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The Effect of Faculty Leadership Style on the Results of Student Evaluation of Teachers

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THE EFFECT OF FACULTY LEADERSHIP STYLE ON THE RESULTS OF STUDENT EVALUATION OF TEACHERS

by

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"Seek Knowledge from the cradle to the grave."

--- The Prophet of Islam

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DEDICATION

To God.

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Mohammad Sadeq Sohrabie

University of the Incarnate Word, 2020

Higher education administrations use student evaluation of teacher (SET) frequently as a performance metric for instructors and professors. Many decisions are being at least partially made based on SET results such as recruiting, retention, and promotion decisions. SET has been subject of many studies but just recently leadership style is being studied as a factor affecting SET. Research shows instructors' transformational leadership in classrooms can lead to more effective and efficient classrooms, which in turn yields higher student satisfaction and academic gains. In this Study, the relationship between SET and transformational/transactional leadership style has been examined using structural equation modeling. The leadership data has been collected using infamous MLQ questionnaire. Testing the construct validity of the MLQ factors used in this study, using confirmatory factor analysis indicated that the original construct proposed by developers of MLQ cannot be applied in a higher education setting. The results indicate that the perception of undergraduate student from leadership style of instructors has no significant effect on SET. However, the difference between student and instructor perception from the (self) leadership style of the instructor can significantly define SET.

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Chapter 1: Introduction to the Research

Institutions of higher education utilize human resources in large scales to perform a variety of tasks essential to organizational functions. Institutional operations such as instruction, student development, health and wellness, professional development, academic research and scholarship, financial management, and community service are influenced by students, faculty, staff, alumni, the surrounding community, and local, state, and federal governments. Many positions within these institutions require leadership traits and skills to ensure effective, high quality, and efficient processes occur to advance the institution's mission and yield desired outcomes. Knowledge of leadership skills and traits helps leaders work actively to achieve their objectives. This helps to refine employment recruiting and training strategies critical to the pursuit of their mission. Thus, it is imperative for higher education administrators, instructors, and professional staff to be aware of evidence-based practices that better serve students (Davies, Hides, & Casey, 2001). An example of one such beneficial practice is the classroom leadership style of higher education instructors. Research shows transformational leadership in classrooms can lead to more effective and efficient classrooms, which in turn yields higher student satisfaction and academic gains (e.g. Bolkan & Goodboy, 2009; Hallinger & Heck, 2005, 2010; Leithwood, & Jantzi, 2006; Pounder, 2006).

This is of utmost importance for classroom instruction, which is designed to prepare students for careers and advanced study. Teachers not only impart knowledge and information to students, but also challenge and support students to think critically and problem solve. They are directly responsible for creating environments that foster knowledge and encourage growth and development. These practices directly involve leadership. The idea of teacher leadership has emerged in the literature mostly within the last three decades (Little, 2003). Little (2003)

discusses teachers in a leadership position with the idea of empowering them. Pounder (2006) discusses how teacher leadership has developed over time and describes this development in what he calls the three waves—managerial, instructional, and teaching and leadership. These waves were developed primarily by Silva, Gimbert, and Nolan (2000). In the managerial wave, teachers are in the organizational structure and a teacher leader manages other subordinate teachers to operate business as usual. In this wave, teachers are equated to employees in any other type of organization. The second wave emphasizes the instructional dimension of the teacher, but still considers teacher leadership in a formal organizational context such as team leaders. This wave is also known as the *remote controlling of teachers*. In the third wave, teacher leadership incorporates both teaching and leadership. Teacher leadership is a process rather than a concept and recognizes teachers should have the opportunity to demonstrate their leadership capabilities. As an example, Wasley (as cited in Silva et al. 2000) defined teacher leaders as those who "help redesign schools, mentor their colleagues, engage in problem-solving at the school level, and provide professional growth activities for colleagues" (p. 5). Pounder (2006) concluded that teacher leaders employ a transformational leadership style. However, he acknowledges there is a need for more empirical studies to establish this link. He also proposed to investigate this notion in organizations other than PK-12 schools such as higher education institutions. As a result, the emergent questions are: How is leadership manifested in teachers in higher education institutions? and Is transformational leadership the dominant leadership style held by college and university faculty members? As will be demonstrated in this research, a review of literature showed that transformational leadership style of higher education instructors has a direct effect on main classroom outcomes (Bolkan & Goodboy, 2009; Hallinger, 2003; Leithwood, & Jantzi, 2006; Pounder, 2008; Treslan, 2006). Literature in this field mainly focuses

on the leadership style of teachers from perspectives of the students. However, this research tries to combine the student and instructors' perspective of the leadership style of instructors inside classrooms.

Statement of the Problem

In the literature, transformative teachers often referred to teachers who use their transformative leadership skills to influence students and other teachers outside of classrooms (Baker-Doyle, 2017; York-Barr & Duke, 2004). Thus, better understanding how transformative leadership skills are used inside of classrooms could be useful to determine if a correlation exists between transformative leadership and student satisfaction. With changes to teacher expectations, curriculum standards, PK-12 school and school district rating systems, teacher evaluations, and more, teachers face ever increasing responsibility that changes as local, state, and federal education policy changes. In addition, today's students are different, and their needs are different. The ways in which teachers instruct, communicate, and lead are essential to student learning and building and maintaining relationships with parents, families. Thus, the leadership skills and communication skills of teachers are more critical to understand.

Pounder (2006) studied leadership styles in classrooms and suggested further investigation into two fundamental assumptions. One suggestion was to better understand how a classroom may be like a small social organization allowing for leadership style to be examined and its effects on student outcomes and student satisfaction. The second suggestion was to establish a correlation between classroom leadership style and teacher leadership notion. Therefore, this study focuses on blended those two suggestions and investigating how college students, as reported in student evaluation of teacher (SET) and perceive the leadership style of their teachers. Specifically, this research wants to answer the following research question: Is

there a meaningful relationship between the SET scores (as the dependent variable) and leadership style factors? Moreover, is there a meaningful relationship between SET and leadership style factors and other independent variables such as student grade point average, and grade expectation at the end of the semester?

Adhikary (2017), who examined the relationship between leadership style factors and faculty effectiveness and satisfaction from faculty using MLQ, utilized a mediation analysis for her examination. In her work, she used self-rating from faculty to measure leadership factors. She recommended approaching the same study from student perspective as well. However, there were issues and limitations in the works of Pounder (2006) and Adhikary (2017). They both collected data from Asian universities, so naturally, both recommended examining the relationship between leadership style (factors) and SET in a different geographical setting with different student characteristics and cultural influences. Given there has been some other works on confirming the validity of the Multifactor Leadership Questionnaire (MLQ) factors (Antonakis, Avolio, & Subrasubramaniam, 2003; Muenjohn & Armstrong, 2008), these two studies assumed the MLQ is a valid instrument and is measuring what it is designed to measure. This is a valid assumption, but there are some works demonstrating MLQ factors may not be as valid in every context (Boamah, & Tremblay, 2019; Edwards, Schyns, Gill, & Higgs, 2012; Heinitz, Liepmann, & Felfe, 2005; Tejeda, Scandura, & Pillai, 2001).

Education is a complex system and needs more complex research methods to address issues related to educational leadership and policy (Ghaffarzadegan, Larson, & Hawley, 2017). Pounder (2006) used correlation analysis and Adhikary (2017) used a simple mediation method to examine their hypothesis. From the standpoint of the complex system theories, these two methods are too simple and simplistic (Roth, 2017).

Purpose of Study

This research focuses on the effect of college instructors' classroom leadership style and the differences between the perceptions of college students and faculty as indicated in SET. The purpose of this research is to examine whether transactional/transformational leadership factors, being captured by MLQ, can explain the variance in SET results when controlling the covariance of the study (e.g. student age, gender differences, course difficulty, and expected grade at the end of the semester for the same course). As a primary stage for this study, we have to re-establish the factors offered by MLQ are valid to be used in the higher education context. Plus, if the differences on the perception of leadership, from perspective of students and teacher can predict the SET scores controlling for the same covariates.

This project, which is based on two previous scholarly works by Pounder (2006) and Adhikary (2017), also examines their works in U.S. based higher education institutional context to utilize more complex methodology to explain the structure based on a valid construct. The researcher also seeks to add to the limited body of the scholarly works, researching the effect of leadership style on SET.

Research Study Significance

By studying classroom leadership skills and styles, this research enriches literature on beneficial approaches to classroom instruction at the higher education level. Moreover, it lends itself to identifying effective methods and theories related to student satisfaction in the college classroom and SET. The intent is for faculty to use more effective classroom leadership and high quality instructional techniques in order to enhance student relationships that foster dynamic learning environments.

