



Teacher Mindset and Grit: How do They Change by Teacher Training, Gender, and Subject Taught?

Sibel KAYA

University of Bedfordshire, Luton, UK

ORCID: 0000-0001-8417-3627

Dogan YUKSEL*

Department of Foreign Language Education, Kocaeli University, Kocaeli, Turkey

ORCID: 0000-0001-9131-3907

Article history

Received:

27.02.2022

Received in revised form:

19.08.2022

Accepted:

16.09.2022

Keywords:

Teacher mindset; grit; gender; pre-service teachers; psychological measures

This study explored the interplay between teacher mindsets and grit levels of Turkish pre-service teachers taking their year of study into account (i.e., first-year vs the fourth year), gender, and the subject taught in a Turkish higher education setting. Student teachers from various programmes at a public university in Turkey participated in the study (N = 321). The participants completed the Teacher Mindset Scale and Grit Scale online after receiving the approval of the university's ethics committee and signing the consent forms. The correlations between the components of teacher mindset and grit demonstrated that as growth teacher mindset scores increased, and effort scores also increased significantly. Furthermore, as fixed teacher mindset scores increased, interest scores decreased. First-year pre-service teachers had significantly higher fixed teacher mindset scores than the fourth year. In terms of grit, fourth-year pre-service teachers showed greater effort than the first year. There was no difference between female and male pre-service teachers regarding fixed teacher mindset. However, female pre-service teachers scored significantly higher on growth teacher mindset, interest, and effort scales. As for the subject taught, the Mathematics Education programme showed higher levels of fixed teacher mindset and the English Language Teaching programme showed lower levels of grit. Practical implications of our findings and limitations of the study are shared accordingly.

Introduction

Mindset is one of the important dispositions that determine teachers' success and persistence in their profession. Mindset research started with the theories of intelligence (Dweck, 1999) but expanded in different fields by including some domain-specific mindsets such as language learning mindsets (Lou & Noels, 2017; Yuksel et al., 2021), mathematical mindsets (Daly, Bourgaize, & Vernitski, 2019), entrepreneurial mindsets (Mathisen & Arnulf,

* Correspondency: doganyuksel@gmail.com

2014), among others. In the field of teaching, the focus is on teachers' mindsets about their teaching ability. Similar to the original fixed and growth dichotomy (Dweck, Chiu, & Hong, 1995), some teachers hold a fixed teacher mindset and believe that their teaching abilities are stable. In contrast, others might hold a growth teacher mindset and view their abilities as subject to improvement through hard work and/or instruction and intervention (Fives & Buehl, 2008; Frondoza, King, Nalipay, & Mordeno, 2020; Nalipay, Mordeno, Semilla, & Frondoza, 2019).

Another integral disposition for teachers to be successful and persistent in their profession is grit (Keesey, Schaefer, Loy, & Allen, 2018). Grit is operationalised as the steadiness of interests and persistence in pursuing long-standing objectives (Duckworth, Peterson, Matthews, & Kelly, 2007). Duckworth (2016) states that holding a growth mindset is an important aspect of grit. Therefore, in recent years the concept of a growth mindset has been incorporated into grit (Keesey et al., 2018). A growth mindset and grit are critical for pre-service teachers since they provide the self-confidence to cope with difficult situations in teaching practice. Teacher education programmes are expected to equip pre-service teachers with the qualifications that help them persevere. The current study explores whether the dispositions of growth mindset and grit change from the beginning to the end of the study of teacher education at a university in Turkey.

Most of the previous research examined the interplay among mindsets, attainment, and some individual characteristics, including goal orientation, self-efficacy, and self-regulation. However, not many studies have focused on the link between teachers' mindset and grit (but see Keesey et al., 2018) and the potential effects of in-service training on this relationship. Motivated by these gaps in the literature, this study examined the interplay between teacher mindset and teachers' grit by considering the gender, year of study, and subject taught in a Turkish higher education setting.

Psychological measures

One of the commonly studied psychological measures in recent years has been mindset. It emerged from the work on *implicit theories* regarding individual characteristics like intelligence and personality that are subject to change (Dweck, 1999, 2006). Dweck (1999, 2006) suggests that these implicit theories can drastically change how individuals handle a learning situation, the degree of effort and persistence they display and eventually their level of achievement. Another psychological measure that caught the attention of researchers and policymakers is grit. International student assessment programmes (e.g., PISA) have incorporated grit in the questionnaires (OECD, 2019). Policymakers have encouraged the promotion of grit and other psychological factors in schools (Zhou, 2016). Grit is related to performance and retention in school and the workplace (Duckworth et al., 2007; Duckworth & Quinn, 2009). Duckworth (2016) argued that grit is also changeable and malleable and therefore has great potential to facilitate youth development.

Previous research investigated the relationship between various personality and psychological traits of students and their academic attainment. Meta-analyses on this topic report weak predictive power of mindsets on academic success (Costa & Faria, 2018; Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018), usually discussing some contextual and domain-specific differences as mediating factors (Costa & Faria, 2018). Here, we aim to test if teacher education programmes could be a significant contextual factor as the candidate teachers are exposed to theoretical knowledge about various educational and pedagogical practices as well as opportunities for teaching practice in their four-year studies (Grossman, Hammerness, &

McDonald, 2009; Seferoğlu, 2006). Similarly, the relationship between grit and success appears to be modest, according to Credé, Tynan, and Harms' (2017) meta-analysis. Rather than focusing on the relationship between these two personality features and academic success, in this study, we examined the interplay among domain-specific teacher mindset, grit, and pre-service teachers' year of study, gender, and subject taught in a teacher education programme.

