

## Toward an Explanation of Variations in Teachers' Perceptions of Teacher Leadership

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### Abstract

The purpose of this study is to understand how teachers' perceptions of teacher leadership are formed in education practice. Based on information processing theory and findings from 873 teachers in Chinese schools, this article provides an explanation of the formation of teachers' leadership perceptions as a function of both alterable variables within the school context and unalterable characteristics of both leaders and followers. It is concluded that alterable school conditions explain most of the variations in teachers' perceptions of teacher leadership. The study proposes the theoretical implication that alterable variables were more powerful in the development process of teachers' perceptions of teacher leadership. In addition, the findings indicate that school principals can control organizational factors to enhance teachers' perceptions of teacher leadership to improve the effectiveness of leadership.

### Résumé

L'objectif de cette étude est de comprendre comment se forment dans la pratique éducative les perceptions des enseignants sur le leadership enseignant. Sur la base de la théorie du traitement de l'information et de résultats obtenus auprès de 873 enseignants dans des écoles chinoises, cet article explique comment se forment les

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perceptions du leadership par les enseignants en fonction à la fois de variables modifiables dans le contexte scolaire et des caractéristiques immuables des leaders et des suiveurs. Il conclut que les conditions scolaires modifiables expliquent la plupart des variations dans les perceptions qu'ont les enseignants du leadership enseignant. L'étude suggère en effet que les variables modifiables jouent un rôle plus important que les caractéristiques immuables dans le développement de ces perceptions. En outre, les résultats indiquent que les directeurs d'école peuvent ajuster les facteurs organisationnels afin d'améliorer la perception du leadership par les enseignants et de renforcer l'efficacité du leadership.

**Keywords / Mots clés :** teachers' perceptions, teacher leadership, information processing theory / perceptions de la part des enseignants, leadership par les enseignants, théorie du traitement de l'information

## Introduction

With the development of school-based management in the Chinese school context, leading from the middle has become an important management trend in the Chinese education management field (Liu, 2021; Liu, Chen, Cheng, & Xiao, 2023; Zhang, Walker, & Qian, 2023). The large size of Chinese schools demands the participation of teacher leaders in their daily management. It has been generally shown that teacher leaders can effectively improve educational practices and effective management in educational practices (Brown, Friesen, Thien, & Liu, 2025; Hargreaves, Thien, & Liu, 2025). Specifically, in the Chinese school system, which is characterized by high accountability and hierarchical structure, Liu et al. (2023) found that teacher leadership can positively impact teacher wellbeing through trust in leaders and teacher efficacy. This indicates the tenacity of the effects of teacher leaders in educational practices in the Chinese context. Despite this, research on how teachers perceive teacher leadership practices is still limited within the literature. Particularly, studies on teachers' perception of teacher leadership effectiveness in China and internationally is still insufficient. This is a significant miss, as stronger perception of teacher leaders' effectiveness can help improve educational practices. For instance, studies have proved that teacher leaders can positively affect teacher wellbeing in educational practices (Liu et al., 2023).

Leadership effectiveness has aroused the widespread attention of researchers in the educational leadership field (Lord & Maher, 2015). In the 1970s, cognitive theory was effectively applied to the study of leadership when the theories of leadership traits, behaviours, and contingency were in dispute, and it was used to explain the relationship between leadership effectiveness and cognitive processes (Lord & Alliger, 1985). Some scholars put forward the idea that leadership effectiveness does not depend on a specific leadership trait, nor is it derived from control of the situation, but instead exists in the minds of subordinates (Eden & Leviatan, 1975; Wang & Xia, 2022). Lord and Maher (1993) argued that leadership is the process of being seen as a leader by others, which further promoted the cognitive revolution of leadership

research. In this kind of research, more attention has been paid to the role of employees' opinions, expectations, and individual cognitive prototypes in the formation of leadership, focusing on the perception process of leadership, rather than the effectiveness or performance of leadership.

Precisely, Chinese scholars have established that motivating teachers to acknowledge one another's contributions and achievements would have a positive impact on Chinese teachers' group perception of competence (Liu, 2021). This form of perceived belief in teachers' competence by colleagues can make teacher leaders feel empowered and engaged in school decision-making. In other words, teacher leadership dimensions of recognition, collegiality, participation, and positive environment are found to have significant relationships with how teachers perceive their colleagues and leaders in the Chinese school context (Liu, 2021; 2024). Perception is a basic psychological process that selects and organizes environmental stimulation and provides meaningful experience to the perceivers. Behavioural scientists believe that people's "reality" depends on their feelings. Perceived reality is the reality that really affects behaviour, so it is necessary to study teachers' perceptions of teacher leadership (Thoits, 1983). Moreso, Chinese school reform has been summoned to reduce competition and encourage trust among teachers (Liu, 2021).

In the education field, there is a relatively unanimous consensus that the concept of leadership is critical to improving school effectiveness (Hallinger & Heck., 1996; Silins & Mulford, 2007). With the expansion of school scale and the emergence of accountability policies, the functions undertaken by schools have become more and more complicated, so the principal cannot be the only provider of leadership; teacher leadership has thus received further attention. Although the discussion on teacher leadership is increasing, there is no consensus on the connotation of teacher leadership (Angelle & DeHart, 2011; Ghamrawi, Naccache, & Shal, 2023). Many researchers have realized the importance of teachers' perception of teacher leadership and have conducted research on this, but there are few studies on how the perception of teacher leadership is formed. Therefore, the purpose of this study is to understand teachers' perception of teacher leadership using information processing theory and to interpret differences in the perception of teacher leadership. This understanding is of great significance for awakening teachers' subjective consciousness and improving the effectiveness of teacher leadership.

