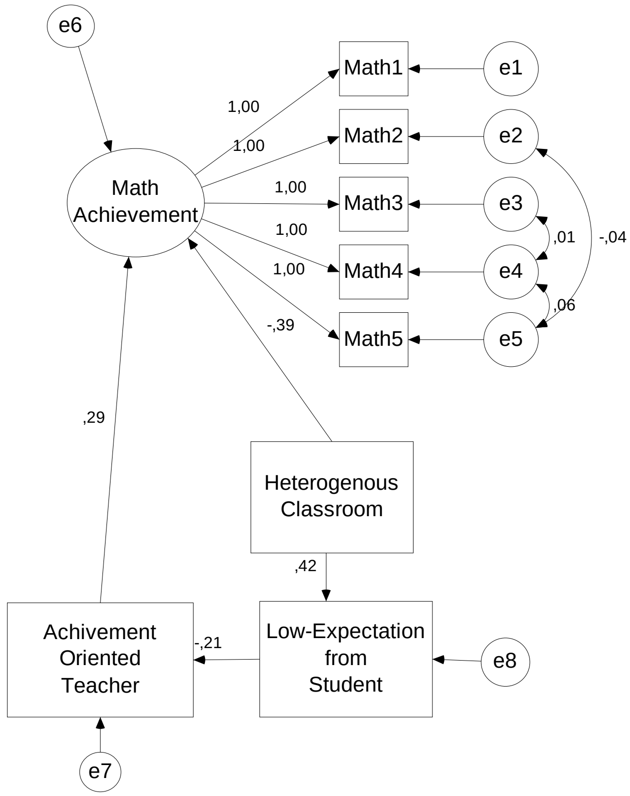


**Figure 3. Effect of classroom homogeneity model**

The measurement results of identified model above produced rather great model-data fit indices ($x^2/df$ = 1.118, GFI = 0.972, AGFI = 0.937, CFI = 0.999, RMSEA = 0.028). The current literature suggests that in case the ratio of $x^2$ to degree of freedom is less than 5, it displays an acceptable model-data fit (Gillaspy 1996; Schumacker & Lomax, 2004). Provided that the ratio under values of 2, it can be interpreted as an indicator for good model-data fit (Ullman, 2001). CFI index yields a fit index that lies just in the 0–1 range. CFI value of 0.90 and above is considered sufficient for an acceptable fit. RMSEA value of 0.80 and less is taken as evidence of acceptable fit (Sumer, 2000; Albright & Park, 2009).

Once relevant fit statistics yielded perfect model-data fit indices, two structural parameters were estimated such as gamma (γ) representing endogenous-exogenous regression relations and beta (β) for endogenous-endogenous regression relations. The SEM figure above indicates that classroom heterogeneity has significantly direct and positive effect over teacher's low-expectation from students (γ = 0.40, $p < 0.01$); plus, direct and negative affect over students' PISA mathematics scores (γ = −0.37, $p < 0.01$). After adding standardised indirect affect estimates, total effect of classroom heterogeneity over PISA mathematics scores aggregates some more (γ = 0.40, $p < 0.01$). Furthermore, findings show that low-achievement expectation of teacher influences directly and negatively in teacher's achievement-oriented behaviour (β = −0.24, $p < 0.01$); indirectly and slightly negatively in students' mathematics achievement (β = −0. 08, $p < 0.01$). In addition, it was found that achievement-oriented teacher approach has a direct effect on students' mathematics PISA scores (β = 0.31, $p < 0.01$).

Furthermore, researchers focused on effect of within school homogeneity to investigate how it was associated with PISA mathematics achievement. Regardless of school principals' view on classroom heterogeneity, within school standard deviation estimates was a more objective indicator to investigate how heterogeneity plays role on students' mathematics PISA scores. Therefore, the first model was retested by exchanging classroom homogeneity variable with standard deviation estimates of PISA mathematics scores for each school.