Teacher mindset

Recent research on mindsets argues that some domain-specific inventories can provide new insights into examining this construct (Costa & Faria, 2018; Lou & Noels, 2017). The concept of teacher mindset (TM) is used in some studies (e.g., Fives & Buehl, 2008; Frondoza et al., 2020; Nalipay et al., 2019), and it is based on the original dichotomy of mindsets regarding having a fixed or growth perspective about the abilities of teaching (Dweck, 1999). Teacher mindset involves what teachers think about developing their teaching skills and capabilities. A growth teacher mindset views teaching as an ability that is open to development and improvement, whereas a fixed teacher mindset regards it as stable (Nalipay et al., 2019).

Even though mindset was generally attributed to a person's theory of intelligence, research suggests that it can be generalised to other aspects of behaviour, too (Sternberg, 2000). The value of mindset in education lies in how educationalists perceive teaching and how it impacts students' motivation and learning (Blackwell, Trzesniewski, & Dweck, 2007). Previous studies demonstrated that teachers' attitudes towards mindset influence their teaching practices and prospects provided for learning, which, in turn, impact students' self-efficacy and performance (Gutshall, 2013; Trouilloud, Sarrazin, Bressoux, & Bois, 2006). Previous research on teacher mindset also explored the relationship between growth teacher mindset and work engagement and found a significant correlation (Frondoza et al., 2020).

Recent research conducted with teachers showed that teachers are a relatively growth-minded occupational group (Asbury, Klassen, Bowyer-Crane, Kyriacou, & Nash, 2016; DeLuca, Coombs, A., & LaPointe-McEwan, 2019). Teachers with a growth mindset tend to have higher teacher self-efficacy beliefs and are more likely to create positive classroom environments where students can overcome difficulties (Leroy, Bressoux, Sarrazin, & Trouilloud, 2007). Moreover, the teacher's mindset influences students' sense of efficacy and success. Asbury et al. (2016) suggest that if a teacher's mindset about intelligence can influence a student's sense of efficacy and success, this elicits concerns about the effects of teachers' mindset regarding teaching and learning. Investigating these beliefs might have some implications for training and preparing teachers. Most of the previous research investigating pre-service and in-service teachers' mindsets used the general mindset scale, which shows people's dispositions towards intelligence. As mindset can be applied to different domains, the current study used the teacher mindset, which is more akin to pre-service teachers' experiences. In this way, we aim to provide a more robust impact of mindset on pre-service teachers' perceptions, which is also highlighted by previous studies (Soleas & Hong, 2020).

Gero (2013) developed a Teacher Mindset Scale based on Dweck's self-theories with 312 primary school teachers from California, USA. Teachers scored higher on growth teacher mindset compared to fixed teacher mindset. Teacher mindset significantly predicted teacher efficacy and professional learning. The author suggests that the teacher mindset is an important new variable in explaining professional learning, teacher quality and student learning; thus, it needs further investigation in other contexts.

In this study, we specifically examined if teacher mindset would differ after pre-service training and examined the teacher mindset of pre-service teachers in a teacher training programme who were either in their first year of study or the last to explore the potential impact of the pre-service teacher training. This appears to be an important gap in the previous literature (Costa & Faria, 2018; Sisk et al., 2018; Soleas & Hong, 2020). Soleas and Hong (2020) cross-sectionally examined the changes in pre-service teachers' mindsets and motivation beliefs during teaching practicum. The current study extends the research to teacher training in which pre-service teachers gain theoretical and practical experience. We also examined if there exists a potential difference in terms of gender and the subject taught.

Grit

Grit has been introduced as a personality trait that predicts achievement by a group of researchers led by Duckworth (e.g., Duckworth et al., 2007; Duckworth & Quinn, 2009). It has two aspects, namely consistency of interests and perseverance of effort. Consistency of interests refers to the tendency to espouse the same array of goals and interests, and perseverance of effort implies the predisposition to perform disregarding the situation and obstacles. Both aspects are assumed to contribute to success (Duckworth & Quinn, 2009). In their meta-analysis, Credé et al. (2017) reported that grit was moderately correlated with success but it was strongly correlated with conscientiousness. Duckworth et al. (2007) argue that grit can be a good indicator of success in situations where some individuals achieve better than their ability test scores might predict.

A line of studies investigated the relationship between grit and some background variables of the participants, including age (e.g., Engel, 2013; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014), ethnicity (e.g., Eskreis-Winkler et al., 2014) and gender (e.g., Allen, 2014; Davidson, 2014). Allen (2014) and Davidson (2014) both reported a very weak relationship between gender and grit. Among few studies that investigated grit in teachers, Zeng, Chen, Cheung, & Peng (2019) examined the interplay among grit (perseverance of effort), growth mindset, well-being and work engagement with secondary school teachers in China. The findings indicated that students with a growth mindset have a higher degree of perseverance of effort, and well-being, which in turn positively influenced teachers' work engagement. Robertson-Kraft and Duckworth (2014) conducted two longitudinal studies with primary, secondary and high school novice teachers in low-income schools. They explored the effectiveness of grit on retention and teacher effectiveness. Findings showed that grittier teachers stayed in classrooms longer and were more efficient in terms of their students' progress.

Similarly, another line of research has found significant correlations between grit and a sense of teaching efficacy for both pre-service (Riddle, 2018) and in-service teachers (Lee, 2020), as well as university professors (Fabelico & Afalla, 2020). Robertson-Kraft and Duckworth (2014) claim that gritty teachers can maintain confidence in their teaching abilities through support-seeking and adaptive coping skills. Researchers imply that school administrators can take grit as an aspect of distinguishing talented new teachers.