## **Literature review**

### ***Definition of teacher leadership***

In recent decades, the concept of teacher leadership has continued to evolve, but there has been no consensus on this concept. Neumerski (2013) believes that it is difficult to find consensus on the composition of teacher leadership. Ackerman and McKenzie (2006) point out that teacher leaders' power originates from the classroom but they need to demonstrate the power through interaction with stakeholders in the school community. Furthermore, Danielson (2006) defines teacher leadership as a set of skills that could help teachers to lead beyond the classroom to reach organizational goals. Similarly, in a more recent study, Schott, Van Roekel, and Tummers (2020) document that teacher leadership is more of a process of influenc-

ing others than a cluster of responsibilities of teacher leaders. This is because teacher leadership has been found to be the basis for increasing teacher quality and for advancing teachers' learning processes related to their roles in classrooms as well as in their school communities (Bellibaş, Gümüş, & Kılınc, 2020; Ding & Thien, 2022; Schott et al., 2020; Shen, Wu, Reeves, Zheng, Ryan, & Anderson, 2020). Definitions of teacher leadership commonly hold that teacher leadership is not only about leading within the classroom but also about leadership in the school community (Nguyen, Harris, & Ng, 2020; Wenner & Campbell, 2017).

Based on its research purposes, this study adopted Angelle and DeHart's (2010) teacher leadership inventory. This is because the definition highlights the roles of teacher leaders that teachers can perceive and relate to. According to these scholars, teacher leaders are people who share content and teach classroom management with colleagues; who are ready to take on the leadership issues, opportunities, and challenges that principals pass on to them; and who are willing to perform teachers' activities "beyond their arranged roles" (p. 19). Angelle and her colleagues proposed a four-factor model of teacher leadership based on previous research (Angelle & Beaumont, 2006; Angelle, Taylor, & Olivier, 2008) that includes 17 items. The teacher leadership inventory contains four factors. The first factor is shared professional knowledge (SPK), meaning that teachers are willing to share teaching knowledge and classroom management skills with colleagues. The second factor is shared leadership (SL), describing a perception of equivalence between principals and teachers. It is measured from two aspects: leadership opportunity (SLO) and leadership participation (SLE). The third factor is super practitioner (SP), showing that teachers are willing to undertake responsibilities beyond the scope of their organization. The fourth factor, principal choice (PC), measures the perception of which teachers can participate in leadership activities under the control of the principal. In sum, teacher leadership means that teachers are willing to take actions to promote student development, improve peer practice, and share the responsibilities of the principal, thereby improving the teaching environment.

### ***Basic working principle of information processing***

Information processing theory is used to understand individual perceptions of leadership. Information processing theory is one of the basic theories of cognitive psychology. It compares the human mind to a digital computer information processing model, processing information from the external environment or information already stored in the system (Bergou, Hillery, & Saffman, 2021; Guida, Caniato, Moretto, & Ronchi, 2023). The process refers to how people choose and receive information; how to encode, internalize, store, and retrieve information; and how to use this information to guide their behaviour in decision-making and so forth (Laari, Lorentz, Jonsson, & Lindau, 2023). Teachers in schools with complex social relationships will be surrounded by a variety of information. They need to process this information while performing their daily work. The process of individual information processing is the process of individual cognition. It is divided into three stages: receiving stimuli (using the sensory system), stimulus coding (using working memory, also called

short-term memory), and storing and retrieving information (using long-term memory; Goodwin & Ahn, 2010; Guo, Xia, Feng, Tan, & Xian, 2024).

The sensory system is the primary receiver of both short-term and long-term goals and needs. Information received from the external environment is screened in the sensory system and relevant information is sent to the short-term memory while irrelevant information is discarded (Guo et al., 2024). The function of the short-term memory is thus to make sense of the information passed on to it by locating existing knowledge structures or storage space from the long-term memory and then processing, assimilating, and modifying them into new information (Jantzi & Leithwood, 1996). If someone is working on a task, this is when the working memory (short-term memory) is used. In the meanwhile, information is encoded. It is like storing information on the hard drive of a computer where it is then uploaded as stored data to deal with tasks in the future.

Long-term memory capacity is unlimited (Jantzi & Leithwood, 1996). It contains previous information, and new information is transferred into it from short-term memory. However, short-term memory is a temporary storage system with limited capacity, so only a limited number of items can be retained and coded at a time (Bergou et al., 2021). If people want to save the information in the short-term memory, they need to repeat it. Otherwise, it will disappear in a few seconds. When the information is retained in the short-term memory, the knowledge in the long-term memory will be activated and transferred to the short-term memory and then integrated with the new knowledge (Guo et al., 2024).