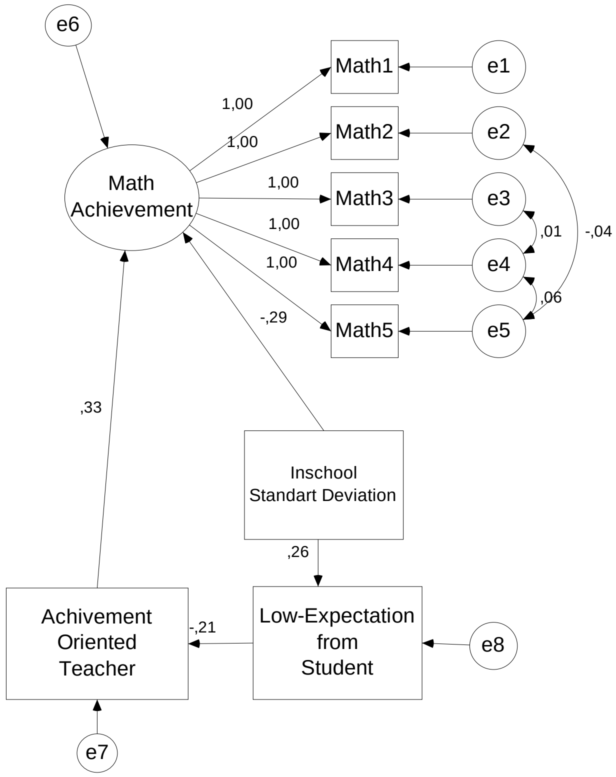


**Figure 6. Effect of within school standard deviation model**

Second model evidenced that within school homogeneity was another direct and indirect indicator on PISA mathematics achievement in a similar way with classroom homogeneity with great model-data fit indices ($x^2/df$ = 1.344, GFI = 0.966, AGFI = 0.923, CFI = 0.998, RMSEA = 0.048). Moreover, standardised effect ways were preserved between the endogenous and exogenous variables so that teachers' low-expectation from students was affected in a positive way (γ = 0.26, $p = 0.001$) and PISA mathematics achievement was affected in a negative way (γ = −0.29, $p < 0.01$) by within school achievement homogeneity. It is found that standardised total negative effect of standard deviation on mathematic achievement reached γ value of −0.30 and indirect effect on teachers' achievement-oriented behaviour equals to γ value of −0.054 ($p < 0.01$). In addition, teachers' low expectation is a negative indicator on achievement-oriented teaching behaviour, respectively, in the same way and same strength with the first model (β = −0.21, $p = 0.009$) while it affects the mathematics score in a positive way with β value of 0.33 ($p < 0.01$).

## 4. Conclusion and discussion

Results showed that classroom achievement homogeneity and within school achievement homogeneity were directly the most important predictors on students' PISA mathematics achievement. Furthermore, they have a significant influence on teachers' achievement expectation from students and achievement-oriented behaviours as well. Classroom heterogeneity has direct and positive affect over teacher's low expectation from students and direct and negative affect over students' PISA Mathematics scores. In addition to this, low-achievement expectation of teacher influences directly and negatively teacher's achievement-oriented behaviour indirectly and slightly students' mathematics achievement in a negative way. Also, the achievement-oriented teacher approach has a direct effect on students' PISA Mathematics scores. Finally, within school homogeneity was another direct and indirect indicator on PISA mathematics achievement in a similar way with classroom homogeneity.

As seen in the literature review, instructional climate variables are potential factors effecting students' academic achievement. Particularly, classroom and within school homogeneity are emphasised by researchers. There has been a controversial literature that supports both homogeneity and heterogeneity. Slavin (1987, p. 109) said that 'For as long as instruction has been delivered, students, teachers, administrators and researchers have debated the question of how classes should be organised'. Shileds (1995) states that the debate on ability grouping to meet academic, social and emotional needs of students have been going on since 1867 when the first known program implemented. Slavin (1987) and Levin (1991) support heterogeneous classes claiming that grouping students according to their abilities is non-democratic. On the contrary, some researchers support homogenous grouping because of its positive effect on academic achievement of high ability students (Gamoran & Berends, 1987; Kerckhoff, 1986). In addition, Lou, Spence, Poulsen, Chambers and Apollonia (1996) revealed that the homogeneous ability groups achieve more than the heterogeneous group.

There are several research studies related to ability-grouping of students. Opdenakker and Van Damme (2001) found no effect for the heterogeneity on mathematics achievement of Belgian secondary students. In contrast, Duru-Bellat and Mingat (1998) reported that French secondary students achieve slightly, but significantly higher in French and mathematics when attending heterogeneous classes. Cheung and Rudowicz (2003) stated that in Hong Kong, students are grouped based on their ability and homogeneity results in higher achievement in mathematics and science. Similarly, Adodo and Agbayewa (2011) found that homogenous ability level grouping is superior for promoting students learning outcome. Luyten and van der Hoeven-van Doornum (1995), however, conclude that it is not clear whether the effect of heterogeneity on achievement is positive or negative. In addition to this, Pierce, Cass and Adams (2011) found that homogenous grouping in mathematics resulted in higher academic achievement.