Definition of Key Terms

Student evaluation of teacher: A mechanism used to measure and improve teaching and learning. “The survey usually employs the use of questionnaire items to evaluate teacher effectiveness and various areas of the course” (Chan, Luk,, & Zeng, 2014, p. 275). They are usually conducted at the end of each semester by the university. The most common forms include the satisfaction of students from a teacher in the classroom and the students’ perception of the instructor’s personality (Clayson & Sheffet, 2006).

Transactional leadership: Focuses on the exchanges that occur between leaders and their followers for compensation or avoidance of punishment (i.e. instructors and students) (Bass, Avolio, Jung, & Berson, 2003; Podsakoff, Todor, & Skov, 1982). “The exchange dimension of transactional leadership is very common and can be observed at many levels throughout all types of organizations” (Northouse, 2016, p. 162).

Transformational leadership: Northouse (2016) define this type of leadership as

> “the process whereby a person engages with others and creates a connection that raises the level of motivation and morality in both the leader and the follower (i.e. instructor and student). This type of leader is attentive to the needs and motives of followers” (p. 162).

The expectation is transformational leaders enhance the performance capacity of their followers by raising expectation bars and encouraging them to face more difficult challenges (Avolio, 1999; Bass, 1999).

Theoretical Framework and Definitions

Being exposed to effective instructional techniques and an engaging classroom environment is more meaningful and important than only facilitating the learning process. Exposure to effective classroom environment across all the time a student may spend in college classes appears to increase the general cognitive ability of the student (Pascarella, Seifert, &

Whitt, 2008). Pounder (2014) reminded us the transformational leadership classroom should be considered as the major motivational and influential factor rather than motivation from traditional rewards and punishments methods available to the "boss."

One way of measuring faculty members' teaching performance is through SET surveys. SET has been used mainly as a tool to judge teachers and decide about their future as a teacher or their progress in academic rankings (Ramsden, 2003). In return, teachers tend to use the results of the SET to argue for promotion or securing their jobs (Zabaleta, 2007). Marsh (2007) argued SET should be used for systematic feedbacks to teacher and a diagnostic tool for teachers' effectiveness. Noting Marsh's (2007) argument, instructors should be able to utilize SET results to increase their classroom effectiveness. Instructors may find SET results useful if SET, which is from the perspective of students, extend their knowledge. In other words, if SET's are filled by both students and instructors, the results should not be the same in order to have some benefits for the instructor. Based on literature (Adhikary, 2017; Pounder, 2003; 2006), classroom leadership styles can influence the effectiveness of the classroom. According to Adhikary (2017), transformational leadership of instructors in classrooms can predict both higher teacher effectiveness and student satisfaction (both directly and also through teacher effectiveness) from the perspective of students. In her research, student satisfaction and teacher effectiveness have been measured using the university SET questionnaire.

The hypothesis is transformational leadership style leads to higher SET scores. Understanding classroom leadership style from the perspective of both teacher and student can influence classroom effectiveness. However, for the SET results to be informative, there needs to be differences between students' perception of the teacher leadership style than the perception of the teacher by herself. Leadership Precision Score (LPS) is the variable that not only reflects the

leadership style, but also notices the differences between the perception of teacher and students. To measure the classroom effectiveness, this study utilizes the SET scores. To control for other factors influencing the SET scoring, I have selected a handful of variables that according to literature can actively affect SET scores as covariates of the regression model.

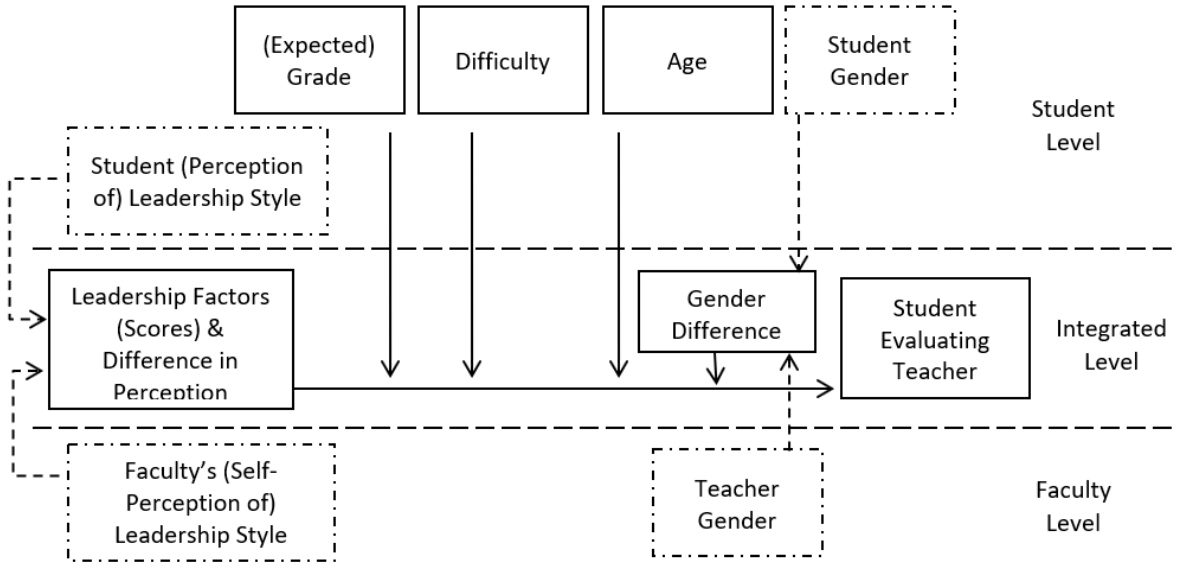

Figure 1. The conceptual framework of the research, factors influencing SET.

Research Questions and Design

The overarching research question asks if there is a meaningful relationship between SET scores (SET total as the dependent variable) and transactional or transformational leadership factors captured by the MLQ questionnaire as independent exogenous variables, controlling for covariates of the study student age, student expected grade for end of the semester, students' perception of course difficulty, and gender difference between faculty and student.

For this research, an empirical positivist quantitative approach is taken to test the conceptual framework. The positivist approach is the appropriate method for correlational studies (Taylor & Medina, 2013).

Research hypotheses for this project are as follow:

Research Question 1: Are the MLQ transactional and transformational leadership factors conceptually and empirically independent and valid?

H_0:

$$\chi^2_{Base\ Model} = \chi^2_{Fitted\ Model}$$

Research Question 2: Do the MLQ transactional and transformational leadership factors predict SET scores?

H_0: The model under consideration fits the data.

Research Question 3: Do the MLQ transactional and transformational leadership rrabie-perception difference, between faculty and students predict SET scores?

H_0:

$$\beta_0 = .0\ (p < 0.05)$$

Concluding Thoughts

In Chapter 1, an outline was provided and a general overview of the research. By investigating the relationship between leadership style from different perspectives and SET results, the intent is to inform higher education faculty and administrators to use classroom leadership as a strategy to increase faculty effectiveness in classrooms. Subsequently, this should increase student satisfaction by providing them a richer academic learning environment. In Chapter 2, a review of relevant literature is provided pertaining to leadership, effective leadership, transformational and transactional leadership styles, SET, and factors effecting SET. This will help build a foundation and basis for the theoretical framework of the research.

Chapter 2: Literature Review

There are two roles assumed for teachers, an instructional role and a leadership role in different situations (classroom, school, and society), and at formal and informal capacities (Neumerski 2013; Sebastian, Allensworth, & Huang, 2016). In this study, the leadership style of college instructors in the classrooms and its effects on student satisfaction and classroom efficacy will be investigated by using Student Evaluating Teacher scores (SET) as an outcome of the classroom. In this chapter, the purpose is to elaborate on the definition of leadership, in general, and transactional and transformational leadership specifically. Furthermore, insight from studies by other researchers measured the leadership style to choose a proper instrument for data collection. On another note, this chapter describes works by other scholars on SET and the relationship between leadership style and SET. This review of literature will help with shaping sound theoretical and conceptual models, designing a proper research and analysis method, and selecting appropriate data collection instruments.