One of the most important basic tasks of living organisms is to classify environmental stimuli (Rosch & Lloyd, 1975). Particularly, the social cognition literature shows that individuals have a natural tendency to classify others (Fiske & Taylor, 1991). Because individuals face tremendous cognitive pressure in the work environment, members of the organization will use their own implicit cognition to construct a simplified model to understand the events that occur in the organization. The leadership prototype is stored in the long-term memory of the human brain and corresponds to specific modules in the cognitive system (Guo et al., 2024; Lord, Foti, & De Vader, 1984). When people are exposed to environmental stimuli, they are accustomed to extracting the schema or knowledge structure related to the stimulus that already exists in the long-term memory system for perceptual matching with the stimulus (Lord & Maher, 1991).

Lord and his colleagues (Lord & Maher, 1991, 1993) noted that individuals usually adopt a recognition-based process and an inference-based process to form the perception of leadership. In a recognition-based process, an individual will judge the degree of matching between leadership and prototypes according to traits and behaviours of the object in the interaction. However, the object will be classified in accordance with organizational performance in the inference-based process. Moreover, Miner (2002) believed that individuals will process information through either automatic or controlled ways. The automatic processes are usually triggered by appropriate *stimulus*, are not constrained by cognitive resources, and do not require intentional attention. In addition, individuals can also use prototypes to classify targets automatically and quickly. Once classified, individuals will rely on the general impression of

the leader rather than specific behaviour to make judgments. The controlled processes require much more effort and willpower, as they involve carrying out logical reasoning and analysis of the obtained information (Shiffrin & Schneider, 1977).

In face-to-face communication, most of the cognitive processing is carried out using the automatic model; inference-based processes will adopt the controlled model when the stimulus is social communication information, which does not come from face-to-face contact. In inference processing, the automatic inference method is generally adopted when the object (e.g., leader) has outstanding performance or is closely related to successful events, namely, when individuals are surrounded by information needed, simplified casual analysis, and perceived guidance. For example, when leaders engage in behaviours that can enhance followers' intrinsic motivation and perceptions as insiders, they tend to improve the followers' belongingness and effectiveness (Yeh, Wang, Wang, Wan, & Chou, 2022). These are examples of inference-based processes of leading.

The controlled inference method is usually used to analyze information logically and in detail with potential complex causality. Automatic processing will emerge when information is overloaded. The recognition-based process and the inference-based process are not absolutely separate. The leadership prototype is formed through exposure to social events, interpersonal interactions, and previous experience, which means that the initial knowledge structure about the leader may be the result of the inference process. The prototype can also be changed due to special events and performance results (Jantzi & Leithwood, 1996). Similarly, Chiu, Balkundi, and Weinberg (2017) revealed that when leaders incorporate social networks and social power by possessing more positive bonds and fewer negative relationships, they are more likely to be recognized as leaders by their followers. This is an indication that leadership behaviours and experiences of social interactions are significant parts of the recognition and inference processes when determining how followers perceive leaders.

### ***How teacher's perceptions of teacher leadership are formed***

Based on the above theories, the study constructed a framework that illustrates how teachers' perceptions of teacher leadership are affected by unalterable and alterable variables. Among them, these variables are also divided into in-school and out-of-school variables. The variables come from key components obtained in the early research on the factors that affect school improvement (Leithwood, Dart, Jantzi, & Steinbach, 1993a, 1993b; Jantzi & Leithwood, 1996), combined with the district-oriented school running, which is the specific policy in the context of China (Wang & Xia, 2022). In the practice of district-oriented school running, most of the approaches adopted are inter-school alliances, that is, the school district will serve as a community that is a relatively loose organization. Unlike in the United States, school districts exist as a first-level educational administration unit between the state and the school. In the context of this policy, alterable variables include the conditions provided by the Ministry of Education, district, school, and community; in-school variables consist of school goals, culture, structure, program, instruction, policies, organization, and resources. These alterable variables are related to teacher experi-

ence, affecting the formation of a teacher's perceptions of teacher leadership (Jantzi & Leithwood, 1996). Unalterable variables include the demographic characteristics of teachers and leaders and the basic characteristics of the school including school size and school level (Liu, 2021; Wang & Xia, 2022).

Lord and Emrich (2000) point out that individual disparity such as gender will affect the formation of the leadership archetype. Different genders may have different expectations of the targeted object. Epitropaki and Martin (2004) found that compared with the male implicit leadership prototype, the female implicit leadership prototype contains more thoughtfulness, sincerity, and honesty, and fewer characteristics such as dominance, aggressiveness, and manipulation. Paris (2004) found that men value traits such as aggressiveness, competitiveness, and resilience more than women, while women value leadership traits such as participation, consideration, and self-confidence compared more than men. These characteristics are closely related to the teacher leadership prototype. Most of the dimensions of teacher leadership reflect female characteristics to a certain extent. Teachers' age, experience, and school level may also affect the formation of the prototype of teacher leadership in a similar way (Meirink, Van Der Want, Louws, Meijer, Oolbekkink-Marchand, & Schaap, 2020; Wang & Xia, 2022).