Teachers usually make comments on ability grouping of students while discussing school outputs and added that teachers who have classes more heterogeneous than homogeneous in ability levels are disadvantageous in learning (Wright et al., 1997, p. 57–58). In other words, ability grouping results in teacher expectation and indirectly student achievement. A large number of student features, gender, ethnicity, socio-economic statue, age, skills and ability grouping possibly affect teacher expectation (Baron, Tom & Cooper, 1985; Obiakor, 1999; Solomon, Battistich & Hom, 1996). Adodo and Agbayeva (2011) recommend that ability grouping allows teacher to better tailor the pace and content of instruction to students' ability level and needs (p. 54). Rosenthal and Jacobson (1968) found that teacher expectation has impact on interaction with students and consequently their academic achievement. Rosenthal (1974) stated that teachers usually have warmer socioemotional climate with high-ability students. For Rubie-Davis (2010), students who are taught by teachers with high expectations gain more in learning compared to those of teachers with low expectations. Even Chaikin, Sigler and Derlega (1974) make a study revealing that they smiled more compared to nonverbal communication of slow learners. In addition, teachers bring new and complicated materials to classroom if they have higher expectations (Cornbleth, Dais & Button, 1974). In other words, expectation affects students' motivation and self-efficacy negatively or positively.

It is clear that teachers are the biggest resource in schools. Academic outcomes of educational systems are greatly affected by teachers. Teacher effectiveness is the problematic issue. It is measured by several indicators such as ability to motivate students, the academic achievement of students and goal orientation (Butler, 2007; Long & Hoy, 2006). One of the primary goals of a teacher is to improve the academic performance of his or her pupils. However, it is affected by several factors. As Rosenthal and Jacobson (1968) said, the expectation of teachers is one of the most powerful factors which influence students' achievement. They added that students for whom teachers hold high expectations showed remarkable academic growth.

Briefly, this study finds that homogenous grouping increase mathematics performance of students, relative to heterogeneous grouping. Placing students into homogenous classes results in placing materials, level and method of instruction to the needs of students. Teachers of homogenous groups set higher academic standards for students with strong achievement expectation. The result of this study well documented that homogeneity and teacher expectation are powerful factors affecting the student learning. It may be best to end the discussion with the words of Feldhusen and Moon (1992) stating that 'Justice is not achieved by equality of treatment, but by equality of opportunity' (p. 65).

### *4.1. Recommendations*

The existing research results show that homogenous grouping benefits the students in terms of academic achievement as well as the high and strong teacher expectation. Although ability grouping is subjected to many obstacles like political and legal regulations, it is possible to propose homogenous grouping depending on the findings.

In addition to this proposal, this research study can be repeated with the data of other countries attending PISA in order to get more information comparable. For educators and politicians, it may be recommended that assessment for learning should be done regularly at national and international levels in order to raise the level of student learning and achievement. It is crucial to strengthen the capacity of teachers to support the learning environment. In addition, principals should support teachers for high morale and achievement orientation.

## References

Adodo, S. O. & Agbayewa, J. O. (2011). Effect of homogenous and heterogeneous ability grouping class teaching on students' interest, attitude and achievement in integrated science. *International Journal of Psychology and Counseling, 3*(3), 48–54.

Albright J. J. & Park, H. M. (2009). *Confirmatory factor analysis using Amos, LISREL, Mplus, SAS/STAT CALIS.* Indian University, Information Technology Service Publishing.

Baron, R. M., Tom, D. Y. H. & Cooper, H. M. (1985). Social class, race and teacher expectations. In J. B. Dusek (Ed.), *Teacher expectancies* (pp. 251–269). Hillsdale, NJ: Erlbaum.

Biggs, J. (1985). The role of meta-learning in study processes. *British Journal of Educational Psychology, 55*, 185–212.

Butler, R. (2007). Teachers' achievement goal orientations and associations with teachers' help seeking: examination of a novel approach to teacher motivation. *Journal of Educational Psychology, 99*(2), 241–252.

Carroll, J. (1982). A model of school learning. In L. Anderson (Ed.), *Perspectives of school learning (*pp. 19–49).