In this study, we examined how teacher mindset was associated with grit in teacher education programmes of a university in Turkey. We also investigated how grit changed between first- and fourth-year students as well as males and females. A review of the previous literature (e.g., Soleas & Hong, 2020) and the examination of the studies reported in meta-analyses (Costa, & Faria, 2018; Sisk et al., 2018) underscore the scarcity of research conducted with pre-service

teachers. Among the few studies conducted with pre-service teachers, Meierdirk and Fleischer (2022) examined student teachers' mindset and resilience in relation to their achievement, gender, and subject taught. There were no differences in mindset and resilience in terms of gender and subject taught. The current research aims to further contribute to the growing literature on personality and psychological research in pre-service teacher education. Soles and Hong (2020) state that pre-service teachers may learn about theories concerned with student learning, such as mindset and grit; however, they may not have the chance to try these theories on themselves. These theories impact teaching as well as learning. Teachers' behaviours often align with their beliefs of mindset and motivation, and students tend to model these behaviours through observation. Early investigation of pre-service teachers' mindset and grit beliefs will provide insight into their future teaching behaviour. Previous personality studies with pre-service teachers used the general mindset. We believe that the teacher mindset is more relevant for our sample, who soon will become teachers. Motivated by the scarcity of previous research in the field, the following research questions guided this study:

Research questions

- (1) Is there a relationship between teacher mindset and grit of pre-service teachers?
- (2) Are there any differences in teacher mindset and grit of pre-service teachers in terms of their year of study, gender, and the subject taught?

Method

Sample

Participants of the study were 321 pre-service teachers enrolled in a large university in western Turkey. Two hundred sixty-four participants were female, and the rest ($n = 57$) were male. All participants studied in various teacher education programmes namely, Early Childhood Education, English Language Teaching, Mathematics Education, Primary Education, Science Education, and Turkish Education. Since the study mainly focused on the change in teacher mindset and grit throughout teacher education, first-year ($n = 181$) and final-year ($n = 140$) students at the Faculty of Education were included. Teacher candidates in Turkey typically take pedagogical and field courses scattered throughout a 4-year programme. In the specific context where the data were collected, all programmes followed the curriculum offered by the Turkish Higher Education Council. In their final year, they complete a practicum alongside other courses. The current study participants had already completed their first-semester practicum. After receiving the university ethical committee's approval to conduct this research, students were reached via their advisors at the faculty and completed the instruments online. The first part of the form included the ethical matters and the consent request. The second section collected demographic information. The third and fourth sections included the *Teacher Mindset Scale* and *Grit Scale*, respectively.

Instruments

Teacher Mindset Scale

The Teacher Mindset Scale was developed by Gero (2013) based on Dweck's self-theories, which were designed to uncover teachers' beliefs about the nature of teaching ability (See Appendix A). The 7-item scale included fixed and growth teacher mindsets. The fixed teacher mindset includes four items and measures the endorsement towards the belief that



teaching ability is largely innate and static over time (e.g., The kind of teacher someone is, something very basic about them and cannot be changed very much). The growth teacher mindset includes three items and measures how much individuals believe that teaching ability can be developed and improved over time (e.g., No matter how much natural ability you may have, you can always find important ways to improve). Teacher mindset statements were positively coded and rated from strongly disagree (1) to strongly agree (6).

The Teacher Mindset Scale was translated to Turkish by three native Turkish speakers, two of whom have a PhD in English as a Foreign Language. Then, the Turkish version of the scale was back-translated into English and checked by one of the researchers for any inconsistency. Moreover, a pilot study was conducted with 20 students from various academic programmes of the same faculty. After minor changes, the instruments were sent to students online via their advisors at the faculty, and the data collection was completed within two weeks. To ensure the content validity of the Teacher Mindset Scale, Exploratory Factor Analysis (EFA) in SPSS and Confirmatory Factor Analysis (CFA) in LISREL were conducted. For EFA, principal component analysis with varimax rotation was utilised as in the original scale. A 2-factor structure explained 54.77% of the variance. Table 1 displays the component matrix.

Table 1. Component matrix of Teacher Mindset Scale

Items	Component 1 (Fixed TM)	Component 2 (Growth TM)
Item 1	0.740	
Item 2	0.686	
Item 3	0.657	
Item 4	0.646	
Item 5		0.751
Item 6		0.806
Item 7		0.827

Kaiser Meyer-Olkin (KMO) measure of sampling adequacy of 0.70 and a significant result on Bartlett's test of sphericity $\chi^2 = 372.44$ ($p < 0.001$, $df = 21$) indicated that the data was suitable for factor analysis. Results of CFA indicated that 7 items yielded two factors as in the original scale and this 2-factor model was well fit ($\chi^2/df = 2.32$, $p = 0.005$, $RMSEA = 0.063$, $NFI = 0.93$, $CFI = 0.96$, $GFI = 0.97$, $AGFI = 0.94$, $SRMR = 0.048$). An adequate model fit is indicated if $RMSEA < 0.06$, $CFI > 0.95$, and $SRMR < 0.10$ (Matsunaga, 2010). Therefore, the 2-factor structure of the teacher mindset can be considered somewhere between 'acceptable' to 'adequate'. Factor loadings ranged from 0.41 to 0.75. Cronbach alpha reliability values were within the acceptable range for both fixed ($\alpha = 0.65$) and growth ($\alpha = 0.71$) teacher mindset.

Grit Scale

The 8-item grit scale developed by Duckworth and Quinn (2009) included two factors, consistency of interest (interest) and perseverance of effort (effort) (see Appendix B). The interest factor includes four items and measures an individual's ability to maintain interest over time. All four items of interest factor are reverse coded and had items including 'I often set a goal but later choose to pursue a different one'. The effort factor also includes four items that are positively coded, such as 'I finish whatever I begin' (Duckworth & Quinn, 2009). Grit statements were rated from never (1) to always (5). Saricam, Celik, and Oguz (2016) adapted the Short Grit Scale to Turkish and reported Cronbach alpha reliability measures as 0.80 for interest and 0.71 for effort factors. Within the current study, both interest ($\alpha = 0.65$) and effort ($\alpha = 0.75$) had acceptable internal consistency.