Angelle and DeHart (2011) point out that teachers of different teaching experiences, educational background, and executive levels formulated different perceptions of teacher leadership in their quantitative research. Moreover, Katzenmeyer and Moller (2009) acknowledge teachers' educational philosophies as elements influenced by their experience or the context in which they live. In literature, new teachers attach more importance to collaboration and knowledge sharing. This corroborates the findings of Meirink et al. (2020) that beginning teachers are very active in enacting leadership and that they perceive teacher leadership as a necessity for improving their skills and knowledge as well as for implementing new ideas. Camburn (2009) found that senior teachers with higher academic qualifications were more likely to assume formal leader roles. Similarly, Liu (2021) documents that female, experienced, and well-educated teachers make more decisions with or without having positions and are more likely to take formal leadership roles. To some extent, it can be inferred that older and more experienced teachers are more likely to develop bureaucratic and masculine leadership images. Although teaching is clearly a female-dominated profession, there is still gender disparity in terms of who should teach the specific subject, who can be the teacher, and who can be the school leader (Schott et al., 2020; Shen et al., 2020). The status of women in education management is still inconsistent with the proportion of women in the total population, and it is not commensurate with the number of women engaged in education. Most women are mainly concentrated in the ordinary faculty. In leadership positions, it is a common phenomenon that the proportion of men is higher than that of women. Although women's roles in the labour market have evolved alongside changes in the division of labour between the sexes, gender imbalance in leadership positions in the education field is still a prominent problem. This gender imbalance may reinforce the image of leadership as masculine and dominant (Lord et al., 1986). In addition, middle schools are usually larger than elementary schools. Therefore,

the images of leaders in higher-level schools and larger-scale schools may be more bureaucratic and administrative (Schott et al., 2020), which will also affect the development of teacher leadership perception.

All in all, the teacher's gender, age, experience, and school level will affect the development of the teacher leadership prototype, as shown below:

1. Compared with male teachers, female teachers are more likely to form teacher leadership prototypes that include features such as helping others, willingness to share, and strong participation.
2. Young and novice teachers are more likely to develop teacher leadership prototypes with characteristics such as helping others, willingness to share, and strong participation.
3. Compared with teachers in higher level and large-scale schools, teachers in elementary and small-scale schools are more likely to develop teacher leader prototypes with characteristics such as helping others, willingness to share, and strong participation.

### ***Process based on recognition***

Cognitive structures or schemas are stored in memory and activated when followers interact with leaders (Kenney, Schwartz-Kenney, & Blascovich, 1996; Mudrock, 2021). Followers match the characteristics of the target object with the prototype to decide whether to classify the target object as a leader. Personal characteristics such as the age and gender of the leader will affect the followers' perception of teacher leadership. Killingsworth, Cabezas, Kensler, and Brooks (2010) conducted three in-depth interviews with education leaders and included gender as a category for their analysis. They also emphasize the importance of differences in experience between men and women. Their research emphasizes that there is a male epistemological hegemony due to the exclusion of women's leadership experience.

According to Lord and Maher (1993), in the case of receiving insufficient social information, the subordinates will automatically adopt the female prototype in the face of a female leader, rather than the leader prototype. This initial cognitive processing is difficult to change; even after getting more information about the positive performance of female leaders, the deviation produced in the beginning will continue. Once an individual associates women with non-leader positions, this will persist for a long time. This association may affect the individual's reception of other information, thereby affecting the individual's classification of leaders. In addition, if a female leader is initially classified using a female archetype, then, at the same level of work performance, her final evaluation will be lower than the evaluation that can be obtained when initially classified using the leader archetype. It is also possible to exclude women as candidates for leadership in cognition (Lord & Maher, 1993).

The age of the leader also affects the process of leadership perception based on recognition. This is especially true in China, where traditionally age is respected, with the elderly taking a central position. Sociology professor Fei Xiaotong found that *Gerontokratie* (gerontocracy) widely exists in China's rural society (Kunze & Menges, 2017). The social basis of this kind of power dependence is the stable traditional norms owned by groups. These social norms are generally accepted by their group members. This norm uses age as an explicit criterion and experience as an

implicit criterion for authority. Although *Gerontokratie* disappeared to a certain extent over time, the pairing of elder leaders with younger subordinates continues to be widely recognized, influenced by Chinese Confucian culture. According to organizational age norms, obtaining the status of a superior manager usually requires extensive experience and training. However, with technological advances and the rise of the knowledge economy, more and more highly educated and highly technologically skilled employees are entering the labour market. This is a challenge to the traditional superior–subordinate relationship. However, the type of industry is also an important referential factor. Relatively young leaders might be more common and easy to accept in information technology organizations and young groups (Tsui, Porter, & Egan, 2002).

In sum, the gender and age of the leader might affect teachers' perception of teacher leadership as follows:

1. Compared with women, men are more likely to be regarded as leaders.
2. Veteran teachers are more likely to be regarded leaders, but if the age of the perceived object is too old, the possibility of being perceived as leader will decrease.

### ***Process based on inference***

The cognitive classification of leaders cannot only match the characteristics and behaviours of the target object with the leader prototype. It must also make causal and logical inferences based on specific events and performances by consuming more cognitive resources. This type of process requires long-term observation and sufficient opportunities for contact and communication. Therefore, a teacher's tenure within their school and the size of the school are particularly important. A teacher's long tenure in a school can provide sufficient time for them to observe their superiors. There will be more opportunities to participate in specific events led by the leader and to observe their final effect. In smaller schools, these events provide another convenient way for teachers to directly contact their superiors. Thus, teachers' tenure and school size will influence teachers' perception of teacher leadership as follows:

1. Teachers who have longer tenure within their school have more accurate perceptions of teacher leadership.
2. Teachers in smaller schools may have more accurate perceptions of teacher leadership.

