

Relationship Between Grit and Teacher Leadership, and Their Effects on the Academic Achievement of Students in an International School in Malaysia

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ABSTRACT

Teacher grit and teacher leadership are two qualities that are touted to improve teacher performance (Duckworth, Quinn & Seligman, 2009; Smylie, Lazarus & Brownlee-Conyers, 1996). However, few empirical studies have investigated the direct relationship between teacher grit and leadership and their direct effects on student achievement. In this case study, a survey of 22 teachers in a Malaysian international school was conducted using Duckworth & Quinn's (2009) short grit (Grit-S) questionnaire to measure grit, and Katzenmeyer & Moller's (2009) Teacher Leadership Self-Assessment (TLSA) questionnaire to measure leadership potential. The findings indicate that grit is positively correlated with five out of six of TLSA's leadership dimensions, except the diversity dimension. Using student results in a standardized examination, this study further found that differences in teacher grit or leadership potential do not result in significant differences in student achievement. The findings are followed by a discussion on the implications of the results on the emphasis of grit and teacher leadership in education reforms, and the limitations of this study.

Keywords: grit, grit-s, teacher leadership, teacher leadership self-assessment, academic achievement

Between October 2011 and December 2012, the Ministry of Education of Malaysia launched a comprehensive review of the national education system. The goal was to raise education standards to match international benchmarks. The results of the review were published in the *National Education Blueprint For 2013 To 2025*. The blueprint identifies a wide range of limitations the national education system is facing, and the changes that will be necessary to overcome them. A recurring emphasis in the blueprint is the focus on developing teacher leadership. For example, the government planned to empower schools by giving them more autonomy in decision making, and to develop dedicated pathways for teachers to move into leadership roles. The goal of these initiatives is to develop highly skilled and competent students (Ministry of Education of Malaysia, 2013). This study will explore two teacher-centric factors that are purported to enhance student achievement, teacher leadership (Smylie, Lazarus & Brownlee-Conyers, 1996) and teacher grit (Duckworth, Quinn & Seligman, 2009).

Good educational leadership has been touted as one of the most effective ways to improve school performance (Barth, 2001). The COVID-19 coronavirus pandemic highlighted the key role of leadership in crisis management within schools. A study of schools around the world found that many schools that adapted well to the pandemic have employed some forms of transformational, situational, or instructional leadership practices (McLeod & Dulsky, 2021). While educational leadership involves the entire school workforce such as teachers, principals, and administrators, there is a type of educational leadership that concerns teachers specifically with teacher leadership. The concept of teacher leadership has been around since the 1990s (York-Barr & Duke, 2004), but there still lacks a consensus definition. However, it can be broadly described as a school culture where teachers are actively

given and contribute to leadership responsibilities in addition to their roles in classroom teaching. Benefits of teacher leadership are reported to manifest in various forms, such as increased teacher morale, reduced workload for school principals, and improved student learning (Barth, 2001; Weiss, Cambonne & Wyeth, 1992). However, the direct effects of teacher leadership on student outcome are less clear, and there is far fewer research focusing on this question (Wenner & Campbell, 2017).

In contrast to teacher leadership, which is a type of practice, grit is a personality trait closely related to conscientiousness from the Big 5 Personality traits (Duckworth *et al.*, 2007). Grit is defined by Duckworth *et al.* (2007) as passion and perseverance in achieving long-term goals. Grit can be thought of as some form of mental 'stamina' which sustains the pursuit of an objective over months to years, even in the absence of positive feedback. Various correlative studies have found grit to be strongly predictive of achievements across various domains, and in some cases even more so than intelligence quotient (Duckworth *et al.*, 2007). For example, grittier individuals are more likely to attain advanced academic degrees than their less gritty counterparts (Duckworth *et al.*, 2007). Grit also predicts achievement in spelling bees (Duckworth *et al.*, 2011), GCSE results (Rimfeld *et al.*, 2016), college GPA in an Ivy League university (Duckworth *et al.*, 2007), and predicts student retention in a military school (Maddi *et al.*, 2012). The positive effect of grit on achievement has also been observed in non-English speaking cultures. A study of South Korean university students showed that grit is positively correlated with student GPA (Hwang, Lim & Ha, 2017). Several studies have shown that grit is predictive of leadership ability (Caza & Posner, 2018; Schimschal & Lomas, 2019). Additionally, higher grit in teachers positively correlates with student achievement

(Duckworth, Quinn & Seligman, 2009) and better teacher retention (Robertson-Kraft & Duckworth, 2014). This aspect of grit is especially relevant to our study.

This research is a small-scale quantitative case study of the relationship between teacher grit and teacher leadership in an international school in Malaysia and will also investigate the roles of teacher leadership and grit as predictors of student academic achievement. In this study, grit and teacher leadership are operationalized as schoolteachers' self-reported scores from Grit-S (Duckworth & Quinn, 2009) and teacher leadership self-assessment questionnaires (Katzenmeyer & Moller, 2009), respectively.

Research questions

1. How do age and leadership position(s) affect teacher grit and leadership potential?
2. What is the correlation between teacher grit and leadership potential?
3. Can teacher leadership potential and teacher grit predict student achievement?

Hypotheses

1. Research hypotheses

- a. Teacher leadership potential and grit are positively correlated.
- b. Both teacher leadership potential and grit affect student academic achievement.