Overview of Leadership Literature

There are numerous definitions for leadership with varying philosophical foundations. Yukl (1989) explained nearly everyone has defined leadership based on his/her/zir perspective and research interest. Stogdill (1974) states, “there are almost as many definitions of leadership as there are persons who have attempted to define the concept” (p. 7). Leadership has been defined in terms of traits and skills, leaders, patterns, role relationships, perceptions, followers, goals, process and organizational culture. For example, Robbins and Judge (2011) defined leadership as the ability to influence people to achieve a common objective. Another example takes a process perspective. Smircich and Morgan (1982) leadership happens where “one or more individuals attempt to frame and define the reality of others” (p. 258). Greenleaf and

Spears (2002) considered leaders as servants of their followers, and by this, introduced the concept of servant leadership in the 1970s.

Winston and Patterson (2006) had an integrative review on the definition of leadership in literature. In their review, they recognize more than 100 leadership dimensions in terms of personality and traits (i.e. being creative and flexible), functions and tasks (e.g. bringing people together or leading the way), and skills (i.e. problem-solving). All of these dimensions are required for leaders based on definitions of *leadership* or *leader* in more than 160 literature sources since 1927 (Winston & Patterson, 2006). These many researchers did not offer a solid definition of leadership. Instead, they invite readers to interpret as they read and to grasp an understanding of leadership by looking at the dimensions of leadership identified in their work. Yukl (1989) discusses how some theorists limited the definition of leadership to only influencing people in a way that results in an enthusiastic commitment by followers. He stated how these theorists focus on willingly committing rather than indifferent compliance or reluctant obedience. Some argue a person who uses authority and control to manipulate or force followers is not “leading" them or practicing leadership skills. Yet, there is an opposing view that considers this definition too restrictive. From this perspective, researchers argue it excludes influence, which is important to understanding why a leader is effective or ineffective in certain situations. These scholars argue the definition of leadership should not be including a pre-judged answer to the research question of what makes a leader effective or not. Yukl (1989) also brought up a good point about the controversy between management and leadership. Some researchers stated the two are qualitatively different, even mutually exclusive. A classic example is Bennis (1993) who discussed “managers are people who do things right and leaders are people who do the right

thing" (p. 78). Another example is Zaleznik (2003) who suggested managers are concerned about how things get done while leaders are concerned with what things mean to people.

Nahavandi (2012) stated leadership definitions share three common elements: a group phenomenon, goal-directedness and action-oriented, and the presence of hierarchy within a group. She believed there cannot be a leader if there is no follower, so leadership is a phenomenon that only exists if there is a group. According to Nahavandi (2012), leaders use their influence on their followers to guide them toward taking certain actions and achieving designated goals. She also said leadership brings hierarchy with itself, which can be strict and formal or flexible and informal.

In this section, I briefly tried to define leadership from perspectives of different scholars from different eras. What they had in common was the role of human in the definition of leadership which I am getting bolder as we progress. The leadership definition moves from getting things done to getting things done to provide meaning for people in an effective way. In the next part, I will narrow the definition furthermore into defining effective leadership.

Effective Leadership

Literature on leadership broadly helps to frame effectiveness. However, it is important to distinguish what constitutes to effective leadership. People can occupy leadership positions and engage in leadership practices, yet not be effective, produce positive results, or lead a healthy environment. Effective leadership is especially important in the context of an academic college classroom. Just as effective teaching is desired for academic environments, effective leadership is relevant to the classroom. Same as the definition for leadership, effective leadership can be defined in different ways (Nahavandi, 2012). Fiedler and Garcia, (1987) defined leadership effectiveness from the group and organizational perspective. From this perspective, a leader is

effective when the organization being led is considered effective and successful (Fiedler & Garcia, 1987). Research findings (Carson, Tesluk, & Marrone, 2007) suggested developing strong organizations and strong internal leadership patterns within their teams could boost effectiveness.

Robert House (1996), in his Path-Goal theory, considered follower satisfaction the primary factor in measuring leadership effectiveness. Podsakoff, MacKenzie, Moorman, and Fetter (1990) studied the effect of transformational leaders' behaviors on organizational citizenship behaviors. They found the effect is indirect. The authors consider follower trust and satisfaction on leader behavior to be the mediator on organizational citizenship behaviors.

Other researchers like Bass (1999) and Bennis and Nanus (1985) who mostly worked on transformational theory, considered the ability to change organizations and followers as a definition of effectiveness for leaders. In a study by Avolio, Bass, and Jung (1999) effective leaders were those who consider themselves as having a transformational rather than transactional leadership style, based on data collected by the multifactor leadership questionnaire (MLQ).

Yukl (2013) in his book, which has described by its publisher as an exploration of what makes an effective leader, suggests effectiveness has roots in three basic leadership elements: teamwork, leader-follower relationship, and leader personality and skills. He proposed effective team building increases cohesiveness, cooperation, and group identification, which in turn could lead to effective leadership. He also shared personality traits are relevant to successful leadership. For example, energy level, stress tolerance, self-confidence, internal control orientation, and emotional intelligence are personal traits that help build effective leadership. Yukl (2013) also talked about follower role in developing effective leadership practices.

Specifically, he mentioned some leadership theories developed centering this idea, like leader-member exchange theory, leader attributions about subordinates, follower attributes and implicit theories, follower contributions to effective leadership, and social learning theory (self-management). Yukl (2013) emphasized that influence is the essence of leadership.

Recently, researchers talk more about elements or factors of effective leadership. George (2000) argues emotional intelligence contributes to effective leadership (see also Caruso, Mayer, & Salovey, 2001), and relates emotional intelligence to the essential elements of effective leadership. These essential elements, from George's perspectives, include developing common goals and objectives, being impressed by others' knowledge and appreciation of work activities and generating and maintaining excitement, confidence, cooperation, and trust. Palmer and his colleagues considered emotional intelligence as a tool for identifying potentially effective leaders and as a tool for developing effective leadership skills (Palmer, Walls, Burgess, & Stough, 2001).

Nahavandi (2012) stated just as the definition of leadership varies greatly based on the perspective of different researchers, so do the definitions for leadership effectiveness or effective leaders. She proposed there is a common thread among many definitions and the focus on the outcome. She argued process issues or skills like follower satisfaction are "rarely primary indicators of effectiveness." She also recommends effective leadership as successful groups in maintaining internal stability and external adaptability while achieving goals. Therefore, Nahavandi suggests elements of effective leadership include goal achievement, smooth internal process, and external adaptability.

Effective leadership has been the main affecting factor on growth and success for both for-profit organization and non-profits (Judge & Piccolo, 2004; Northouse, 2016; Sadeghi &

Pihie, 2012). This importance has led to development of many leadership theories and planning for leadership training and development. Theories include: trait theory (Kirkpatick & Locke, 1991), contingency theory (Fiedler, 1967), situational theory (McCleskey, 2014), transaction/transformation theories (Bass, 1997; Judge & Bono, 2000), and skill theories (Wolinski, 2010). Some scholars believe transformational and transactional leadership are two important theories to understand and explain leadership effectiveness (Hargis, Watt, & Piotrowski, 2011). Hargis et al. (2011) stated there are strong ties between transformational leadership and effective leadership factors (team efficacy and leader effectiveness), also strong ties between transactional performance and task performance, and employee efforts, these two leadership theories are important and competent of explaining leadership effectiveness. In another study, Ridder (2016) meta-analysis researched the relationship between transformational leadership and effective leadership using studies with MLQ data. Ridder (2016) found there is a positive correlation within all aspects of transformational leadership and effective leadership (r (2603) = .73, $p < .001$).

Spendlove (2007) reviewed literature for effective leadership competencies. He determined attributes like openness, honesty, listening, negotiating, persuading, strategic thinking can lead to effective leadership. These competencies are universal and reflected in transformational leadership style. In another publication, Bryman (2007) listed leader behaviors that have been demonstrated effective leadership in higher education environment in the literature. Behaviors like having strategic vision, treating others fairly, having personal integrity, open communication, creating collegiate work environment, acting as a role model, and being considerate. Brynman (2007) stated being considerate is comparable to individual consideration, which is one of the transformational leadership models of Bass (1985). On the contrast, there is

at least one study shows consideration is not related to effectiveness measures. Brown and Moshavi (2002) surveyed 70 higher education leaders using the MLQ, but they failed to demonstrate any association between consideration and effective leadership.

Transactional and Transformational Leadership

Herein, we refer to transactional leadership as a leadership style by which a leader "manages through transactions, using their legitimate, reward, and coercive powers to give commands and exchange rewards for services rendered" (Bateman, Snell, & Konopaske, 2019, p. 359). Bass (1999) defined transactional leadership as "an exchange relationship between leader and follower" in pursuit of their personal interests or common goals (p. 9). This nature of transactional leadership focuses on self-interest and the exchange relationship with followers made some scholars doubt calling it a leadership style and refer to it more as a management style (Rost, 1993).