## **Method**

### ***Instruments***

The research tools used in this study contained 68 items across three scales: the teacher leadership scale (see Appendix A) designed by Angelle and Dehart (2010), and the internal school's characteristics scale (see Appendix B), and the external school's characteristics scale (see Appendix C) from Leithwood et al. (1993a) and Jantzi and Leithwood (1996), respectively.

All scales adopt a five-point scoring method from *strongly disagree* (one point) to *strongly agree* (five points). In addition, the survey also collected data on teachers' relevant educational experience, length of experience, tenure, age, gender, school

level and size, and the gender and age of the targets whose leadership was perceived by the teachers.

### Participants

A total of 892 teachers participated in this survey and research. All teachers were informed that their participation was voluntary. Nineteen unqualified questionnaires were deleted from the study. A total of 873 valid questionnaires were obtained, and the questionnaire response rate reached 97.8 percent. The average value was used to fill in missing data. Specifically, in terms of grades, 268 (30.7%) teachers were from primary schools, 367 (42%) teachers were from secondary schools, and 238 (27.3%) teachers were from high schools. As for school size, 275 (31.5%) teachers were in large-sized schools, 313 (35.9%) teachers were in medium-sized schools, and 285 (32.6%) teachers were in small-sized schools. It should be noted that in China, large-sized schools have more than 3,000 students, medium-sized schools have between 2,000 and 3,000 students, and small-sized schools have fewer than 2,000 students. The demographics are presented in Table 1.

**Table 1: Descriptive statistics for independent and dependent variables (N = 873)**

| Variables   | Frequency | Percentage | Cumulative percentage |
|---|-----------|------------|-----------------------|
| <b>Unalterable variables—teacher characteristics</b>  |           |            |                       |
| <b>Gender</b>   |           |            |                       |
| Female  | 589       | 67.5       | 67.5                  |
| Male  | 284       | 32.5       | 100.0                 |
| <b>Age (years)</b>                                    |           |            |                       |
| 20–30   | 185       | 21.2       | 21.2                  |
| 31–40   | 224       | 25.7       | 46.8                  |
| 41–50   | 290       | 33.2       | 80.1                  |
| 51+   | 174       | 19.9       | 100.0                 |
| <b>Teachers' lengths of experience (years)</b>        |           |            |                       |
| Under 5   | 157       | 18.0       | 18.0                  |
| 6–10  | 108       | 12.4       | 30.4                  |
| 11–20   | 233       | 26.7       | 57.0                  |
| 21+   | 375       | 43.0       | 100.0                 |
| <b>Teachers' tenure in school (years)</b>             |           |            |                       |
| Under 5   | 285       | 32.6       | 32.6                  |
| 6–10  | 154       | 17.6       | 50.3                  |
| 11–20   | 275       | 31.5       | 81.8                  |
| 21+   | 159       | 18.2       | 100.0                 |
| <b>Unalterable variables—school's characteristics</b> |           |            |                       |
| <b>School's level</b>                                 |           |            |                       |
| Primary school  | 268       | 30.7       | 30.7                  |
| Intermediate school                                   | 367       | 42.0       | 72.7                  |
| Senior high school                                    | 238       | 27.3       | 100.0                 |
| <b>School's size (# students)</b>                     |           |            |                       |
| 300–1000  | 42        | 4.8        | 4.8                   |
| 1001–2000   | 243       | 27.8       | 32.6                  |
| 2001–3000   | 313       | 35.9       | 68.5                  |
| 3001+   | 275       | 31.5       | 100.0                 |

**Table 1 (continued)**

| Variables                                      | Frequency | Percentage | Cumulative percentage |
|--|-----------|------------|-----------------------|
| Unalterable variables—teachers characteristics |           |            |                       |
| Teachers' gender                               |           |            |                       |
| Female   | 357       | 40.9       | 40.9                  |
| Male   | 516       | 59.1       | 100.0                 |
| Teachers' age (years)                          |           |            |                       |
| 20–30  | 28        | 3.2        | 3.2                   |
| 31–40  | 232       | 26.6       | 29.8                  |
| 41–50  | 501       | 57.4       | 87.2                  |
| 51+  | 112       | 12.8       | 100.0                 |

**Data analysis**

SPSS Statistics version 23 was used to perform descriptive statistics correlation and regression analysis and to test reliability. AMOS version 22 was used to conduct confirmatory factor analysis.