Data Analysis

The assumption of normality for parametric analyses was assessed through skewness and kurtosis values. For psychometric purposes, skewness and kurtosis values between -2 to +2 are acceptable (George & Mallery, 2010). For teacher mindset components of the *fixed* and *growth* and grit components of *interest* and *effort* yielded skewness and kurtosis values between -2 to +2, indicating that the data is fairly normal and the basic assumption of parametric testing is fulfilled. A bivariate correlation analysis was conducted to test the association between teacher mindset (fixed, growth) and grit (interest, effort). Independent samples t-tests were carried out to identify any group differences in teacher mindset and grit regarding gender and year. To examine the differences between subjects taught, a combination of Kruskal-Wallis and Mann-Whitney tests was used. These non-parametric tests were utilised since there were less than 30 participants in some groups.

Results

Research question 1

Table 2 shows descriptive statistics for each component of the teacher mindset and grit scales. The maximum score for teacher mindset was six, and for grit, it was five. As in Gero's (2013) original study, teacher candidates in the current study, too, were more oriented towards a growth teacher mindset rather than a fixed teacher mindset in terms of teaching skills.

Table 2. Descriptive statistics of Teacher Mindset and Grit Scale

Score	N	Min	Max	Mean	sd
Fixed TM	321	1.00	5.50	3.04	0.89
Growth TM	321	2.33	6.00	5.49	0.59
Interest	321	1.50	5.00	3.37	0.75
Effort	321	1.50	5.00	3.84	0.70

Table 3 shows correlations between teacher mindset and grit scale. There was a small but significant negative correlation between fixed teacher mindset and consistency of interest which means as pre-service teachers endorsed fixed teacher mindset, their interest scores decreased significantly ($r = -0.22$; $p < 0.01$). Growth teacher mindset was positively correlated with the perseverance of effort ($r = 0.19$; $p < 0.01$). In other words, as pre-service teachers' growth teacher mindset scores increased, their effort scores also increased. Within mindset and grit, correlations were also examined. As the fixed teacher mindset score increased, the growth score decreased ($r = -0.22$; $p < 0.01$). Finally, as interest scores increased, effort scores also increased significantly ($r = 0.50$; $p < 0.01$).

Table 3. Correlations between teacher mindset and grit

Score	Fixed TM	Growth TM	Interest	Effort
Fixed TM	1			
Growth TM	-0.22**	1		
Interest	-0.20**	0.08	1	
Effort	-0.07	0.19**	0.50**	1

** $p < 0.01$

Research question 2

Independent samples t-test results in teacher mindset and grit scores based on year were presented in Table 4. First-year pre-service teachers had significantly higher fixed teacher mindset scores than the fourth year ($t = 3.55$; $p < 0.01$). In other words, first-year pre-service



teachers were more likely to endorse a fixed teacher mindset regarding teaching. Regarding grit, the fourth-year pre-service teachers showed greater effort than the first-year ($t = 1.97$; $p < 0.05$). In terms of growth teacher mindset scores and consistency of interest scores, there were no significant differences between the two groups, though senior students scored slightly higher than first-year students.

Table 4. Differences between the first and fourth-year pre-service teachers

Score	Group	N	Mean	sd	t
Fixed TM	1	181	3.19	0.88	3.55**
	4	140	2.83	0.85	
Growth TM	1	181	5.45	0.64	1.29
	4	140	5.54	0.53	
Interest	1	181	3.32	0.76	1.27
	4	140	3.43	0.74	
Effort	1	181	3.77	0.77	1.97*
	4	140	3.92	0.60	

* $p < 0.05$; ** $p < 0.01$

Table 5 shows independent samples t-test results based on gender. Accordingly, there was no difference between females and males regarding fixed teacher mindset scores. However, there was a significant difference in growth teacher mindset scores favouring females ($t = 3.02$; $p < 0.01$). Female pre-service teachers were more growth mindset oriented compared to males. Female pre-service teachers also scored significantly higher on the grit components of consistency of interest ($t = 4.43$; $p < 0.01$) and perseverance of effort ($t = 4.46$; $p < 0.01$).

Table 5. Differences between female and male pre-service teachers

Score	Group	N	Mean	sd	t
Fixed TM	Female	264	3.00	0.82	1.31
	Male	57	3.21	1.13	
Growth TM	Female	264	5.54	0.54	3.02**
	Male	57	5.23	0.73	
Interest	Female	264	3.45	0.75	4.43**
	Male	57	2.98	0.63	
Effort	Female	264	3.92	0.66	4.46**
	Male	57	3.47	0.80	

** $p < 0.01$

Table 6 shows the combined results of Kruskal-Wallis and Mann-Whitney tests of differences based on the subject taught. Accordingly, there were no differences between subjects taught in terms of growth teacher mindset scores. In terms of fixed teacher mindset, pre-service teachers in the Mathematics Education programme scored significantly higher than two other programmes (Primary Education and Turkish Education) ($\chi^2 = 16.33$; $p < 0.01$). For the grit components, pre-service teachers in the English Language Teaching programme showed significantly lower levels of consistency of interest ($\chi^2 = 14.52$; $p < 0.05$) and perseverance of effort ($\chi^2 = 22.22$; $p < 0.01$) compared to other programmes.