Cates, G. & Rhymer, K. (2003). Examining the relationship between mathematics anxiety and mathematics performance: an instructional hierarchy perspective. *Journal of Behavioral Education, 12*(1), 23–34.

Chaikin, A., Sigler, E. & Derlega, V. (1974). Nonverbal mediators of teacher expectancy effect. *Journal of Personality and Social Psy-chology, 30*(1), 144–149.

Cheung, C. & Rudowicz, E. (2003). Academic outcomes of ability grouping among Junior High School Students in Hong Kong. *Journal of Educational Research, 96*(4), 241.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D. & York, R. L. (1966). *Equality of educational opportunity.* Washington, DC: U.S. Government Printing Office.

Coleman, J. S., Hoffer, T. & Kilgore, S. (1982). *High school achievement.* New York, NY: Basic Books.

Cooper, H. & Good, T. (1983). *Pygmalion grows up: Studies in the expectation communication process*. New York, NY: Longman.

Cornbleth, C., Davis, O. & Button, C. (1974). Expectations for pupil achievement and teacher-pupil interaction. *Social Education, 38*, 54–58.

Davidson, H. (2009). *Ability grouping*. Retrieved from http://www.education.com/reference/article/ability-grouping

Duru-Bellat, M. & Mingat, A. (1998). Importance of ability grouping in French Colleges and its impact upon pupils academic achievement. *Educational Research and Evaluation, 4*(4), 348–368.

Feldhusen, J. F. & Moon, S. M. (1992). Grouping gifted students: issues and concerns. *Gifted Child Quarterly, 36*, 63–67.

Ferguson, R. F. (1991). Paying for public education: new evidence on how and why money matters. *Harvard Journal on Legislation, 28*(2), 465–498.

Findley, W. G. & Bryan, M. M. (1971). *Ability grouping: 1970*. Athens, GA: Center for Educational Improvement, College of Education, University of Georgia.

Gallagher, C. A., Monroe, H. M. & Fish, J. L. (2000). *An iterative approach to classification analysis*. Retrieved from: https://www.casact.org/pubs/dpp/dpp90/90dpp237.pdf

Gamoran, A. & Berends, M. (1987). The effects of stratification in secondary schools: synthesis of survey and ethnographic research. *Review of Educational Research, 57*, 415–436.

Gillaspy J. A. (1996). *A premier on confirmatory factor analysis*. Austin, ED: 395 040.

Good, T. L. & Brophy, J. E. (1984). Teacher expectations. In *Looking in classrooms* (pp. 93–121.). New York, NY: Harper & Row.

Good, T. L., Mulryan, C. & McCaslin, M. (1992). Grouping for instruction in mathematics: a call for programmatic research on small-group processes. In D. A. Grouws (Ed.), *Handbook of mathematics teaching and learning* (pp. 165–193).

Haahr, J. H., Nielsen, T. K., Hansen, M. & Jakobsen, S. T. (2005). *Explaining student performance. Evidence from the international PISA, TIMSS and PIRLS surveys.* Danish Technological Institute.

Hallinan, M. T. (1994). Tracking: from theory to practice. *Sociology of Education, 67*(2), 79–84.

Hattie, J. A. C. (2002). Classroom composition and peer effects. *International Journal of Educational Research, 37*, 449–481.

Hoyle, R. H. (1995). *The structural equation modelling approach: basic concepts and fundamental issues in structural equation modelling: concepts, issues and applications*. Sage Publications.

Kass, G. V. (1980). An exploratory technique for investigating large quantities of categorical data. *Applied Statistics, 29*(2), 119–127.

Kerckhoff, A. C. (1986). Effects of ability grouping in British secondary schools. *American Sociological Review, 51*, 842–858.

Kleine, R. B. (2005). *Principles and practise of structural equation modeling*. New York, NY: The Guilford Press.

Levin, H. (1991). *Accelerated schools.* Stanford, CA: Accelerated Schools Project.

Linnenbrink, E. A. & Pintrich, P. R. (2002). Achievement goal theory and affect: an asymmetric bidirectional model. *Journal of Educational Psychology, 37*(2), 69–78.

Long, J. F. & Hoy, A. W. (2006). Interested instructors: a composite portrait of individual differences and effectiveness. *Teaching and Teacher Education, 22*(3), 303–314.

Lou, Y., Spence, J., Poulsen, C., Chambers, B. & Apollonia, S. (1996). Within class grouping. A meta-analysis. *Review Education Research, 66*(4), 423–458.