Herein, we refer to transformational leadership as a leadership style by which a leader "motivates his followers to transcend their personal interests for the good of the group" (Bateman, et al., 2019, p. 359). Bass (1999) defined transformational leadership as a style by which a leader "moves his followers beyond their self-interest…through idealized influence, inspiration intellectual simulation, or individualized consideration" (p. 13). Transformative leadership first emerged in leadership literature in 1978 from the descriptive research of Burns (1978) on political leaders. Since then, many researchers have studied on this concept and made various connections. Bass (1985) for the first time used the term *transformational leadership* instead of Burns' (1978) transforming leadership. Being an industrial organizational psychologist, which is described by the Society for Industrial and Organizational Psychology as the inventor of organizational psychology), Bass (1985) explained the psychological mechanism

of Burns' (1978) transforming leadership and called it transformational leadership. Bass, later on worked to develop a measure (MLQ) for transformational/transactional leadership.

A comparative look into these two leadership styles will help to understand them better. Odumeru and Ogbonna (2013) compared transactional and transformational leadership theories. First, while transactional leadership is responsive, transformational leadership is proactive, meaning, transformational leaders try to inspire followers to look for creative solutions and positive changes before the issues arise, while transactional leaders are looking to solve the current issues and find answers for already existing problems. Second, transformational leadership aims to change the culture while transactional leadership tends to work within current frameworks and keep the culture as is. Achievement mechanism is transactional leadership is based on rewards (and punishment) while transformational leadership promotes ideals and values. Transactional leadership motivates by bringing up personal interests while transformational leadership encourages followers to consider group interests first. While transformational leadership emphasis is on individual consideration and intellectual stimulation, transactional leadership is about management-by-exception (Odumeru & Ogbonna, 2013).

Recent literature suggests transformational leadership in theory and practice can be more effective comparing other types of leadership style considering effective leadership as the ability to inspire followers to pursue group goals rather than self-interest (Hur, Van den Berg, & Wilderom, 2011). Transformational leadership can be more effective since it is about inspiring others to put group interest(s) first. If we consider establishing strong relationship with followers a requirement for effective leadership, transformational leaders are more effective because of their ability to connect with followers with more meaningful and stronger bonds (Sadeghi & Pihie, 2012).

Concept and Measures of Transformational/Transactional Leadership

As Bass (1999) stated "Much has been done but more still needs to be done…" (Bass, 1999). In 1999, Bass wrote about 20 years of development in transformational leadership. He mentioned three main measures for transformational leadership: Leader-Member Exchange (LMX), Leader Behavior Description Questionnaire (LBDQ), and Multifactor Leadership Questionnaire (MLQ).

Leader-member exchange. LMX is a descriptive theory (Gerstner & Day, 1997) that tries to define leadership by explaining the dyadic relationship between leader and followers (Graen & Uhl-Bien, 1995). The effects on followers in terms of job performance and experience are key areas to understand especially in applying to teaching/classroom instruction and student knowledge acquisition. An often criticism to LMX is the descriptive nature of the theory which fails to prescribe for a perfect LMX relationship (like a normative theory would do so).

Leader behavior description questionnaire. LBDQ is the first studies on the leadership behavior (Farahbakhsh, 2006). Before 1945, leadership studies focused on leadership traits. An Ohio State University multidisciplinary team of researchers forged the new approach toward explaining leadership from a behavioral perspective. This theory explained leaders show two behaviors to achieve their goals: they are people-oriented (consideration) and task-oriented (initiating structure) (Stogdill, 1974; Stogdill & Bass, 1981). Other works using the same approach include Mc Gregor X and Y theory (Farahbakhsh, 2006).

Multifactor leadership questionnaire. Working to expand on Burns (1978) transforming leaders, Bass (1985) introduced transformational leadership idea. Bass and Avolio (1995) interviewed about 70 executives about how leaders influence and inspire followers to pursue the group interest over self-interest. As a result of this study, they developed a 73-item

questionnaire on a five-point Likert scale with seven leadership dimensions: charisma, inspirational motivation, intellectual stimulation, individual consideration, contingent reward, management-by-exception, and laissez-faire leadership. Later, this instrument was refined over time with more research studies. The current version of the multifactor leadership questionnaire (MLQ 5x-Short) (See Appendix A) consists of 45 items, five factors measuring transformational leadership: (Idealized Attributes (IA), Idealized Behaviors (IB), Inspirational Motivation (IM), Intellectual Stimulation (IS), and Individual Consideration (IC)); two factors measuring transactional leadership include: Contingent Rewards (CR) and Management-by-Exception (Active) or MBEA; and finally two factors measuring passive-avoidance leadership include: Management-by-Exception (Passive) or MBEP and Laissez-Faire (LF).

MLQ developers frequently responded to scholarly critics and improved the quality of the measure by using it in different settings and different research projects (Avolio & Bass, 1995; 1999; Bass, 1999). Other researchers examined the validity of the instrument from the beginning as well. Perhaps the most noted work on the validity of the MLQ is work by Antonakis (2001). He established validity of MLQ using 18 independent studies with a total sample size of 6,525. The most recent example of works on MLQ is the test of factor structure of the instrument (Dimitrov & Darova, 2016).

Many researchers have adopted MLQ as their primary instrument especially in educational settings. For example, Leithwood and Jantzi (2006) have shown “significant and primarily indirect effect” of transformational leadership in schools on both student achievement and engagement by a meta-analysis using 32 empirical studies between 1996 and 2005. Leithwood and Sun (2012) published a meta-analytic review of 79 unpublished research studies on transformational school leadership and its effect on student achievement, teachers, and

schools. They showed transformational leadership has positive direct effect on student achievement, teacher internal state and behavior. Ibrahim, Ghavifekr, Ling, Siraj, & Azeez (2014) used MLQ to show the positive relationship between transformational leadership and teachers' commitment toward their organization in Malaysian schools.

Leadership in Schools and Universities

Policy-makers working on school improvement believe the successful implementation of their policies is associated with school leadership (Brown, Anfara, Hartman, Mahar, & Mills, 2002; Leithwood & Jantzi, 2006). Literature now shows the significant effects of effective leadership on school conditions and students' learning (e.g., Hallinger & Heck, 1998, 1999, 2010). Hallinger and Heck (1999) asked the question, "*Can leadership enhance school effectiveness*?" In reviewing literature on leadership studies in schools published from 1990 until 1998, it claimed leadership improves the effectiveness by influencing educational systems through three primary avenues: 1) purposes, 2) structures and social networks, and 3) people. These types of evidence have boosted interest in research studying how to develop effective school leaders. Governments, foundations, universities, and private sector organizations are now evaluating educational programs and developing new evidence-based programs (Hallinger, 2011; Heck & Hallinger, 2005).

Hallinger and Heck's (1999) third avenue of leadership influence on the educational systems, people, emphasizes the importance of influencing people. They reinforced leadership in educational settings needs to be people-oriented. Leithwood (1994) discussed the notion of people effects and brings it under the concept of transformational leadership. He claimed transformational leadership has an effect on psychological dispositions of teachers and staff in school (teachers' perception of school characteristics, teacher commitment to change, and

organizational learning), which in turn can affect outcomes like restructuring initiatives and student outcomes in a positive way. However, Leithwood (1994) claims have been in the context of organizational changes in educational settings but considering change as an integral part of organizations, it can be expanded as a general guideline for all educational organizations.

Bush (2003) linked management and leadership models. He linked collegial management mode with three leadership styles: participative, transformational, and interpersonal. Mahdinezhad and Suandi (2013) found transformational leadership can have positive association with job performance and commitment in a higher education setting. Pounder (2014) stated transformational leadership can be utilized in classroom environments and called it the fourth wave of requirement defining the quality of teacher leaders in higher education.

Teachers' effectiveness has been evaluated in several ways including student learning outcomes, student classroom participation, and student perceptions of instructor credibility. In attempting to describe effectiveness, teachers should also glean from literature on the use of leadership to be more effective in classrooms (Bolkan & Goodboy, 2009). Literature now supports leadership theories can be applied in classrooms (Harvey, Royal, & Stout, 2003; Ochieng Walumbwa, Wu, & Ojode, 2004; Pounder, 2008). Majority of these studies investigated transformational or transactional leadership style in classrooms. Researchers usually have examined the effects of the leadership style of teachers on variables such as students' extra effort in the classroom, students' perceptions of instructor effectiveness, and satisfaction, and more traditional student learning outcomes (Leithwood & Jantzi, 2006). Findings from this research show transformational leadership is associated with most of outcome and effectiveness variables (Leithwood & Jantzi, 2006).