**Construct validity and reliability of the scales**

The four-factor model demonstrated that the model fit index was not high ( $\chi^2/df = 11.031$ , CFI = 0.929, TLI = 0.915, RMSEA = 0.107). The model of in-school characteristics within the school displayed as follows:  $\chi^2/df = 10.689$ , CFI = 0.895, TLI = 0.886, RMSEA = 0.105. The model of out-of-school characteristics displayed as follows:  $\chi^2/df = 25.392$ , CFI = 0.901, TLI = 0.879, RMSEA = 0.167. According to the adjustment information feedback from the model, the relationship between the residuals was adjusted. Because the item's residuals under the same dimension had different degrees of correlation, in the four-factor model the correlation of the residuals was added to items 1 and 2, items 7 and 8, items 9 and 10, and items 10 and 11. The correlated residuals might be due to the specific items within the dimension that are similar, thereby sharing variance beyond the general construct (Michels, Bingham, Luben, Welch, & Day, 2004). Thus, the model fit well with the data after revision ( $\chi^2/df = 7.621$ , CFI = 0.955, TLI = 0.944, RMSEA = 0.087). In the model of in-school characteristics, the correlated measurement error was added to items 5 and 6, items 7 and 8, items 9 and 10, items 19 and 20, items 20 and 21, items 21 and 22, items 22 and 24, and items 23 and 24. The model fit well with the data after revision ( $\chi^2/df = 8.567$ , CFI = 0.919, TLI = 0.911, RMSEA = 0.093). In the model of out-of-school characteristics, the correlated measurement error was added to terms 4 and 5, items 6 and 7, items 8 and 9, items 9 and 10, items 12 and 13, items 13 and 14, items 12 and 14, and items 13 and 14. The model fit well with the data after revision ( $\chi^2/df = 9.153$ , CFI = 0.970, TLI = 0.959, RMSEA = 0.097). The correlated measurement error in the in-school characteristics and out-of-school characteristics indicate that multiple items share a common method of measurement, thereby exhibiting correlated residuals (Michels et al., 2004).

The reliability of the teacher leadership met measurement requirements. The internal consistency coefficient of each sub-dimension was 0.976, 0.936, 0.957, and 0.649, and the internal consistency coefficient of the total dimension was 0.928. The reliability of the in-school characteristics met requirements. The internal consistency

coefficient of the total dimension was 0.979. The reliability of the out-of-school characteristics met measurement requirements. The internal consistency coefficient of the total dimension was 0.992.

*How much of the variation in teachers' perceptions of teacher leadership is accounted for by unalterable, compared with alterable, variables?* Table 2 displays the results of the regression analysis performed to answer these questions. When unalterable variables were first entered into the regression, the result revealed that the combined alterable and unalterable variables explained 62 percent of the total variation in teachers' leadership perception. Of this 62 percent, about 1.8 percent was accounted for by unalterable variables, whereas 60.2 percent was accounted for by alterable variables. Based on this research finding, alterable variables were more influential in the process of the formation of teachers' teacher leadership perception. This finding is consistent with the findings of Chiu et al. (2017), who report that followers' perceptions of leadership ability was influenced by the followers' experience of the interactions between them and the leaders. Similarly, Yeh et al. (2022) report that leadership attitudes such as good climate, caring, and empowering followers influenced how followers perceived their leaders' qualities. These past findings affirm the findings of this present study about the highly influential ability of alterable variables in the formation of teachers' perception about teacher leadership.

**Table 2: Effects of alterable variables on teachers' perceptions of teacher leadership after controlling unalterable variables**

|                                    | Unalterable variables |                   |       | Alterable variables |                   |             | Total          |     |
|------------------------------------|-----------------------|-------------------|-------|---------------------|-------------------|-------------|----------------|-----|
|                                    | Multiple R            | R <sup>2</sup> ch | Fch   | Multiple R          | R <sup>2</sup> ch | Fch         | R <sup>2</sup> | df  |
| Teacher leadership (TLI)           | 0.133                 | 0.018             | 1.95* | 0.776               | 0.602             | 1315.467*** | 0.620          | 872 |
| Shared professional knowledge (SE) | 0.127                 | ns                | 1.762 | 0.727               | 0.529             | 977.892***  | 0.545          | 872 |
| Shared leadership (SL)             | 0.124                 | ns                | 1.680 | 0.795               | 0.632             | 1494.434*** | 0.647          | 872 |
| Super practitioner (SP)            | 0.096                 | ns                | 1.007 | 0.720               | 0.518             | 936.067***  | 0.527          | 872 |
| Principal choice (PS)              | 0.117                 | ns                | 1.498 | 0.418               | 0.175             | 184.196***  | 0.189          | 872 |

Note: \*\*\*.P <= 0.001

*Are there differences among the perceptions of individual teacher leadership dimensions, and do alterable variables have a different influence on them compared with unalterable variables?* As indicated in Table 3, alterable and unalterable variables can significantly influence different dimensions of teachers' perception of teacher leadership. However, alterable and unalterable variables have the smallest effects on the dimension of principal choice compared with other dimensions. The combined alterable and unalterable variables can explain 64.7 percent of variation of the shared leadership dimension of teacher leadership. Table 4 describes the results of the regression analysis. There was only a 7 percent difference in understanding of the variation among the three independent variables (7%, 2%, 0%).