2. Null hypotheses

- a. There are no correlations between teacher leadership potential and grit.

- b. Teacher leadership potential and grit have no effect on student academic achievement.

Literature Review

What Do We Know About Teacher Leadership?

When reviewing empirical studies of teacher leadership, one of the most striking observations is the lack of consensus on its definition. Literature on this teacher leadership largely falls into three camps – those who gave their own working definitions of teacher leadership, those who cited others' definitions, and those who did not define the concept altogether. For example, in one of the most widely cited and earliest comprehensive reviews of teacher leadership, (York-Barr & Duke, 2004) characterized teacher leadership as:

‘Teacher agency through establishing relationships, breaking down barriers, and marshaling resources throughout the organization in an effort to improve students’ educational experiences and outcomes’ (p. 263)

When authors Wenner and Campbell (2017) published their review of literature on teacher leadership 12 years after York-Barr and Duke’s; they defined teacher leadership as:

Leading within and beyond the classroom; identify with and contribute to a community of teacher learners. Teachers who maintain Kindergarten to Grade 12 classroom-based teaching responsibilities, while also taking on leadership responsibilities outside of the classroom. (p. 7)

Additionally, authors Katzenmeyer and Moller (2009), whose Teacher Leadership Self-Assessment questionnaire was used in this study, defined teacher leadership as:

Leading within and beyond the classroom; identify with and contribute to a community of teacher learners and leaders; influence others towards improved educational practice; and accept responsibility for achieving outcomes of their leadership. (p. 26)

In contrast, some researchers show teachers clearly engaging in leadership practices but did not define teacher leadership in their literature, such as Hart (1995) in her literature review of the implications of teacher leadership, and Brosky (2011) in his study of the use of political techniques by teacher leaders. The lack of a common definition is at least in part due to the broad range of responsibilities encompassed by the umbrella of teacher leadership. For example, the responsibilities of a teacher leader can be purely bureaucratic such as helping with school administrative work (Smylie & Denny, 1990), to teaching-related activities such as facilitating professional development of other teachers (Smylie & Denny, 1990; Hart, 1995; Gonzales & Behar-Horenstein, 2004).

However, even in the absence of a definition, several themes have emerged on how best to describe teacher leadership. Firstly, teacher leadership involves *empowering teachers with significant decision-making authority*. This could mean offering the teacher leaders direct paths to channel their ideas to upper-level administrators (Vernon-Dotson, 2008), or letting teachers decide to try out novel ideas to improve their teaching (Gonzales & Behar-Horenstein, 2004). Secondly, *teacher leadership is highly collaborative*. This usually involves a supportive and nurturing environment where teachers actively share and learn teaching techniques from each other (Carpenter & Sherretz, 2012; Gonzales & Behar-Horenstein, 2004).

Benefits of Teacher Leadership

As noted in the introduction, educational leadership and specifically teacher leadership has featured heavily in the Malaysian Education Blueprint. The Blueprint highlighted that it was the product of extensive consultation with experts, so it is reasonable to assume that the Ministry of Education expects good returns from its emphasis on teacher leadership. What are some of the known benefits of teacher leadership?

One reported benefit of teacher leadership is the increased teacher participation in school operations. Proponents of teacher leadership report that involving teachers in decision making processes of the school will help to cultivate a sense of ownership, and ensures that the teachers are more involved and therefore willing to see the decisions through to completion (Weiss, Cambonne & Wyeth, 1992; Hart, 1995).

Teacher leadership can also present good leadership role models. In the Malaysia Education Blueprint, leadership skills in students were deemed to be one of the key skills needed to be globally competitive (Ministry of Education of Malaysia, 2013). According to Roland Barth (2001), teacher leadership may be the answer, as the participative and democratic nature of teacher leadership will present good role models for students to emulate. However, the lack of empirical sources cited by Barth suggests that future research should investigate the purported effect that teacher leaders have on the development of student leadership.

Finally, and perhaps most importantly, despite claims that teacher leadership may result in improved student academic outcomes, the current body of research supporting this claim is scarce and inconsistent. In a longitudinal study, Smylie et al.

(1996) reported that increased teacher participation in decision making resulted in minor improvements of student outcomes in science and mathematics. Additionally, Leithwood et al. (2008) reported that good leadership is one of the major determinants of student outcomes, second only to teaching quality. In contrast, another study showed that teacher leadership had no effect on student scores in English and Language arts (Sugg, 2013). This should be an area of focus for future research, as understanding which aspects of leadership are most important for student outcomes, if any, would allow for optimal allocation of school resources.

Challenges Facing Teacher Leadership

The benefits of teacher leadership to teachers and schools are quite established, and the gains that it may bring to student academic performance alone should warrant serious consideration of its integration into mainstream education policies. That said, teacher leadership still faces several major challenges that need to be addressed.

First, there is no consensus on how to define teacher leadership, although there are common themes. This is an important hurdle to overcome because for teacher leadership initiatives to be implemented equally and to develop measurable outcomes there should be a clear, unambiguous understanding of what is meant by 'teacher leadership. This lack of consensus definition will become a problem when measuring the effects of teacher leadership. There is to-date nothing resembling a global standard on how to measure teacher leadership. For example, Sugg, (2013) used a truncated version of the School Improvement Grant Teacher and showed that teacher leadership is not linked to student achievement, while Survey, Ross & Gray (2006) and Smylie, Lazarus & Brownlee-Conyers (1996) used their self-designed transformational leadership and participative leadership surveys, respectively, and

reported positive links between teacher leadership and student achievement. However, their use of different instruments made their end results difficult if not impossible to compare.