The idea of teacher leadership has emerged in the literature mostly within the last three decades (Little, 2003). Little (2003) explained teacher leadership from an aspect of teacher empowerment. Pounder (2006) explained teacher leadership developed over time and describes this development in three stages—or as he calls it, the three waves. These waves were primarily developed by Silva et al. (2000). The first wave is the managerial wave. Teachers are placed in the organizational structure and a teacher-leader manages other subordinate teachers to run the business as usual. In this wave, teachers are seen like other employees in an organization. The second wave has emphasized the instructional dimension of the teaching, but still had teacher leadership in formal organizational positions such as team leaders. This wave has been called the "remote controlling of teachers." In the third wave, teacher leadership corporate teaching and leadership.

Teacher leadership is a process rather than a concept and recognizes teachers should have the opportunity to demonstrate their leadership capabilities. As an example, Wasley (as cited in Silva et al. 2000) defined teacher leaders as those who "help redesign schools, mentor their colleagues, engage in problem-solving at the school level, and provide professional growth activities for colleagues" (p. 5). Based on literature, Pounder (2006) concluded there is a highly likely teacher leaders employ transformational leadership style. However, he acknowledged there is a need for more empirical studies to establish this link. He also proposed to investigate this notion in organizations other than a school like in higher education institutions.

Muijs and Harris (2003; 2006) identified three elements of teacher leadership. First, teachers lead other teachers by coaching, mentoring, and leading working groups. Secondly, teachers lead developmental tasks critical for improving learning and teaching. Thirdly, teachers lead pedagogy by the developing effective teaching methods. Crowther (1997) defined teacher

leaders as “individuals acclaimed not only for their pedagogical excellence but also for their influence in stimulating change and creating improvement in the schools and socio-economically disadvantaged communities in which they work” (p. 6). His perspective has come from frameworks of leadership theories, one of the exceptions in this field (Pounder, 2006). Crowther’s (1997) criteria for identifying teachers as leaders include a significant contribution to the school community; high esteem; having influence in school decision-making processes and accepting a high level of school-based responsibility. This study is one example of transformational leadership style in educational settings.

Student Evaluation of Teacher

While leadership is important, there are more immediate and more commonly used measured for assessing teacher effectiveness in higher education. In fact, higher education has been so successful in developing different measures for different purposes within higher educations (Cannon, 2001). Cannon (2001) called these measures performance indicators and categorizes them into five groups. Indicators are presenting managerial tools for specific features of teaching and learning. Student evaluation of teacher is one these tools for individual evaluation of teachers/instructors (Cannon, 2001). Other indicators include, *peer evaluation* which is focused on teaching teams, and *course experience questionnaire* which is focused on a course of the program of the study.

Students’ perceptions of their teachers’ classroom instruction are measured by the SET. It is widely used in higher education (Pounder, 2006). In the U.S., data from SET can be used for decisions about conditions of faculty employment such as contract renewals for part-time faculty or tenure and promotion for tenure-track faculty. SET can provide education administrators with 1) a tool to improve teaching, 2) a measure for teacher effectiveness, 3) a way to help students

select their teachers, 4) a tool to monitor teaching quality, and 5) a topic for researchers (Marsh, 2007). Today, SET is a part of higher education practices (Shevlin, Banyard, Davies, & Griffiths, 2000). Studies often use questionnaires and factor analysis to investigate the dimensions of effective teaching. Two good examples are Swartz et al. (1990) and Lowman and Mathie (1993). Swartz, White, Stuck, & Patterson (1990) mentioned instructional presentation and management of student behavior as factors of effective teaching, whereas Lowman and Mathie (1993) considered intellectual excitement and interpersonal rapport as factors of effective teaching. SET is widely used all over the world, but the level of using the SET information to increase the effectiveness of teachers is not known. Spooren, Brockx, & Mortelmans (2013) agreed even today SET is a hot topic in higher education, but there are certain concerns about validity and usefulness of the SET that needs to be addressed in future research.

Emery, Kramer, and Tian (2003) outlined couple of issues for using SET especially as an indicator of effectiveness or decision making about teachers, including: teacher popularity and personality, student achievement, situational factors, user errors, rater qualification. Emery et al. (2003) believed SET is a “popularity contest” rather than an instrument of assessing learning as the main goal of a classroom. They mention SET scores are correlated with achievement scores and that can affect the rating. At the same time, more rigorous, tougher, and achievement-oriented classrooms mean more work for students, which can bring down the teacher rating. Situational factors are among other factors that are normally neglected when interpreting SET scores. For example, teacher ratings across different departments vary and it is hard to consider them comparable. Classes of English and history tend to gain lower ratings. Another example of situational factor can be experience of students in the higher education environment. Freshmen

tend to score teachers lower than sophomores. Emery et al. (2003) even raised a question also asked by other scholars: Are students qualified to evaluate their teachers?

Zabaleta's (2007) work showed low grades can be moderately correlated to low SET scores, but high grades are not related to higher SET ratings. He recommends not to use SET as a comparison tool between teachers, and not as a tool for critical decision making like retention or tenure and promotion of faculty.

Clayson (2003) conducted a meta-analysis research to study the relationship between SET and what students learn. He concluded the higher is the objectivity of the learning measure the less it is related with SET. SET is not a tool to evaluate student learning achievement. But SET is related to students' satisfaction or perception of learning.

Factors Affecting SET

Pounder (2006) reviewed literature on SET and factors affecting the SET score. He divided the factors into three groups including student-related factors (i.e. gender and academic level), course-related factors (i.e. grading and course content), and teacher-related factors (i.e. age and experience). Kindred and Mohammed (2005) discussed some of the student related factors that can affect SET, including: student related factors (e.g. expected grade), teacher related factors (e.g. physical attractiveness, gender, race, and rank), and course related factors (e.g. difficulty). Freng and Webber (2009) mentioned that over 8% of variance in SET (on RateMyProfessor.com) is explained by physical attractiveness of the teacher (hotness factor). Physical attraction not only influences the SET scores (the quality), but also accounts for motives of the student to evaluate teachers more openly (for example on RateMyProfessor.com) (Kindred & Mohammed, 2005). Barth (2008) suggested in a college probably main factor affecting the SET is the quality of teaching, keeping in mind hard teaching techniques and rigorous methods

backfires on teacher ratings. Boring, Ottoboni, and Stark (2016) stated there is a large bias against female teachers that is not statistically adjustable. This bias varied by discipline and student gender. They considered SET to be more sensitive to students' gender bias and grade expectation than they are to teaching effectiveness. Marsh (2007) counting several factors affecting SET, named expected graduation as influencing SET score (depending on interpretation). He also mentioned other factors such as class size, workload, prior knowledge, and interest into the subject. Marsh (2007) also addressed the level of the course or years in school as a factor affecting SET. Upper level courses, or courses with more advanced students and advanced content tend to be more highly rated.

Cohen (1981), in his meta-analysis found that difficulty is not related to the SET ratings, but he found a high correlation between student final scores and SET ratings of instructors. This finding was aligned with the results from other researchers of the era. The big flaw of Cohen's study was the fact that he studied those researchers where students rated their instructors after receiving their final scores (Merritt, 2008). Zabaleta (2007) found a correlation between grades of Spanish language students and their instructors' SET scores. He especially pointed to the correlation between low grades and lower evaluation scores. However, he called the correlation to be a weak one.

Uniting Transformational Leadership & SET

Library research included terms such as faculty evaluation, student evaluating teacher, leadership, transformational, transactional, etc., alone or in combination utilizing the university library system and Google Scholar© resulted in very few scholarly works, and only a handful of them studying the relationship between SET and leadership styles in higher educational settings. This study as I explained in the Chapter 1, is based on two scholarly works as follow.

The Hong Kong study. The Hong Kong study is where the ideas of combining transformational leadership and SET have met. According to Pounder (2006), a Hong Kong study on transformational-transactional leadership theory using the MLQ evaluated teacher-leadership classroom styles in a university. The study was conducted at the business school of one of Hong Kong's accredited universities including 285 final year students as participants from the total of 876 students in the bachelor of business program. Pounder (2004) selected last year students as he claims them to be more engaged and motivated to discriminate in evaluating their teachers rather than lower grade students. In this way, he also eliminated the effect of experience of students or level of students on the evaluation sores as they are all in the same level. Pounder (2004) used a slightly modified version of MLQ x5 short to measure the leadership style and SET scores for his research.

Pounder (2004) collected data and analyzed with a positivist approach to test five hypotheses:

H1: a positive correlation between each dimension of transformational leadership and each dimension of transactional leadership.