**Table 3: Correlations between independent and dependent variables**

|  | Shared professional knowledge (SE) | Shared leadership (SL) | Super practitioner (SP) | Principal choice (PS) | Teacher leadership (TLI) |
|--|------------------------------------|------------------------|-------------------------|-----------------------|--------------------------|
| <b>Alterable variables</b>                   |                                    |                        |                         |                       |                          |
| Out-of-school                                | .748**                             | .812**                 | .731**                  | -.409**               | .798**                   |
| Within-school                                | .595**                             | .664**                 | .608**                  | -.387**               | .634**                   |
| <b>Unalterable variables—school</b>          |                                    |                        |                         |                       |                          |
| Level  | 0.010                              | 0.029                  | 0.033                   | -0.039                | 0.019                    |
| size   | -.079*                             | -.095**                | -0.049                  | -0.015                | -.103**                  |
| <b>Unalterable variables—teacher</b>         |                                    |                        |                         |                       |                          |
| Gender                                       | 0.002                              | 0.014                  | 0.010                   | -0.056                | -0.015                   |
| Age  | -0.013                             | -0.017                 | -0.022                  | 0.031                 | -0.004                   |
| Years of teaching experience                 | 0.006                              | -0.021                 | -0.017                  | 0.064                 | 0.013                    |
| Years of tenure in school                    | 0.024                              | 0.022                  | 0.022                   | 0.014                 | 0.033                    |
| <b>Unalterable variables—targeted object</b> |                                    |                        |                         |                       |                          |
| Gender                                       | -0.014                             | 0.005                  | -0.020                  | -0.021                | -0.015                   |
| Age  | .092**                             | 0.052                  | 0.054                   | 0.005                 | .084*                    |

Notes: \*\*.P <= 0.01; \*.P <= 0.05

Are there differences among individual teacher leadership dimensions in their sensitivity to different sets of unalterable demographics variables? Table 4 depicts the results of the regression analysis that answered this question. The table shows that there were very small differences (1% to 6%) among the individual teacher leadership dimensions. Each unalterable variable only explained a very small amount of variance among these dimensions. This might be because teacher leadership has been found to be an effective leadership practice regardless of the demographics or characteristics of teachers (Shen et al., 2020; Nguyen et al., 2020). Moreover, the current global technological revolution and knowledge economy might have also impacted the Chinese culture of using age as an explicit criterion for experience and authority (Kunze &

**Table 4: Effects of unalterable organizational, principal, and teacher characteristics on teachers' perceptions of teacher leadership**

|                                    | Organizational effects  |        | Principal effect        |         | Teacher effect          |         | Total effect   |       |     |
|------------------------------------|-------------------------|--------|-------------------------|---------|-------------------------|---------|----------------|-------|-----|
|                                    | R <sup>2</sup> (Unique) | F      | R <sup>2</sup> (Unique) | F       | R <sup>2</sup> (Unique) | F       | R <sup>2</sup> | R     | df  |
| Teacher leadership (TLI)           | 0.007                   | 3.244* | 0.007                   | ns      | 0.003                   | ns      | 0.018          | 0.133 | 872 |
| Shared professional knowledge (SE) | 0.004                   | ns     | 0.011                   | 4.641** | 0.002                   | ns      | 0.016          | 0.127 | 872 |
| Shared leadership (SL)             | 0.008                   | 3.666* | 0.003                   | ns      | 0.002                   | ns      | 0.015          | 0.125 | 872 |
| Super practitioner (SP)            | 0.002                   | ns     | 0.003                   | ns      | 0.003                   | ns      | 0.009          | 0.096 | 872 |
| Principal choice (PS)              | 0.002                   | ns     | 0.000                   | ns      | 0.013                   | 2.2822* | 0.014          | 0.117 | 872 |

Notes: \*\*.P <= 0.01; \*.P <= 0.05

Menges, 2017; Tsui et al., 2002), leading to less effects of age and gender on teachers' perception of teacher leadership.

Regarding the total variation in leader perceptions accounted for by alterable variables, what proportion was contributed by in-school, compared with out-of-school, variables? Table 5 reports the results of the regression analysis that answered this question. This analysis showed that in-school conditions explained 40.2 percent of the variation in leader perceptions explained by the alterable in-school variables; the remaining 15 percent was explained jointly by in-school and out-of-school conditions.

Are there differences among individual teacher leadership dimensions in their sensitivity to different sets of alterable variables? The information in Table 5 answers this question. Five dimensions of teacher leadership were affected by the in-school factors from a moderate to a minor level. The dimension of principal choice was less sensitive to the unalterable and alterable variables within schools. Out-of-school variables did not explain a unique proportion of perceived differences, and there were no differences in the sensitivity of the personal leadership dimension among the results.

**Table 5: Effects of alterable in-school and out-of-school variables on teachers' perceptions of teacher leadership**

|                                    | In-school-effects       |            | Out-school-effects      |             | Total effects  |       |     |
|------------------------------------|-------------------------|------------|-------------------------|-------------|----------------|-------|-----|
|                                    | R <sup>2</sup> (Unique) | F          | R <sup>2</sup> (Unique) | F           | R <sup>2</sup> | R     | df  |
| Teacher leadership (TLI)           | 0.402                   | 584.485*** | 0.637                   | 1530.868*** | 0.642          | 0.801 | 872 |
| Shared professional knowledge (SE) | 0.355                   | 478.459*** | 0.560                   | 1108.991*** | 0.564          | 0.751 | 872 |
| Shared leadership (SL)             | 0.440                   | 685.390*** | 0.659                   | ns          | 0.660          | 0.812 | 872 |
| Super practitioner (SP)            | 0.369                   | 509.943*** | 0.534                   | 998.268***  | 0.731          | 0.534 | 872 |
| Principal choice (PS)              | 0.150                   | 153,248*** | 0.167                   | 174.931***  | 0.174          | 0.417 | 872 |

Note: \*\*\*,  $P < 0.001$

### Summary and conclusion

The purpose of this study was to develop and partially examine a theoretical understanding of how teachers' perceptions of teacher leadership are formed. Leadership is regarded as an influence process, and so it is also a perception process on the part of followers (Jantzi & Leithwood, 1996). Perceptions of teacher leaders are crucial for education change, as teacher leaders are more and more important in the education improvement process. This line of research would suggest that school leaders should be conscious of the perception of teacher leadership for improving the effectiveness of leadership and school improvement.