Secondly, as detailed above, despite all the purported benefits of teacher leadership over the past three decades, there have been few studies that directly investigate the effect of teacher leadership on student academic achievement – the key goal of all education systems. Wenner & Campbell (2017) and York-Barr & Duke (2004) noted in their reviews that together span 30 years, that they found little empirical research explicitly linking teacher leadership to student learning. The relationship between teacher leadership and student outcomes remains unclear, with some showing minor correlations (Smylie, Lazarus & Brownlee-Conyers, 1996; Ross & Gray, 2006), and others showing none at all (Sugg, 2013). Furthermore, the factors that mediate teacher leadership and student outcome are largely unknown. This highlights the need for more rigorous research and calls into question the necessity of pursuing teacher leadership as an avenue to improve student outcomes, given that its main selling point; improved student outcomes, appears to be minor.

Adding to the previous point, teacher leadership research in Malaysia is significantly sparser than in Western countries (Bush *et al.*, 2018), where the bulk of teacher leadership studies originated. There is no Malaysian equivalent of the American Teacher Leadership Institute which works to define teacher leadership competencies and develop teacher leaders based on those competencies. With so many changes already made to the Malaysian national education policies to promote and support teacher leadership, there is clearly a need to ramp up effort to increase empirical research of teacher leadership and establish its effects, especially in a Malaysian context. While Malaysia can opt to wait and rely on the results generated

by international researchers such as those from the Teacher Leadership Institute, but a concept so heavily centered on interpersonal relationships as teacher leadership is likely to be dependent on culture, such as the degree of centralization of an educational system (Bush *et al.*, 2018). This means that research most relevant for Malaysian educational policies are likely the ones conducted in a Malaysian setting.

Third, conflicts may arise from communication between teacher leaders and their colleagues. For example, Weiss *et al.* (1992) reported that unequal participation of teachers taking up leadership roles can result in resentment. Teachers served as teacher leaders feel that their colleagues who opted out of taking leadership roles have reaped the benefits of the teacher leaders' actions without investing their own time and effort. Conversely, the teachers who did not participate in leadership resented the authority afforded to the teacher leaders, and the changes that these leaders propose, especially if the leaders are junior teachers. Furthermore, the involvement of teachers in school-wide decision-making processes resulted in some degree of conflicts as many teachers are not equipped with skills to negotiate with colleagues, handle criticisms and reach a consensus (Weiss, Cambonne & Wyeth, 1992; Gonzales & Behar-Horenstein, 2004). This finding was supported by a study of teacher leadership in three underprivileged American schools which found that the teacher leaders struggle with communicating effectively with the other non-leader teachers (Vernon-Dotson, 2008). One way forward could be to integrate conflict negotiation skills into existing teacher training curriculum to ensure that if disagreements do arise, the teacher leaders are able to navigate it skillfully.

Fourth, as increased responsibilities are inherent in practices of teacher leadership, another challenge is the increased workload, which takes time away from

teachers' primary responsibility of classroom teaching (Brooks, Scribner & Eferakorho, 2004). Furthermore, the poorly defined responsibilities of a teacher leader contribute to the loss of work efficiency (Margolis & Huggins, 2012). This challenge highlights the importance of identifying which aspects of teacher leadership are most beneficial, to streamline teacher leaders' responsibilities and not overwhelm them with additional work.

What Do We Know About Grit?

In 1907, renowned Harvard psychologist William James wrote an article titled "The Energies of Men." In it, he stated that most individuals have vast amounts of internal resources and only a remarkable minority has tapped them to the fullest. Towards the end of the article, James suggested two queries to be answered. The first is to produce more refined concepts of human mental abilities, and the second is to discover methods by which human potential can be unlocked (James, 1907).

Angela Duckworth and colleagues stated in their 2007 publication that the first of James' questions had been answered, as many studies of human intelligence had been conducted in the past 100 years, including the well-known measure of intelligence quotient or IQ (2007). Duckworth however noted that James' second question was less studied and less understood – we still know comparatively little about why only a minority of individuals push their innate abilities to their limits to reach high levels of achievement, compared to others with similar intelligence. Duckworth then suggested that they have found an answer to James' second question – they reported the discovery of a trait common to top performers of all domains investigated, namely grit (Duckworth et al., 2007).

Duckworth's 2007 publication is arguably the most widely cited literature on grit, with 6,253 citations at the time of this publication. They defined grit as passion and perseverance for long term goals. Grit is the mental stamina that allows an individual to persist in a long-term endeavor even in the face of setbacks and lack of positive results. To measure grit, Duckworth designed a 12-item questionnaire, and later narrowed it down to an 8-item 'Short Grit' or Grit-S questionnaire (Duckworth & Quinn, 2009). The 8-item questionnaire is divided equally into two subscales – one to measure 'consistency of interest', and another to measure 'perseverance of effort' (Duckworth & Quinn, 2009). Grit is closely related to conscientiousness of the Big Five Personality traits, but unlike conscientiousness, grit emphasizes the maintenance of a long-term goal and less on self-control (Duckworth et al., 2007; Duckworth & Gross, 2014). Grit is also closely related to growth mindset, which is another non-cognitive trait first reported by Carol Dweck in 2008. Growth mindset is the belief that one's ability is not innate but rather a function of effort and different strategies, and can therefore be cultivated (Dweck, 2008). When someone with a growth mindset suffers a major setback, they do not assume that the failure is an indicator of their lack of innate ability and gives up; rather, they assume that the failure is due to a lack of the right volume or types of practices.