H2: a positive correlation between contingent reward dimension of transactional leadership and each dimension of transformational leadership and each leadership outcomes.

H3: a positive correlation between each dimension of transformational leadership and each leadership outcomes.

H4: female students score transformational leadership higher than males

H5: a positive correlation between each leadership outcomes and SET scores.

The results indicated teachers' usage of transformational leadership in classrooms positively and significantly correlated with each classroom outcome scales. The same pattern was identified when results were disaggregated by teacher. According to these results, the ratings for each of the transformational characteristics of classroom leadership (i.e., idealized influence-attributes, idealized influence-behavior, inspirational motivation, intellectual stimulation, and individual consideration) correlated positively and significantly with student ratings of each of the classroom leadership outcomes (i.e., extra effort, effectiveness, and satisfaction). The interesting finding from this research indicates however, there was a strong correlation between teacher leadership outcomes and the SET score, none were statistically significant at the 0.05 level.

The Nepal study. Adhikary (2017) examined the relationship between leadership factors, faculty effectiveness and satisfaction from faculty in the classroom, all measured by MLQ. Faculty ($N = 13$) rated themselves in leadership factors, and students ($N = 137$) rated their respective faculty in effectiveness and satisfaction. This study used faculty and students of a business in Kathamandu, Nepal. The author used mediation analysis to test the relationships , their direction and mediation effect of leadership factors on effectiveness and satisfaction, instead of using the traditional SET questionnaire. She claimed transformational leadership style can successfully predict faculty effectiveness.

Chapter 3: Methodology

Research Design

The purpose of this study is to study the effect of college instructors' classroom leadership style and the differences between the perceptions of students and faculty as indicated in SET. This effect will be examined using leadership style factors data collected through MLQ questionnaire, SET scores collected through the evaluation questionnaire, and demographic variables.

This research study will be based a post-positivist paradigm using a quantitative approach to test the conceptual framework which reflect my personal philosophy. According to Panhwar, Ansari, & Shah (2017) post-positivism is a mixture of rigor objectivity, positivist and interpretive epistemology, quantitative methodology, and confirmatory/disconformity evidence. Post-positivism in social and educational research recommends researching in natural environments and promotes utilizing diverse methodology approaches to reduce bias and increase objectivity (Phillips & Burbules, 2000). Post-positivism tries to offer an explanation or a solution to a problem using scientific methods, claiming a certain level of certainty rather than absolute certainty, assuming there are no absolute truths (Mack, 2010). Phillips and Burbules (2000) called post-positivism a pluralistic paradigm in research that helps in conducting a scientific socio-educational research by partially concluding and recommending further research.

Sample

The sample for this study includes undergraduate students in regular 4-year degree programs from all class standings and their respective faculty. However, this study is at student level, faculty data is also needed to calculate the gender difference variable and leadership concept difference variable. Also, recruiting faculty who are eager to support and participate

would minimize the effort for collecting data from students. There are two universities involved in the data collection process. The first university is a non-profit private institution, and the second one is a public university. Both institutions are in Southwest of Texas. At the first university, I approached the office of institutional effectiveness (IE) and asked them to send out an invitation letter to possible faculty in the university, trying to have a randomized sample. According to the university, office of IE, 320 invitations were sent out. With only five faculty responding to invitation emails, I approached the second university and used convenience sampling and recruited five more faculty from the college of business to participate in this study with their students. Faculty and students recruited in these universities asked to participate in the study by filling out questionnaires during their class time.

The total target population is 10,538 undergraduate students according to the websites of the universities. Table 2 breaks down sample size and participant characteristics of the sample after cleaning the data using listwise deletion.

A power analysis using the G*Power™ computer program (Faul, Erdfelder, Lang, & Buchner, 2007) indicates a total sample of 235 participants (N=235) would be needed to predict the dependent variable (ρ^2=.10) with 95% power using a priori multiple linear regression test with alpha at .05 (Table 1).

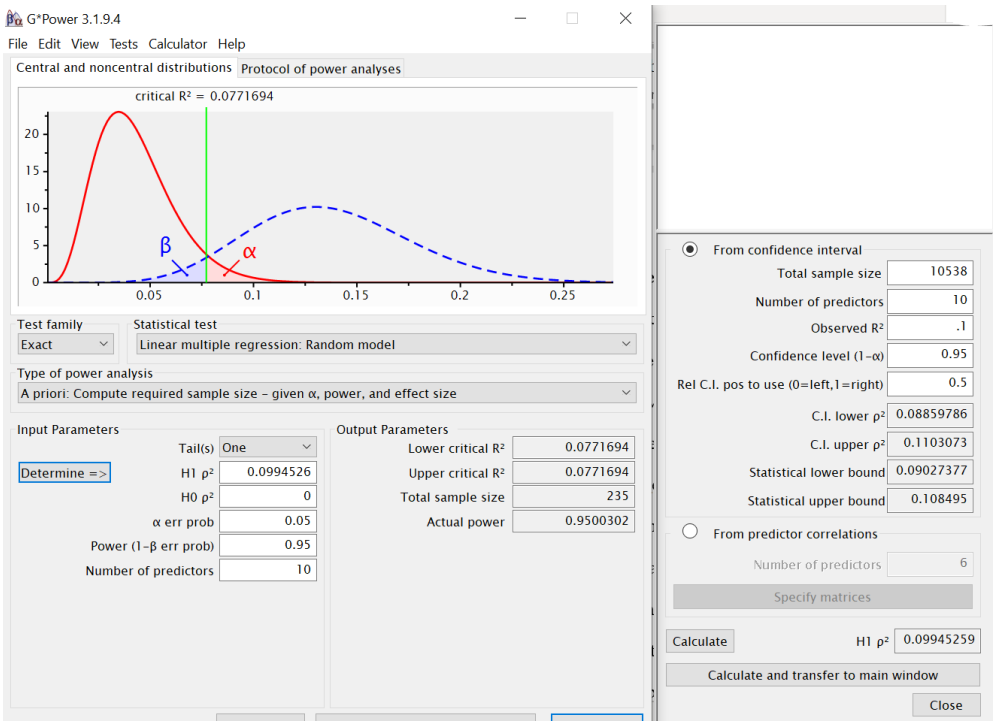

Figure 2. G*Power sample size calculation output table and graph.

Table 1.

Sample Size Calculation

	Parameters	Values
Input	Tail(s)	Two
	H_1 ρ^2	0.10
	H_0 ρ^2	0
	α Error Probability	0.05
	Number of predictors	10
Output	Lower critical R^2	0.08
	Upper critical R^2	0.08
	Total sample size	235
	Actual power	0.95

Table 2.

Participants' Characteristics

Description	Faculty		Students	
	N	%	N	%
University				
Private	5	50	162	44.88
Public	5	50	199	55.12
Gender				
Female	6	60	172	47.65
Male	4	40	189	52.35
College Major				
Social Science	3	30	30	8.31
Education	--	--	10	2.77
Pharmacy	--	--	13	3.60
Business	5	50	215	59.56
Health	1	10	19	5.26
STEM	1	10	54	14.96
Media	--	--	8	2.22
PT	--	--	5	1.39
Professional Studies	--	--	2	0.55
Missing Value	--	--	5	1.39
Total	10	100	361	100

Data Collection

Data collection for this project has been done in undergraduate classrooms. With permission from participating faculty, I attended their classes in person, explained the research and asked if students are willing to participate. Then paper copies of the questionnaires were distributed, and students were given time to complete the survey. At the same time, faculty were asked to fill out the MLQ questionnaire. The time burden of all questionnaires together to be

filled out was approximately 20 minutes. In the classroom, I made sure only targeted students would fill out the survey and asked non-traditional student (e.g., students who are under the age of 18 years, graduate students, adult learning students) not to participate. The students or faculty were not offered any incentives for participation; however, some faculty rewarded participating students with extra course credits to appreciate their help and support for the project.

Data Analysis

Instrument. The survey distributed as the data collection instrument for this research consists of three questionnaires. The first one is a demographic questionnaire, the second one is the Student Evaluating of Teachers (SET) from the private university, and the third one is the Multi-Factor Questionnaire (MLQ) (Appendix A). The MLQ questionnaire is a copy-righted tool and required purchase of the license to re-produce and use. Four hundred licenses were purchased for this research. The researcher has also purchased the manual for MLQ to help with rating and interpreting the data. The MLQ consists of 45 questions forming five transformational factors, two transactional factors, two passive leadership factors, and three outcome factors (effectiveness, extra effort, and satisfaction). The SET, which is a decade old instrument, has nine questions and its validity has been tested (Fike, Doyle, & Connelly, 2010). This instrument has been originally designed to be used as a paper-based survey, but later was adapted for an online version. A study of differences demonstrated both online and paper version measure the same thing with almost equitable means (Fike, Doyle, & Connelly, 2010).