The knowledge of teachers' teacher leadership perception has been insufficiently explored in literature. In particular, the process through which these perceptions are developed and the alterable and unalterable factors that influence them is underexplored.

The theoretical framework of this study was based on the work of Lord and Maher (1993). It included alterable organizational factors and unalterable variables

relevant to the characteristics of teachers, school leaders, and the school organization. It was hypothesized that these factors can influence teachers' teacher leader perception through recognition and inference.

The testing of this model was conducted based on survey results from China. The model used in this study explained a considerable proportion of the variation in teachers' perceptions of teacher leadership. Alterable variables in the model could explain 62 percent of the explained variation in teachers' teacher leadership perception.

## Implications

The results showed that the collective alterable and unalterable variables portrayed 62 percent of the total variation in teachers' leadership perception. Of this 62 percent, about 1.8 percent was reported for unalterable variables, but 60.2 percent was described for alterable variables. Based on the research results, alterable variables were more powerful in the process of developing teachers' teacher leadership perception. This implies that school principals can take more actions to control organizational factors in order to enhance teachers' perceptions of teacher leadership for the purpose of improving leadership effectiveness in the education context.

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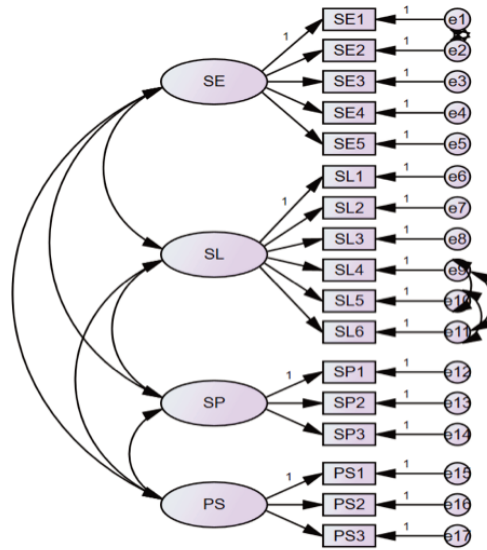
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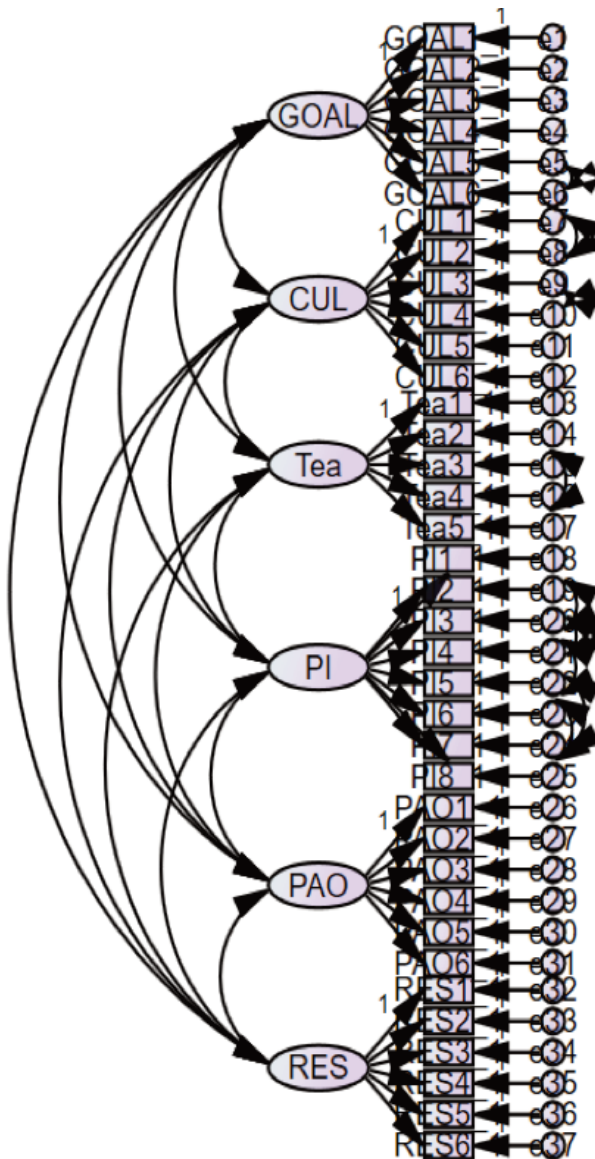
Appendix A: Teacher leadership scale

Liu, Liu, & Adeniji

Variation in Teachers' Perceptions of Teacher Leadership



Appendix B: Internal school characteristics scale



Appendix C: External school characteristics scale