Benefits of Grit and the Challenges it Faces

Since Duckworth's seminal paper on grit, numerous empirical studies have demonstrated the links between grit and high achievement. Being grittier predicted better performance in spelling bees (Duckworth *et al.*, 2011), and better performance and retention in a military academy (Maddi *et al.*, 2012). Grit was also linked to higher life satisfaction (Clark & Malecki, 2019). In terms of education, research of undergraduates has shown grit to be strongly predictive of GPA (Duckworth *et al.*,

2007; Hwang, Lim & Ha, 2017). Among primary and secondary school children in Peru, grit was linked to good academic self-efficacy and higher school satisfaction (Oriol *et al.*, 2017). If Oriol's results are translatable to adults, it would be reasonable to hypothesize that higher grit in teachers will lead to higher retention rates due to higher school satisfaction, and better teaching capabilities due to better academic self-efficacy. If this is the case, then teacher recruitment and training efforts should increase their emphasis on grit.

One of the aims of the current study is to confirm the predictive role of teacher grit on student academic outcomes. Several studies have reported the positive correlations between teacher grit and student achievement, among other positive teacher traits. (Duckworth, Quinn & Seligman, 2009; Robertson-Kraft & Duckworth, 2014). However, these findings show only correlation and not causality. Further studies are needed to investigate whether increasing teacher grit can improve student outcomes – the goal of education. If confirmed, grit may be used as a teacher recruitment criterion, and teacher training programs can be designed with an emphasis on developing grit.

Given the positive correlation between grit and student achievement, researchers have questioned if grit not only predicts achievement, but also causes it. If grit and achievement have a causal relationship, then growing an individual's grit should have a positive effect on their achievement. Several researchers have suggested that developing a growth mindset may help to develop an individual's grit (Duckworth, 2016; Polirstok, 2017). Additionally, a study of middle school students has shown that grit and growth mindset are distinct traits that amplify each other (Park *et al.*, 2020). This is not surprising considering the complementary natures of grit and growth mindset. For example, an individual with a more developed growth

mindset would be more likely to be pursuing an endeavor for extended periods despite setbacks.

The ability of the growth mindset to reinforce grit and achievement has to some extent, been confirmed in children by longitudinal studies. A large-scale study by Paunesku *et al.* (2015) of high school students in the US showed that growth mindset can be cultivated, and this resulted in an increase in grade point averages for students who were most at risk of dropping out. However, this study did not measure grit, so the newly cultivated growth mindset may have enhanced the student outcomes independently of grit. Another large-scale randomized longitudinal study in Turkish elementary schools demonstrated that by training teachers to implement several teaching strategies and philosophies grounded in growth mindset, the students' self-reported grit scores increased, and they became more inclined to take on difficult academic tasks, and persevered despite failures (Alan, Boneva & Ertac, 2019).

The other aim of our research is to study the effect of grit on teacher leadership ability. In theory, grit should be positively correlated with teacher leadership. Since teacher leadership is a collection of skills and best practices such as an abundance of teaching experience, good pedagogical and interpersonal skills (York-Barr & Duke, 2004), a grittier individual should theoretically be a better leader as they would have persisted in the profession for longer, and therefore have more time to practice their leadership skills. However, unlike spelling bees or college examinations, teacher leadership is not a solo act. In fact, many of the factors that facilitate good teacher leadership are external in nature like having administrative support, understanding school principals, culture of shared leadership, and tolerance of mistakes (Wenner & Campbell, 2017). This may mean that even if grit makes an

individual into a better teacher leader, the positive effects of their leadership could be masked by the lack of enabling external factors.

There is limited empirical research on the link between grit and leadership capacity. A search on Google Scholar showed fewer than 30 published literatures. However, the few that do exist show positive correlations between the two constructs. For example, using self-reported scores of grit and positive leadership of various industry leaders, Schimschal & Lomas (2019) demonstrated that higher grit is linked with better positive leadership capabilities. Similarly, a study of 3702 leaders in work and non-work contexts also found that grit is positive correlated to self-reported leadership capabilities (Caza & Posner, 2018).

Methodology

The literature included here was chosen from Google Scholar and ERIC databases. Only empirical studies, or books and reviews based on empirical research were considered for inclusion. Usage of non-empirical literature such as opinion pieces will be highlighted in text. An exception to this is the inclusion of the Malaysian Education Blueprint whose content is not entirely empirical, but crucial in guiding national education policies.

Participants and data collection

Due to the government-imposed coronavirus-related movement restrictions, convenience sampling was more practical, so it was the method of choice in this study. Consequently, all participants were teachers at a Malaysia-based international school – Magnolia International School (a pseudonym) where the researcher in this study also teaches. Participants in this study are 22 teachers ($N = 22$ teachers) age

18 and over at the time of study ($M = 39.9 \pm 9.9$ years old). Teachers in the study have spent on average 15.7 ± 9.2 years in the teaching profession.