Variables. In this research, using the MLQ questionnaire, I tried to quantify leadership style of faculty across two leadership styles. Factors that emerge in within this measurement include five latent variables that define transformational leadership and two latent variables that define transactional leadership. The five transformational latent variables include: idealized

attributes (IA), idealized behaviors (IB), inspirational motivation (IM), intellectual stimulation (IS), and individual consideration (IC). The two transactional latent variables include: contingent reward (CR), and management by exception (MBEA). Two leadership outcome variables are also of interest here: effectiveness (EFF), and satisfaction (SAT). These variables are being measured using multiple items in the MLQ questionnaire. Other variables that we use in this research to test our conceptual framework include: student age (Age), differences on gender between students and faculty (Gender_Diff), course difficulty (Difficulty), expected grade at the end of the semester for this course (Grade), and SET_total which is the summation of all item scores from the SET questionnaire.

Analysis. In this research, the main purpose is to test the hypothesized conceptual framework. The conceptual framework is the construct that show relationships among different variables. I have tested these relationships and also have tested how these variables try to define SET_total. For this research, I will employ structural equation modeling (SEM). Using SEM, a researcher can test relationships between variables, adequacy of a model, and reliability of indicators (confirmatory factor analysis) (Tabachnick & Fidell, 2018). As Hair and his colleagues mentioned a two-step approach toward SEM is a better fit in cases where measures needs to be validated (Hair, Black, Babin, & Anderson, 2010). In this research, as the first step, I did a confirmatory factor analysis (CFA) as a check of the validity for leadership latent variables. To assess the internal consistency reliability of all other multiple-item scale, I used the Cronbach's alpha calculation (Teo, 2014; Warner, 2008). As the second step, I draw the model in the statistical package and run analysis, and then will check for the results or any necessary modifications.

Cronbach's alpha. Cronbach's alpha provides a measure for internal consistency of a scale. In Other words, this test quantifies to what extend items in a same group measure the same construct (Tavakol & Dennick, 2011). The alpha coefficient is in fact, a "reliability coefficients estimated with variance components. These coefficients describe the accuracy of the instrument on a 0-to-1 scale" (Cronbach, & Shavelson, 2004).

Cronbach's α value has been calculated for items within latent variables. Each of the leadership factors consists of four items: idealized attributes (α = .72), idealized behaviors (α = .66), inspirational motivation (α = .80), intellectual stimulation (α = .72), individual consideration (α = .61), contingent reward (α = .69), and management by exception active (α = .71). SET total score (SET_total) consist of nine items (α = .88).

Confirmatory factor analysis. Another method to evaluate consistency of a scale is CFA. It is a tool to confirm/reject our measurement theory. Measurement theories require the measurement model to be operationalized, meaning after a construct is defined, a priori number of factors need to be specified, and which variables will load those specified factors. CFA is dependent on the measurement theory and can only verify or reject an established theory (Hair, et al., 2010). Brown (2006) defines CFA as a type of SEM, in which the relationship between *observed variables* or *indicators* (e.g., survey items) and *latent variables* or *factors* (e.g., leadership style factors in MLQ) can be examined. In the case of this research, MLQ has already well established factors and constructs. I will use CFA to verify the consistency of the leadership factors in the context of this research, also as a starting point for our SEM analysis.

Structural equation modeling. Tabachnick and Fidell (2018) define SEM as a collection of techniques by relationships between multiple variables can be examined, weather these variables are discrete or continuous, and weather from a multivariate or univariate approach.

SEM examines structures and interrelationship between constructs (and variables) like series of multiple regression analysis. SEM foundations has roots in multivariate techniques where it studies the relationships among multiple variables at the same time. SEM can be called as a combination of factor analysis and multiple regression analysis (Hair, et al., 2010). Byrne (2013) mentions that the terminology of this technique signifies two important aspects: a) the relationships under study are represented in the form of series of structural (regression) equations, and b) to help with conceptualization of these structural relationships, they can be schemed pictorially.

Hair and his colleagues (2010) recommend a six stage decision making process for any SEM project that I follow in this research. The first stage is to define individual constructs. The second stage is about developing the measurement model. The third stage is to design a study that yields emprical results. The fourth stage is to assess the validity of the model. If the model is valid, we move to the next stage, otherwise we start over from the stage that seems to have the root of the validity problem. In the fifth stage, structiral model is being specified. The last stage is to assess the validity of the structural model. If the model is not valid, we need to go back, refine the model and re-test the validity. If the model is valid, we draw conclusions and recommendations. The two-step approach to analysis and overall research design that I followed in this dissertation project are based on these six stages. The first four stages are the first step, which is about the measurement model and its validity. Stages five and six are about the validity of the structural model and finalizing the study.

To conduct analysis of this research, and cleaning the raw data collected, I utilized STATA™ 16.0. The SEMBUILDER feature in this application allows for SEM and CFA, as well as other statistical methods needed for this project. This package offers few modelling

techniques, the most straightforward and widely used one is maximum likelihood estimation. This method utilizes a likelihood function to estimate the parameter of a probability distribution, assuming the model the observed data is the most probable (Rossi, 2018). For the standard error type, I used the default setting, in this case, observed information matrix (OIM). I also needed to determine amount of iteration for estimation and test. I used 50 iterations for each test. The package stops at the iteration point where the model has achieved convergence and maximum likelihood.

After running both CFA and SEM analysis, according to the six-stage approach, I needed to assess model validity. For SEM and CFA, we used goodness-of-fit indices. "Model fit compares the theory to reality by assessing the similarity of the estimated covariance matrix (theory) to reality (the observed covariance matrix)" (Hair, et al., 2010, p. 576). In a perfect world, the observed and estimated covariance matrices would be equal. Hair et al. (2010) categorized fit indices in to five groups:

1) Chi-squared (χ^2) GOF, associated degree of freedom (*d.f.*), and statistical significance (p),
2) Absolut fit indices (e.g., GIF, RMSEA or SRMR),
3) Incremental fit indices (e.g., CFI or TLI),
4) Goodness-of-fit indices (e.g., GIF, CFI, TLI, etc.),
5) Badness-of-fit indices (e.g., RMSEA, SRMR, etc.).

These authors refuse to determine a single magic value for any of these indices; however, they have some rules of thumb as recommendations.

Research Hypothesis

The research hypotheses for this project are as follows:

RQ1: Are the MLQ transactional and transformational leadership factors conceptually and empirically independent and valid?

H_0:

$$\chi^2_{Base\ Model} = \chi^2_{Fitted\ Model}$$

RQ2: Do the MLQ transactional and transformational leadership factors predict SET scores?

H_0: The model under consideration fits the data.

RQ3: Do the MLQ transactional and transformational leadership perception difference, between faculty and students predict SET scores?

H_0:

$$\beta_0 = .0\ (p < 0.05)$$

Ethical Considerations

Ethical considerations for this study included anonymity, thought collection, handling and storage of collected data. I tried to minimize the risk of being identified for students as no individually identifiable information were asked, with the exception of age, gender, and class standings. For faculty, because the approach was made in a personal manner, I, as the researcher, had full knowledge of who they were, but I am not going to disclose any individual information about them nor disseminate the results on individual levels. Institutional Review Board approval was sought before start of the project. Also license to re-produce and use the MLQ was purchased. I also tried to minimize the consumption of paper, as much a possible by not printing any materials, unless it was completely necessary.

Chapter 4: Results

The purpose of this study was to first establish the construct validity of leadership factors as described by MLQ, then test the conceptual model of the study which emphasizes on the relationship between leadership factors and SET scores.