Table 6. Differences based on the subject taught

Score	Group	N	Mean	sd	χ^2 Sig. difference	
Fixed TM	1. Early Childhood Education	83	3.11	0.85	16.33**	
	2. English Language Teaching	85	3.20	0.89		
	3. Mathematics Education	37	3.29	0.95		3 > 4
	4. Primary Education	74	2.81	0.78		3 > 6
	5. Science Education	19	2.88	1.03		
	6. Turkish Education	23	2.68	0.84		
Growth TM	1. Early Childhood Education	83	5.49	0.61	-	
	2. English Language Teaching	85	5.41	0.64		
	3. Mathematics Education	37	5.40	0.53		
	4. Primary Education	74	5.54	0.62		
	5. Science Education	19	5.63	0.40		
	6. Turkish Education	23	5.65	0.47		
Interest	1. Early Childhood Education	83	3.52	0.76	14.52*	
	2. English Language Teaching	85	3.11	0.84		
	3. Mathematics Education	37	3.33	0.71		1 > 2
	4. Primary Education	74	3.50	0.65		4 > 2
	5. Science Education	19	3.46	0.70		
	6. Turkish Education	23	3.32	0.67		
Effort	1. Early Childhood Education	83	3.91	0.64	22.22**	
	2. English Language Teaching	85	3.52	0.86		
	3. Mathematics Education	37	3.88	0.51		1 > 2
	4. Primary Education	74	4.03	0.60		3 > 2
	5. Science Education	19	4.08	0.40		4 > 2
	6. Turkish Education	23	3.82	0.74		5 > 2

* $p < 0.05$, ** $p < 0.01$

Discussion

The current study focused on the relationship between teacher mindset and grit within the teacher education context. There was a significantly positive correlation between the growth teacher mindset score and effort score. As pre-service teachers endorsed, the belief that teaching skills can be improved over time tended to score higher on the perseverance of effort subscale. There was a significantly negative correlation between pre-service teachers' fixed teacher mindset scores and consistency of interest scores; in other words, as pre-service teachers supported the belief that teaching is a fixed and static skill, their consistency of interest, which is a subscale of grit, decreased. In comparing the first and fourth-year pre-service teachers, it was observed that first-year pre-service teachers showed significantly higher fixed teacher mindset scores and significantly lower effort scores compared to the fourth year. In terms of gender, female pre-service teachers scored significantly higher on growth teacher mindset and both subscales of grit than males. In terms of the subject taught, the Mathematics Education programme scored significantly higher on fixed teacher mindset compared to the two other programmes. For the components of grit, the English Language Teaching programme scored consistently lower compared to other programmes.

As Dweck (1999, 2006) stated, self-theories can affect the degree of effort and persistence one puts forward. In general, holding a growth mindset encourages an individual's resilience, perseverance, and motivation toward learning. For individuals who endorse a growth mindset, setbacks and failure indicate the need for greater effort (Blackwell et al., 2007; Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Donohoe, Topping, & Hannah, 2012; Suzuki, Tamesue, Asahi, & Ishikawa, 2015; Zeng, Hou, & Peng, 2016; Zhao et al., 2018). Confirming

this notion in an educational context, in a recent study with Chinese secondary school teachers, Zeng and colleagues (2019) found a significant correlation between a growth mindset and perseverance of effort. Similarly, the current study found a positive correlation between growth teacher mindset and effort. Zeng and colleagues (2019) reported that this relationship is crucial because it influences teachers' work engagement. Teachers with a higher growth mindset will likely show more effort to improve their teaching skills and will try harder for student motivation and learning. They hold every student to a high standard, have fewer behavioural problems in classrooms, and have stronger student outcomes (Ricci, 2013). On the other hand, teachers with a fixed mindset have higher levels of work avoidance (Burnette et al., 2013) and hesitate to put effort into various useful development opportunities (Zeng et al., 2019). These findings were confirmed by the current study, where pre-service teachers with higher levels of fixed teacher mindset showed lower levels of interest, indicating that they tend to give up instead of persisting through difficulties.

The current study did not find a significant difference between the growth teacher mindset levels of first and fourth-year students. This could be due to a ceiling effect since both groups reported very high levels of growth teacher mindset. This finding is encouraging since teacher candidates are expected to have high aspirations regarding their profession. The decreased level of fixed teacher mindset and increased level of effort for senior students compared to first-year students could be explained by the training they received in the teacher education programmes. Teacher candidates are exposed to a vast amount of knowledge about classrooms, schools, teachers, and instructional practices throughout their studies. They face the difficulties of teaching and explore coping mechanisms in these situations. As in most countries, teacher candidates in Turkey complete a practicum in their final year of the programme. During this experience, they have the opportunity to teach and interact with students and teachers. Several other researchers point out the role of practicum in teacher education programmes in terms of boosting the self-efficacy of teacher candidates (Fives, Hamman & Olivarez, 2007; Knoblauch & Woolfolk Hoy, 2008; Martins, Costa & Onofre, 2015; Palmer, 2006). Hands-on teaching and other discrete positive experiences provided within teacher education programmes could be helping pre-service teachers to build a growth teacher mindset and perseverance of effort. These discrete experiences may involve observing professors and cooperating teachers (Palmer, 2006), verbal encouragement (Bandura, 1997) and feedback from classmates and teachers (Mulholland & Wallace, 2001), and support from teacher education faculty (Rots, Aelterman, Vlerick, & Vermeulen, 2007).

The current study's findings did not confirm those of Soleas and Hong (2020). They investigated the changes in pre-service teachers' mindset and motivation beliefs at the end of the teaching practicum. They found decreasing levels of growth mindset beliefs and increasing levels of resilience. They attributed these results to the realities and difficulties of real classrooms, which may have overwhelmed pre-service teachers. However, the pre-service teachers in our study started the teacher education programme with high levels of growth teacher mindset and completed the programme with similar levels without any decrease. This might be due to the contribution of theoretical and practical knowledge they receive over four years. Alternatively, there might be cultural differences in terms of how real classroom situations affect pre-service teachers in different countries. Therefore, the mechanism of how classroom experiences influence pre-service teachers' psychological attributes needs further exploration.