After informed consent was obtained from all participating teachers, they were asked to complete two questionnaires – the Grit-S questionnaire by (Duckworth & Quinn, 2009) and the Teacher Leadership Self-Assessment questionnaire by (Katzenmeyer & Moller, 2009). As teachers were teaching online due to the Covid-19 lockdown, both questionnaires were digitized as Google forms, and administered online. Time taken to complete both questionnaires was self-reported to be between 10 to 30 minutes.

For data on student academic achievement, results from the Cambridge Secondary Checkpoint Examinations 2020/21 were used. This examination tests mastery in five subjects - English, mathematics, biology, physics, and chemistry. Scores in this examination were given as real numbers between 0.0 (very poor) and 6.0 (very good). Only scores for chemistry were used in this study ($N = 48$ test scores), as it was the only subject with two participating teachers who were teaching the same subject to two groups of students of the same year group – the British Year 9.

Measures

Grit is measured using the short grit (Grit-S) questionnaire developed and validated by (Duckworth & Quinn, 2009). Items in the questionnaire can be divided into two subscales – four items to assess ‘perseverance of effort’ and four items to assess ‘consistency of interest’. This questionnaire consists of eight items graded on a 5-point Likert-type scale. Possible responses range from ‘5 = very much like me’ to

'1 = not like me at all'. Grit score is calculated as an average of the eight items. The Grit-S questionnaire is included as Appendix A.

Teacher leadership potential is measured using the Teacher Leadership Self-Assessment (TLSA) questionnaire developed by (Katzenmeyer & Moller, 2009). The TLSA consists of 42 questions spread across six subscales – (1) self-awareness, leading change; (2) communication; (3) diversity; (4) instructional proficiency; (5) continuous improvement; (6) self-organization. All items measure on a 5-point Likert-type scale. Possible responses range from '5 = Always' to '1 = never'. The TLSA questionnaire is included as Appendix B.

Data processing and analysis

Using the grit and leadership potential data obtained from teachers, their mean and standard deviation were calculated and reported. The Pearson's *r* correlation test was then conducted to measure the correlation between teacher grit and leadership potential.

Using the chemistry examination results from the two groups taught by two teachers with different grit and TLSA leadership potential, a *t*-test was conducted to investigate if there was a significant difference between the student test scores.

Ethics

All aspects of this study, especially the treatment of participants and handling of their data is conducted in full accordance with the British Educational Research Association's Revised Ethical Guidelines for Educational Research (BERA, 2018). No participants were exposed to any forms of physical or psychological harm. No participants will be prejudiced should they decide to not participate. All participants were adults and participation was strictly voluntary with informed consent only.

Results

RQ 1: How does age and leadership positions affect teacher grit and leadership potential?

Table 1

Summary statistics for age, teaching experience, Grit and TLSA scores

	Min	Max	M	SD
Age	26	61	39.3	10.1
Teaching experience	2	35	15.0	9.4
Grit				
overall	2	5	3.4	0.8
COI	2.5	5	4.0	0.6
POE	2.6	4.9	3.7	0.6
TLSA				
Self awa	19	30	25.5	2.5
Lead. Cha.	15	30	24.0	4.2
Comm.	21	30	25.1	2.5
Div.	22	30	27.0	2.5
Ins.	21	29	25.5	2.5
Cont. Imp.	16	30	24.2	3.4
Self org.	20	30	24.6	3.1

Note: COI = consistency of interest, POE = perseverance of effort, Self awa. = self-awareness, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organization, N = 22.

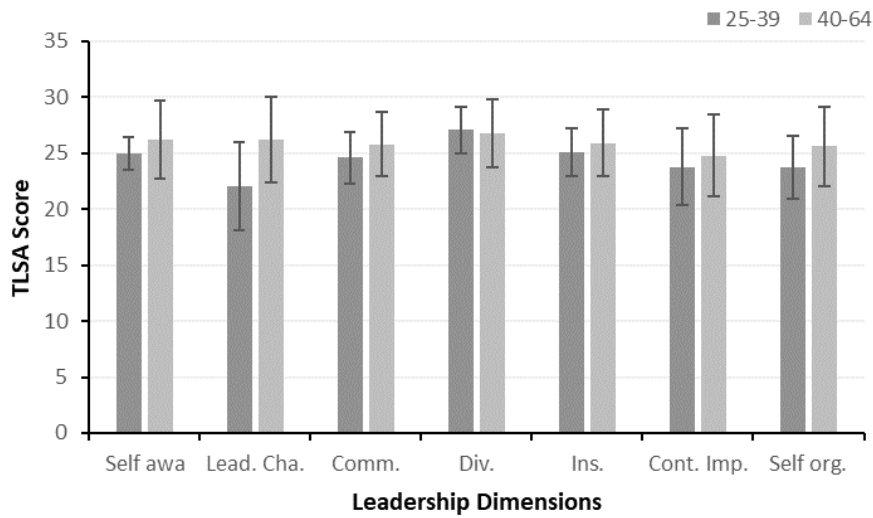
Table 2

Teacher Grit as a Function of Age.