Luyten, H. & van der Hoeven-van Doornum, A. (1995). Classroom composition and individual achievement. Effects of classroom composition and teacher goals in Dutch elementary education. *Tijdschrift voor Onderwijsresearch, 20*(1), 42–62.

Ma, X. (1999). A Meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education, 30*(5), 520–540.

MacCallum, R. C. & Austin, J. T. (2000). Applications of structural equation modelling in psychological research. *Annual Review of Psychology, 51*, 201–226.

McCarter, A. (2014). *Ability grouping in elementary education* (Doctoral dissertation). Retrieved from www.dc.etsu.edu/etd/2459

Mosteller, F. (1995). The Tennessee study of class size in the early school grades. *The Future of Children, 5*(2), 113–127.

Obiakor, F. E. (1999). Teacher expectations of minority exceptional learners: impact on accuracy of self-concepts. *Exceptional Children, 66*, 39–53.

Opdenakker, M. C. & Van Damme, J. (2001). Relationship between school composition and characteristics of school process and their effect on Mathematics achievement. *British Educational Research Journal, 27*(4), 407–432.

Peterson, P. L. & Wilkinson, L. C. (1984). Instructional groups in classroom: organization and processes. In Peterson, Wilkinson & Hallinan (Eds.), *The social context of instruction: group organization and group processes.* Academic Press Inc.

Pierce, R., Cassady, J. & Adams, C. (2011). The effects of clustering and curriculum on the development of gifted learners' math achievement. *Journal for the Education of the Gifted, 34*(4), 569–594.

Reuman, D. (1989). How social comparison mediates the relation between ability- grouping practices and students' achievement expectancies in mathematics. *Journal of Educational Psychology, 81*(2), 178–189.

Rosenthal, R. (1974). *On the social psychology of the self-fulfilling prophecy: further evidence for Pygmalion effects and their mediating mechanisms*. New York, NY: MSS Modular Publications.

Rosenthal, R. & Jacobson, L. (1968). *Pygmalion in the classroom: teacher expectation and pupils' intellectual development.* New York, NY: Holt, Rinehart and Winston.

Rubie-Davies, C. M. (2010). Teacher expectations and perceptions of student attributes: is there a relationship? *British Journal of Educational Psychology, 80*(1), 121–135.

Schumacker R. E. & Lomax, R. G. (2004). *A beginner's guide to structural equationmodeling*. Lawrance Erlbaum Associates.

Shileds, C. M. (1995). A comparison study of student attitudes and perceptions in homogeneous and heterogeneous classroom. *Roeper Review, 17*(4), 234–238.

Slavin, R. E. (1987a). Ability grouping and student achievement in elementary schools: a best-evidence synthesis. *Review of Educational Research, 57*(3), 293–336.

Slavin, R. E. (1987b). Grouping for instruction in the elementary School. *Educational Psychologist*, *22*(2), 109.

Slavin, R. E. (1990). Achievement effects of ability grouping in secondary schools: a best-evidence synthesis. *Review of Educational Research, 60*(3), 471–499.

Solomon, D., Battistich, V. & Hom, A. (1996, April). *Teacher beliefs and practices in schools serving communities that differ in socioeconomic level*. Proceedings of the American Educational Research Association Annual Meeting, New York, NY.

Sumer N. (2000). Yapisal esitlik modelleri: temel kavramlar ve ornek uygulamalar [Structural equation modelling: basic concepts and sample applications]. *Turk Psikoloji Yazilari, 3*(6), 74–79.

The Organization for Economic Cooperation and Development. (2005). *School factors related to quality and equity results from PISA 2000*. Paris, France: OECD Publishing.

The Organization for Economic Cooperation and Development. (2013b). *What Makes schools successful? Resources, policies and practices—Volume IV*. Paris, France: OECD Publishing.

Ullman, J. B. (2001). Structural equation modeling. In B. G. Tabachnick & L. S. Fidell (Eds.), *Using multivariate statistics*. Needhem Heights, MA: Ally & Bacon.

Walberg, H. (1981). A psychological theory of educational productivity. In F. Farley & N. Gordon (Eds.), *Psychology and education.* Chicago, IL: National Society for the Study of Education.

Weinstein, R. S. (2002). *Reaching higher: the power of expectations in schooling*. Cambridge, MA: Harvard University Press.

Wright, S. P., Horn, S. P. & Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11*, 57–67.