In terms of gender, Credé and colleagues' (2017) meta-analytic review and later research with university students (e.g., Hodge, Wright & Bennett, 2018; Sigmundsson, Haga & Hermundsdottir, 2020) suggested similar levels of grit between males and females; however,

several other studies reported higher general grit (e.g., Christensen & Gerald, 2014; Eskreis-Winkler et al., 2014; Suzuki et al., 2015), as well as academic grit (Clark & Malecki, 2019) for females. The findings of the current study confirmed those of the later studies. The current study partly confirmed the findings of a recent study with Turkish in-service teachers in which female teachers hold significantly higher perseverance of effort and similar consistencies of interest than males (Argon & Kaya, 2018). Since pre-service teachers in Turkey consist of an overwhelming number of females, the current study has a disproportionate number of females than males. Therefore, the findings regarding gender differences should be interpreted cautiously. Females also showed higher levels of growth teacher mindset compared to males. In other words, females more frequently than males, tended to believe that teachers can always improve their practice regardless of their level of expertise.

When pre-service teachers' teacher mindset and grit were examined in relation to the subject taught some differences were found, contrary to the findings of Meierdirk and Fleischer (2022). Pre-service teachers in the Mathematics Education programme were slightly more inclined towards a fixed teacher mindset compared to their counterparts. A fixed mindset in mathematics could be due to the one-dimensional teaching of mathematics in which instruction is primarily focused on mastering procedures and formulas (Sun, 2019). By using prescribed strategies for solving problems, instructors send the message that there is only one way to succeed in mathematics. Struggling with the strategies presented to them students tend to adopt fixed mindset beliefs in mathematics (Sun, 2018). Pre-service mathematics teachers might have adopted fixed teacher mindset beliefs due to the one-dimensional mathematics instruction they received in the teacher education programme and their preceding school experience.

In terms of grit scales, the English Language Teaching programme showed consistently lower levels of interest and effort compared to other programmes. Low levels of grit might be due to the difficulties English Language Teaching programme students face in their classes as they need to both learn a new language and master how to teach it. This dual expectation might have hampered the interest and efforts of our participants in the English Language Teaching programme (Aydın, 2016).

Implications and Limitations

Keeseey and colleagues (2018) state that developing a growth mindset and grit in pre-service teachers is important for improving teacher retention as well as the confidence to handle the demanding workload of teaching. Researchers claim that explicit teaching of a growth mindset and grit benefits the university student population in general since they experience a great level of anxiety. Rockoff et al. (2008) have suggested that recruiting teachers with certain adaptive personality traits can improve the quality of teaching. It is recommended that a growth mindset (both in intelligence and teaching) and grit should be a common component of teacher education programmes. Growth teacher mindset and grit in these programmes not only support pre-service teachers' learning during college but also help them become more positive teachers working to meet the needs of all students.

Growth mindsets and grit can be propagated through intervention (e.g. DeBacker, Heddy, Kershen, Crowson, Looney, & Goldman, 2018; Paunesku, Walton, Romero, Smith, Yeager, & Dweck, 2015). These interventions deliver students the information that skills can grow when they work hard on challenging tasks and practice. Pre-service teachers need to know that having a growth mindset and grit, not only benefits themselves but their students in the future. Pre-service teachers with low self-esteem in teaching may especially benefit from interventions.



These candidates should be informed that struggle is not a sign of failure but an opportunity for growth (Paunesku et al., 2015). To assist pre-service teachers, their professors at the faculty and their mentors at the student placement also need to be informed about the effects of mindset and grit on teachers and students in general.

The current study was limited to only one higher education institution in the western part of Turkey. Therefore, the results of the study should be interpreted cautiously. The study can be replicated in other settings as well as with in-service teachers in various contexts. Given that teachers' grit is a strong predictor of retention and effectiveness, understanding the connection between grit and teacher mindset can help administrators support their teachers. As Gero (2013) suggested, the teacher mindset is a newly emerged personality trait, and its effects on teachers' professional development, classroom practices, and student learning need further research. The interplay between teacher mindset and other psychological traits, as well as investigating cultural differences in teacher mindset, are recommended for future research.

Data availability statement

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- Allen, B. R. (2014). *An analysis of student success predictors for technical college persistence* (Unpublished doctoral dissertation). Edgewood College, Madison, Wisconsin, USA.
- Argon, T., & Kaya, A. (2018). Examination of Grit Levels of Teachers According to Personal Variables. *Journal of Education and Training Studies*, 6(3a), 45-53.
- Asbury, K., Klassen, R., Bowyer-Crane, C., Kyriacou, C., & Nash, P. (2016). National differences in mindset among students who plan to be teachers. *International Journal of School & Educational Psychology*, 4(3), 158-164.
- Aydın, S. (2016). A qualitative research on foreign language teaching anxiety. *The Qualitative Report*, 21(4), 629.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Worth Publishers.
- Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: a longitudinal study and an intervention. *Child Development*, 78, 246-263.
- Burnette, J. L., O'Boyle, E., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mindsets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin*, 139, 665-701.
- Christensen, R., & Gerald, K. (2014). Comparative measures of grit, tenacity and perseverance. *International Journal of Learning, Teaching and Educational Research*, 8(1), 16-30.
- Clark, K. N., & Malecki, C. K. (2019). Academic Grit Scale: Psychometric properties and associations with achievement and life satisfaction. *Journal of School Psychology*, 72, 49-66.