	Age	
	25-39	40-64
n	12	10
M	3.6	3.5
SD	0.6	0.5

Figure 1

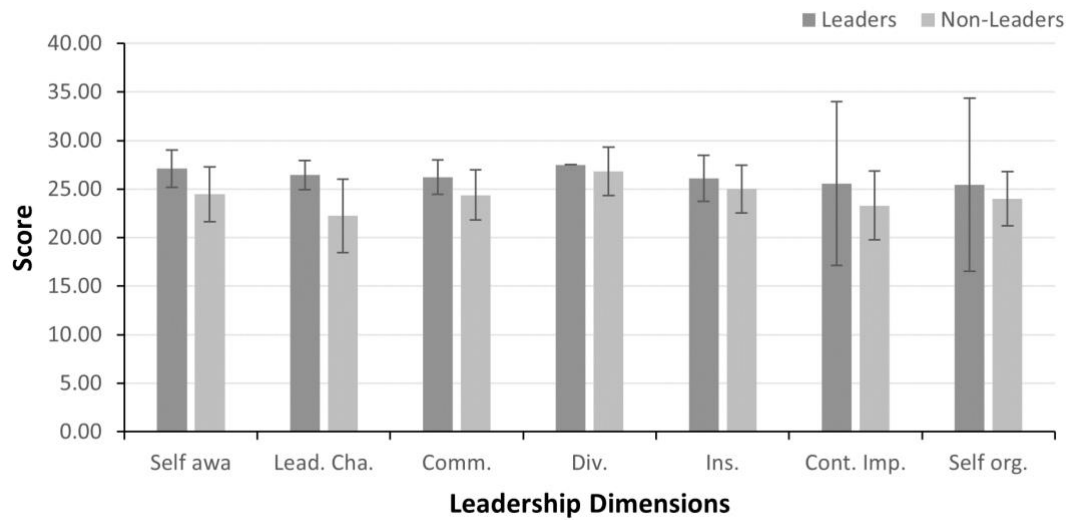
TLSA's Leadership Dimensions as a Function of Age



Note. Self awa. = self-awareness, Lead. Cha. = leading change, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organisation

Figure 2

TLSA's Leadership Dimensions as a Function of Leadership Position



Note. Self awa. = self-awareness, Lead. Cha. = leading change, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organisation

In this study, both Grit-S and TLSA instruments showed good reliability and internal consistency with Cronbach's alpha values of 0.75 to 0.97 respectively. The average grit score of the teachers is 3.7 out of a maximum of 5. If only the 'consistency of interest' and 'perseverance of effort' subscales are used, then the average grit scores are 3.4 and 4.0 respectively. For the TLSA questionnaire, out of a maximum of 30, the average scores are 25 for self-awareness, 24 for leading change, 25 for communication, 27 for diversity, 25 for instructional proficiency and leadership, 24 for continuous improvement and 25 for self-organization (Table 1).

The average grit scores of the teachers do not vary positively with age, which is inconsistent with Duckworth's (2007) results, but the correlations in this study are nonsignificant ($p = .08$, Table 2), likely due to the small sample size. Out of the TLSA's seven leadership dimensions, only one is positively correlated with age in this study. Older teachers in this study appear to be better at leading change than their younger colleagues ($p = .02$, Figure 1). However, older teachers in this study are no more adept than their younger colleagues in the remaining six TLSA leadership dimensions ($p > .05$, Figure 1).

This school practices a hybrid of instructional and distributed leadership practices. Teacher leader positions include principals and education directors whose primary roles are in administrative work, head of departments and level coordinators whose primary roles are in classroom teaching. In this study, teachers holding leadership positions ($n = 9$) do not appear to be grittier than their non-leader counterparts ($n = 13$), both with overall grit of 3.7 ($p = .95$).

In terms of Katzenmeyer and Moller's leadership dimensions, *t*-tests revealed that teachers in this study who were holding leadership positions were more self-

aware ($p = .01$) and are better at leading changes ($p = .02$) than their non-leader counterparts. However, teacher leaders in this study are not significantly different from their non-leader peers in the other five TLISA leadership dimensions ($p > .05$, Figure 2).

RQ 2: Correlation between grit and teacher leadership potential

Table 3

Correlation between grit and TLISA leadership dimensions by leadership position

	n	Pearsons correlation, r with grit						
		Self awa.	Lead. cha.	Comm.	Div.	Ins.	Cont. Imp.	Self org.
Overall	22	0.23	0.20	0.20	-0.24	0.31	0.24	0.30
Teacher leaders	9	0.76*	0.61	0.72*	-0.17	0.79*	0.68*	0.88**
Non teacher leaders	13	-0.03	0.07	-0.22	-0.31	-0.004	0.02	-0.15

Note. Self awa. = self-awareness, Lead. Cha. = leading change, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organisation. * $p < .05$, ** $p < .01$

Table 4

Correlation between grit and TLISA leadership dimensions by age

Age Group	n	Pearsons correlation, r with grit						
		Self awa.	Lead. cha.	Comm.	Div.	Ins.	Cont. Imp.	Self org.
Overall	22	0.23	0.20	0.20	-0.24	0.31	0.24	0.30
25 - 39	12	-0.22	-0.28	-0.27	-0.21	-0.14	0.04	-0.13
40 - 65	10	0.35	0.36	0.46	-0.24	0.60	0.36	0.50

Note. Self awa. = self-awareness, Lead. Cha. = leading change, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organisation. All $p > .05$

By running the Pearson correlation (r) test, grit of teachers in this study is found to be positively correlated with six of Katzenmeyer and Moller's TLISA leadership dimensions (Table 3), in support of our hypothesis. However, teacher grit in this study is negatively correlated with the diversity dimension ($r = -0.23$, $p = .29$). In terms of statistical significance, the p -values are $p = .30$ for self-awareness, $p =$

.37 leading change, $p = .37$ for communication, $p = .29$ for diversity, $p = .15$ for instructional proficiency and leadership, $p = .27$ continuous improvement and $p = .18$ for self-organization.

When the participants are divided into teachers who hold leadership positions and those who do not, the correlations between grit and TLSA's leadership dimensions are notably stronger for teacher leaders compared to their non-leader counterparts. Furthermore, most of the correlations are significant, with p -values of $p = .01$ for self-awareness, $p = .08$ for leading change, $p = .02$ for communication, $p = .67$ for diversity, $p = .01$ for instructional proficiency and leadership, $p = .04$ for continuous improvement and $p = .001$ for self-organization (Table 3). Surprisingly, for the non-teacher leaders, the correlations between grit and leadership potential are not only weaker than for teacher leaders, but are negative for the dimensions of self-awareness, communication skills, ability to handle diversity, instructional proficiency and leadership, and self-organization, albeit with non-significant p -values ($p > .05$).

Grouping the teachers by age showed that the correlations between grit and TLSA's leadership dimensions are stronger for older teachers compared to their younger peers (Table 3). In fact, for the younger teachers the correlations are all negative except for the 'continuous improvement' dimension. However, all correlations by age groups appear to be nonsignificant ($p > .05$).

RQ 3: Can teacher grit and teacher leadership predict student achievement?

Table 5

Grit and Leadership scores for Chemistry Teachers X and Y

	Grit	TLSA							Total
		Self awa.	Lead. Cha.	Comm.	Div.	Ins.	Cont. Imp.	Self org.	
Teacher X	4.375	23.00	15.00	21.00	23.00	22.00	22.00	21.00	147.00
Teacher Y	3.75	27.00	25.00	29.00	29.00	27.00	28.00	28.00	193.00

Note. Self awa. = self-awareness, Lead. Cha. = leading change, Comm. = communication, Div. = diversity, Ins. = instructional proficiency and leadership, Cont. Imp. = continuous improvement, Self org. = self-organisation

Table 6

Outcomes for Chemistry by Students Taught by Teachers with Different Grit and Leadership Ability

	Chemistry grades	
	Group X	Group Y
n	18	30
Min	2.7	1.7
Max	6.0	6.0
Mean	5.4	5.2
SD	1.0	1.1

Two of the teachers (Teachers X and Y) in this study teach chemistry to the same year group – British Year 9. To our knowledge, the two student groups are segregated at random, and are similar in factors that can affect their academic outcomes, such as age, English proficiency, family socioeconomic status, parents' education level and parental involvement in their child's education. We therefore assumed that the main difference between the two student groups, are their chemistry teachers.

Teachers X and Y have similar educational background – both have science degrees from Top 100 universities according to the TIMES Higher Education University Ranking. Additionally, as determined through peer observations, both teachers have similar teaching styles, uses the same teaching resources, and have similar English proficiency. However, the two teachers have different grit and

leadership scores (Table 5). Teacher X has a higher grit score than Teacher Y, whereas Teacher Y outscores X in all of Katzenmeyer and Moller's leadership dimensions. With the assumption that teachers X and Y differ only in grit and leadership abilities, we ran a *t*-test to examine if the chemistry examination results of their two student groups are significantly different (Table 6). The results showed that the two groups of students do not differ significantly in their chemistry results ($p = .56$).

Discussion

Our results showed that grit in teachers is positively correlated with TLSA leadership dimensions, and this correlation is even more prominent and significant among teacher in leadership positions. This echoed the results of other studies of correlations between grit and leadership among working adults (Schimschal & Lomas, 2019; Caza & Posner, 2018). Interestingly, grit is positively correlated with every leadership dimension except for diversity. The items for the TLSA diversity subscale emphasize the ability and willingness to deal with other individuals' values and beliefs. This contrasts with the other subscales which are more focused on oneself. One possible explanation of our results may be that having more grit makes an individual more focused on achieving her goals to the point that accommodating the needs of others becomes a lesser priority.