- Costa, A., & Faria, L. (2018). Implicit theories of intelligence and academic achievement: A meta-analytic review. *Frontiers in Psychology, 9*, 829, 1-16. <https://doi.org/10.3389/fpsyg.2018.00829>
- Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology, 113*, 492-511.
- Daly, I., Bourgaize, J., & Vernitski, A. (2019). Mathematical mindsets increase student motivation: Evidence from the EEG. *Trends in Neuroscience and Education, 15*, 18-28.
- Davidson, B. A. (2014). *Examining the relationship between non-cognitive skills and leadership: The influence of hope and grit on transformational leadership behavior* (Unpublished doctoral dissertation). University of Kansas, Lawrence, Kansas, USA.
- DeBacker, T. K., Heddy, B. C., Kershner, J. L., Crowson, H. M., Looney, K., & Goldman, J. A. (2018). Effects of a one-shot growth mindset intervention on beliefs about intelligence and achievement goals. *Educational Psychology, 38*(6), 711-733.
- DeLuca, C., Coombs, A., & LaPointe-McEwan, D. (2019). Assessment mindset: Exploring the relationship between teacher mindset and approaches to classroom assessment. *Studies in Educational Evaluation, 61*, 159-169.
- Donohoe, C., Topping, K., & Hannah, E. (2012). The impact of an online intervention (Brainology) on the mindset and resiliency of secondary school pupils: A preliminary mixed methods study. *Educational Psychology, 32*(5), 641-655.
- Duckworth, A. L. (2016). *Grit: The power of passion and perseverance*. New York, NY: Scribner.
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*(6), 1087-1101.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment, 91*(2), 166-174.
- Dweck, C. S. (1999). *Self-Theories: Their role in motivation, personality and development*. New York, NY: Taylor and Francis/Psychology Press.
- Dweck, C. S. (2006). *Mindset*. New York, NY: Random House.
- Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry, 6*(4), 267-285.
- Engel, L. I. (2013). *What predicts first semester college performance? Cognitive ability, SAT, conscientiousness, and grit* (Unpublished doctoral dissertation). Hofstra University, Hempstead, New York, USA.
- Eskreis-Winkler, L., Shulman, E. P., Beal, S. A., & Duckworth, A. L. (2014). The grit effect: Predicting retention in the military, the workplace, school and marriage. *Frontiers in Psychology, 5*(36), 1-12.
- Fabelico, F., & Afalla, B. (2020). Perseverance and passion in the teaching profession: Teachers' grit, self-efficacy, burnout, and performance. *Journal of Critical Reviews, 7*(11), 108-119.
- Fives, H., & Buehl, M. M. (2008). What do teachers believe? Developing a framework for examining beliefs about teachers' knowledge and ability. *Contemporary Educational Psychology, 33*(2), 134-176.
- Fives, H., Hamman, D., & Olivarez, A. (2007). Does burnout begin with student-teaching? Analysing efficacy, burnout, and support during the student-teaching semester. *Teaching and Teacher Education, 23*, 916-934.
- Frondozo, C. E., King, R. B., Nalipay, M. J. N., & Mordeno, I. G. (2020). Mindsets matter for teachers, too: A growth mindset about teaching ability predicts teachers' enjoyment



- and engagement. *Current Psychology*. Advance online publication. <https://doi.org/10.1007/s12144-020-01008-4>
- George, D., & Mallery, M. (2010). *SPSS for Windows step by step: A simple guide and reference*. Oxford, UK: Pearson.
- Gero, G. P. (2013). *What drives teachers to improve? The role of teacher mindset in professional learning* (Unpublished doctoral dissertation). Claremont Graduate University, California, USA.
- Grossman, P., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imagining teacher education. *Teachers and Teaching: Theory and Practice*, 15(2), 273-289.
- Gutshall, C. A. (2013). Teachers' mindsets for students with and without disabilities. *Psychology in the Schools*, 50, 1073-1083.
- Hodge, B., Wright, B., & Bennett, P. (2018). The role of grit in determining engagement and academic outcomes for university students. *Research in Higher Education*, 59(4), 448-460.
- Keeseey, S., Schaefer, A., Loy, M., & Allen, C. J. (2018). Developing growth mindset and grit in pre-service teachers. *Kentucky Teacher Education Journal: The Journal of the Teacher Education Division of the Kentucky Council for Exceptional Children*, 5(1), Article 3.
- Knoblauch, D., & Woolfolk Hoy, A. (2008). "Maybe I can teach those kids." The influence of contextual factors on student teachers' efficacy beliefs. *Teaching and Teacher Education*, 24, 166-179.
- Lee, L. W. (2020). *The relationship between secondary teachers' grit and self-efficacy beliefs on classroom management and student engagement* (Unpublished doctoral dissertation). Liberty University, Lynchburg, Virginia, USA.
- Leroy, N., Bressoux, P., Sarrazin, P., & Trouilloud, D. (2007). Impact of teachers' implicit theories and perceived pressures on the establishment of an autonomy-supportive climate. *European Journal of Psychology of Education*, 22, 529-545.
- Lou, N. M., & Noels, K. A. (2017). Measuring language mindsets and modeling their relations with goal orientations and emotional and behavioural responses in failure situations. *The Modern Language Journal*, 101, 22-33.
- Martins, M., Costa, J., & Onofre, M. (2015). Practicum experiences as sources of pre-service teachers' self-efficacy. *European Journal of Teacher Education*, 38(2), 263-279.
- Mathisen, J., & Arnulf, J. K. (2014). Entrepreneurial mindsets: theoretical foundations and empirical properties of a mindset scale. *International Journal of Management and Business*, 5(1), 81-97.
- Matsunaga, M. (2010). How to factor-analyse your data right: Do's, don'ts, and how-to's. *International Journal of Psychological Research*, 3(1), 97-110.
- Meierdirk, C., & Fleischer, S. (2022). Exploring the mindset and resilience of student teachers. *Teacher Development*, 26(2), 263-278.
- Mulholland, J., & Wallace, J. (2001). Teacher induction and elementary science teaching: Enhancing self-efficacy. *Teaching and Teacher Education*, 17(2), 243-261.
- Nalipay, M. J. N., Mordeno, I. G., Semilla, Jr. B., & Frondoza, C. E. (2019). Implicit beliefs about teaching ability, teacher emotions, and teaching satisfaction. *Asia-Pacific Educational Research*, 28, 313-325.
- OECD. (2019). PISA 2018 questionnaire framework, in PISA 2018 assessment and analytical framework. Paris: OECD Publishing.
- Palmer, D. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36(4), 337-353.

- Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mindset interventions are a scalable treatment for academic underachievement. *Psychological Science, 26*(6), 784-793.
- Ricci, M. C. (2013). *Mindsets in the Classroom: Building a culture of success and student achievement in schools*. New York, NY: Routledge.
- Riddle, R. (2018). *A predictive correlational study of the relationship between grit and self-efficacy beliefs among pre-service teachers* (Unpublished doctoral dissertation). Liberty University, Lynchburg, Virginia, USA.
- Robertson-Kraft, C., & Duckworth, A. L. (2014). True grit: Trait-level perseverance and passion for long-term goals predicts effectiveness and retention among novice teachers. *Teachers College Record, 116*(3), 1-27.
- Rockoff, J. E., Jacob, B. A., Kane, T. J., & Staiger, D. O. (2008). Can you recognise an effective teacher when you recruit one? (Working Paper 14485). Retrieved from *National Bureau of Economic Research*: <http://www.nber.org/papers/w14485> Accessed March 21, 2021
- Rots, I., Aelterman, A., Vlerick, P., & Vermeulen, K. (2007). Teacher education, graduates' teaching commitment and entrance into the teaching profession. *Teaching and Teacher Education, 23*(5), 543-556.
- Saricam, H., Celik, I., & Oguz, A. (2016). Turkish adaptation of the Short Grit Scale (Grit-S): Validity and reliability study. *International Journal of Turkish Literature Culture Education Journal, 5*(2), 927-935.
- Seferoğlu, G. (2006). Teacher candidates' reflections on some components of a pre-service English teacher education programme in Turkey. *Journal of Education for Teaching, 32*(4), 369-378.
- Sigmundsson, H., Haga, M., & Hermundsdottir, F. (2020). Passion, grit and mindset in young adults: Exploring the relationship and gender differences. *New Ideas in Psychology, 59*, 100795.
- Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To what extent and under which circumstances are growth mindsets important to academic achievement? Two meta-analyses. *Psychological Science, 29*(4), 549-571.
- Soleas, E. K., & Hong, J. (2020). The school of hard knocks: Pre-service teachers' mindset and motivational changes during their practicum. *Foro de Educación, 18*(2), 237-257.
- Sternberg, R. (2000). The concept of intelligence. In R. J. Sternberg (Ed.), *Handbook of Intelligence* (pp. 3-13). Cambridge, UK: Cambridge University Press.
- Sun, K. L. (2018). Brief report: The role of mathematics teaching in fostering student growth mindset. *Journal for Research in Mathematics Education, 49*(3), 330-335.
- Sun, K. L. (2019). The mindset disconnect in mathematics teaching: A qualitative analysis of classroom instruction. *The Journal of Mathematical Behavior, 56*, 100706.
- Suzuki, Y., Tamesue, D., Asahi, K., & Ishikawa, Y. (2015). Grit and work engagement: A cross-sectional study. *PLoS One, 10*(9), 1-11.
- Trouilloud, D., Sarrazin, P., Bressoux, P., & Bois, J. (2006). Relation between teachers' early expectations and students' later perceived competence in physical education classes: Autonomy-supportive climate as a moderator. *Journal of Educational Psychology, 98*, 75-86.
- Yuksel, D., Curle, S., & Kaya, S. (2021). What role do language learning mindsets play in English Medium Instruction? A comparison of engineering and business administration in Turkey. *Journal for the Psychology of Language Learning, 3*(1), 50-62.

- Zeng, G., Hou, H., & Peng, K. (2016). Effect of growth mindset on school engagement and psychological well-being of Chinese primary and middle school students: The mediating role of resilience. *Frontiers in Psychology, 7*, 1873.
- Zeng, G., Chen, X., Cheung, H. Y., & Peng, K. (2019). Teachers' growth mindset and work engagement in the Chinese educational context: Well-being and perseverance of effort as mediators. *Frontiers in Psychology, 10*, 839.
- Zhao, Y., Niu, G., Hou, H., Zeng, G., Xu, L., Peng, K., & Yu, F. (2018). From growth mindset to grit in Chinese schools: the mediating roles of learning motivations. *Frontiers in Psychology, 9*, 2007.
- Zhou, K. (2016). Non-cognitive skills: definitions, measurement and malleability. Paper commissioned for the Global Education Monitoring Report 2016, *Education for people and planet: Creating sustainable futures for all*. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000245576> Accessed February 16, 2021

APPENDIX A

Teacher Mindset Inventory

Instructions: Please rate how much you agree or disagree with these statements. There is no right or wrong answer. We are interested in your personal opinion.

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

1. The kind of teacher someone is, something very basic about them and can't be changed very much.
2. Some teachers don't really benefit from professional learning because they have a natural ability.
3. Teachers can change the way they teach in the classroom, but they can't really change their true teaching ability.
4. Some teachers will be ineffective no matter how hard they try to improve.
5. No matter how much natural ability you may have, you can always find important ways to improve.
6. Every teacher, no matter who they are, can significantly improve their teaching ability.
7. Teachers can continue to improve their practice throughout their careers.



APPENDIX B

Grit Scale

Instructions: Please respond to the following eight items. Be honest – there are no right or wrong answers!

1	2	3	4	5
Not like me	Not much	Somewhat	Mostly	Very much like
at all	like me	like me	like me	me

1. New ideas and projects sometimes distract me from previous ones.
2. Setbacks don't discourage me.
3. I have been obsessed with a certain idea or project for a short time but later lost interest.
4. I am a hard worker.
5. I often set a goal but later choose to pursue a different one.
6. I have difficulty maintaining my focus on projects that take more than a few months to complete.
7. I finish whatever I begin.
8. I am diligent.