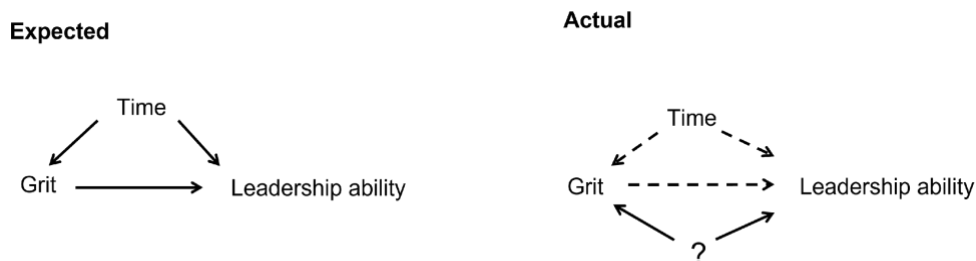
Secondly, we found that older teachers are not significantly grittier than their younger colleagues. This contrasts with the results in Duckworth's 2007 study which showed that when education level is controlled, older individuals are grittier than their younger counterparts. As the participants in Duckworth's study are from diverse backgrounds, whereas participants in our study were solely teachers, our results may mean that teachers have acquired their grit by other means therefore making

the effect of age negligible. We also discovered that of the seven TLSA leadership dimensions, older teachers are significantly better at leading change. This may be because older teachers have spent enough time in their profession to earn their coworkers' respect as well as learn how to negotiate effectively with colleagues and school administrators. Both are crucial parts of being a teacher leader (York-barr & Duke, 2004; Wenner & Campbell, 2017).

Thirdly, we found that teacher leaders are no grittier than non-teacher leaders but outscore their non-leader counterparts in TLSA leadership dimensions of self-awareness and leading changes. We saw this similar trend between older teachers compared to their younger counterparts. This may indicate that grit and leadership skills develop independently of each other during an individual's leadership journey through the influence of other factors, contrary to our expectations that grit facilitates the development of leadership skills (Figure 3). To date, there has been no study investigating the effect of cultivating grit on one's leadership capabilities, so this is an avenue of future research.

Figure 3

Expected and Actual Interactions between Grit and Leadership



Note: Solid lines indicate causal relationship. Dotted lines indicate weak or unclear relationships. '?' represents unknown factor(s).

Finally, we found that students who studied chemistry under teachers with different grit and leadership ability do not differ significantly in their standardized

examination results (Table 5 and 6). This is unexpected given the purported benefits of grit and leadership on achievement. Higher grit in teachers has been reported to be correlated with better student outcomes (Duckworth, Quinn & Seligman, 2009; Robertson-Kraft & Duckworth, 2014). Here we propose two possible explanations for our findings. First, teacher-centric factors may not be as important in determining student outcomes compared to student-centric or socioeconomic factors. Studies have shown that factors such as language proficiency, gender, parental occupation and education level, and family's socioeconomic status are significantly predictive of student outcome (McCoach *et al.*, 2010; Farooq *et al.*, 2011). Similarly, student-centric factors such as their grit and mindset have well-established positive correlations with student academic outcomes (Duckworth *et al.*, 2007; Claro, Paunesku & Dweck, 2016). Future research should compare the contribution of teacher-centric factors to academic achievement against the contributions of student-centric or socio-economic factors. If it is confirmed that teacher-centric factors play only an ancillary role in student outcomes, then we should reassess the investments and emphasis placed on developing teacher leadership such as in the Malaysian Economic Blueprint. Secondly, we cannot discount the possibility of the two teachers over or under reporting their grit or TLISA Leadership questionnaire scores. In our unpublished study of the effects of grit on student achievement, we found that high-achieving students reported low grit scores that were incongruent with their work ethics and academic attitude as assessed through interviews and classroom observations. The questionnaire scores can be made more objective by having them be filled by an impartial third party. Robertson-Kraft & Duckworth (2014) demonstrated one approach by which this can be achieved, which is by having research assistants rate teachers' grit after reading their resumes.

Conclusion

In this case study, we have demonstrated that in the context of teachers in an international school in Malaysia, grit along with leadership dimensions of self-awareness, leading change, and self-organization are positive correlated with age. We also showed that teacher leaders are no grittier than non-leaders but are more self-aware and better at leading changes. Moreover, teacher grit is found to be positively correlated with all of Katzenmeyer and Moller's leadership dimensions except diversity, and this correlation is strengthened for teacher leaders. Finally, we showed that neither teacher grit nor teacher leadership ability appear to have statistically significant effects on student outcomes.

Limitations and Recommendations

While enthusiastic about the correlation shown between grit and teacher leadership and its possible implications, we should acknowledge that this study is bound by a few limitations. First, due to the COVID-19 related movement restrictions in Malaysia, the researcher was limited to sampling from only one school, severely limiting its sample size, which contributed to the poor statistical significance (Thiese, Ronna & Ott, 2016) and generalizability to the larger population.

Secondly, the small sample size due to travel restrictions also limited the researcher to using convenience sampling as opposed to probabilistic sampling. As a result, most of the participants in this study were teachers in the researcher's work circle. This means that there are likely other demographics of teachers that were not included in this study.

Thirdly, the researcher who administered the TLSA and Grit-S questionnaire is also a teacher at the school where the respondents are located. This renders the

survey results vulnerable to response biases, as certain responses to the questionnaire items may be perceived by the respondents as indicative of 'low grit' and 'low leadership ability' which are less socially desirable traits.

Finally, this is a case study which by nature has inherently low external validity. Care should be taken when extrapolating these results to other contexts, for example public or rural schools. The results of this research should be confirmed with a larger sample size and probabilistic sampling.

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Appendix A

Link for Grit-S Questionnaire used in this study: <https://forms.gle/3tMLFrm11mcv844z6>

Appendix B

Link for Teacher Leadership Self-Assessment Questionnaire used in this study:

<https://forms.gle/q6N42jRWUaeGaTJs5>