Descriptive Statistics

Table 3

Descriptive Statistics

Variables	N	Mean	Median	Min	Max	Variance	Skewness	Kurtosis
Gender_diff	361	.53	1	0	1	0.25	-.11	1.01
Difficulty	361	2.85	3	1	5	.58	-.00	3.22
Grade	361	90.62	92	65	100	33.55	-.87	3.69
SET_total	361	31.85	33	14	36	19.00	-1.43	5.06
IA	361	3.13	3.25	.25	4	.61	-1.03	3.81
IB	361	2.72	2.75	0	4	.68	-.63	3.45
IM	361	3.23	3.5	0	4	.58	-1.34	5.25
IS	361	3.08	3.25	.25	4	.60	-1.06	4.26
IC	361	3.01	3	.25	4	.59	-.77	3.53
CR	361	3.23	3.25	.25	4	.51	-1.18	4.50
MBEA	361	2.07	2	0	4	1.06	-.12	2.28
MLQ_diff	361	9.85	11	-47	43	239.86	-.60	3.49

Table 3 represent the descriptive statistics of the main variables used in the analysis. The descriptive statistics point out that majority of the collected data are skewed. SET total scores are foreseeably skewed toward the right side (complete score) as it was in previous research. Not

only skewness, but kurtosis also indicate abnormal distribution in general among variables. Among all the variables only two variables represent normal distribution: gender difference, which is a dichotomous variable, and MBEA factor in MLQ questionnaire.

Path Diagram of Theoretical Model of the MLQ

According to the MLQ manual, there are five factors associated with transformational leadership and two factors associated with transactional leadership. Each of these seven factors are defined by four items that are in the questionnaire. The MLQ manual also shows that these factors have strong construct validity, no matter if the rater is below the leader in organizational chart or is based on self-reported scores. Figure 3 shows the primary construct of transformational leadership factors and Figure 4 represents transactional leadership factors in path diagrams.

The first run of CFA on the base model showed successful convergence of the model. Looking at the GOF indices, they are not an indication of a valid model. Table 4 summarizes the GOF indices for both models.

Table 4.

Characteristics of Different Fit Indices Demonstrating GOF Across Different Model Situations

Fit indices	CFA Base Model	CFA Fitted Model
χ^2 (*d.f.*, *p*-values)	2633.259 (350, 0.00)	605.013 (324, 0.00)
CFI	0.468	0.889
SRMR	0.304	0.054
RMSEA	0.135	0.049
CD	1.000	0.998

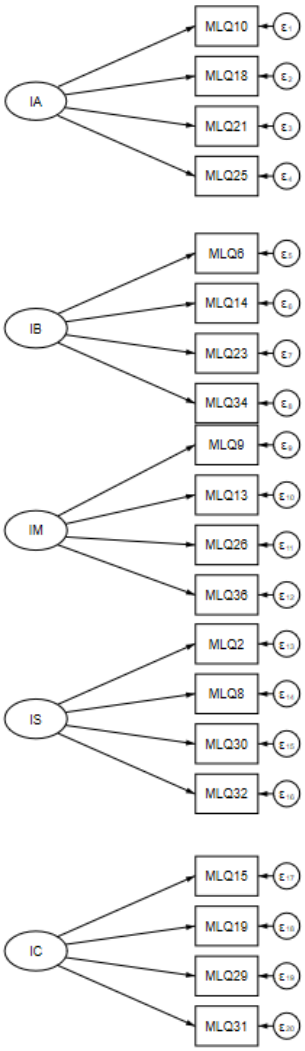

Figure 3. Transformational factor construct base model.

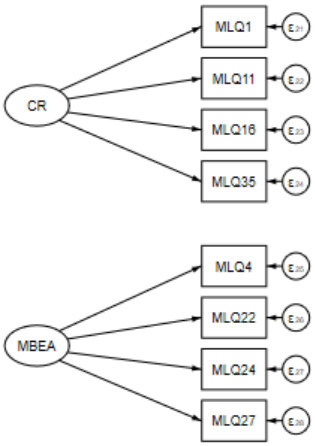

Figure 4. Transactional factor construct base model.

Following up to reconstruct the model seeking for a better validity, I used modification indices to guide me. The following model is the modified fitted model as the results, which clearly is a better model looking at GOF indices. The difference between the GOF main index $\Delta\chi^2 = 2{,}208$ (26, < .00001) is significant, which implies the fitted model is a better model than the original base model. This fitted model suggests some correlations between some of the latent variables and item residuals. There are also some cross loadings between items of one latent variable to another latent variable.

Path Diagram of the Main Research Theoretical Model

Moving on to the second step, I used the fitted model as the base to study the structural validity of the research conceptual model (Figure 5). This model examines the relationship between leadership style factors as identified in MLQ questionnaire with SET scores at student level. In this model, student age (Age), gender differences between student and faculty (Gender_Diff), course difficulty from student perspectives (Difficulty), and expected grade at the end of semester for the course (Grade) act as covariates. The model was fitted perfectly, reporting a significant Chi-squared of 842.691 (457, < .00001), Root Mean Square Error of Approximation (RMSEA) was at 0.048, Standardized Root Mean Residual (SRMR) was at 0.06, and Comparative Fit Index (CFI) was at 0.918, which are all good numbers but slightly lower than the fitted CFA model.

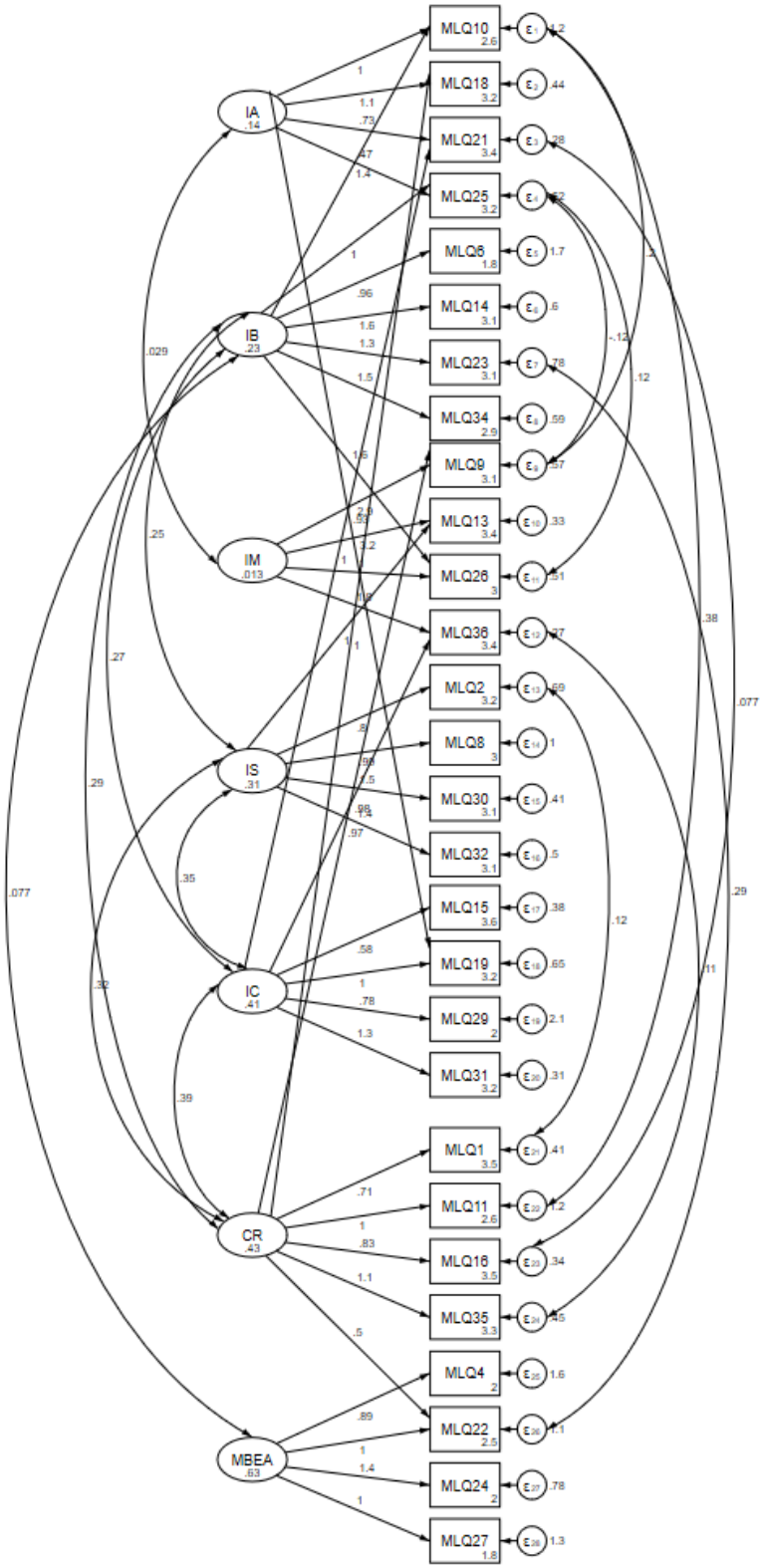

Figure 5. Path Diagram for CFA Fitted Model.

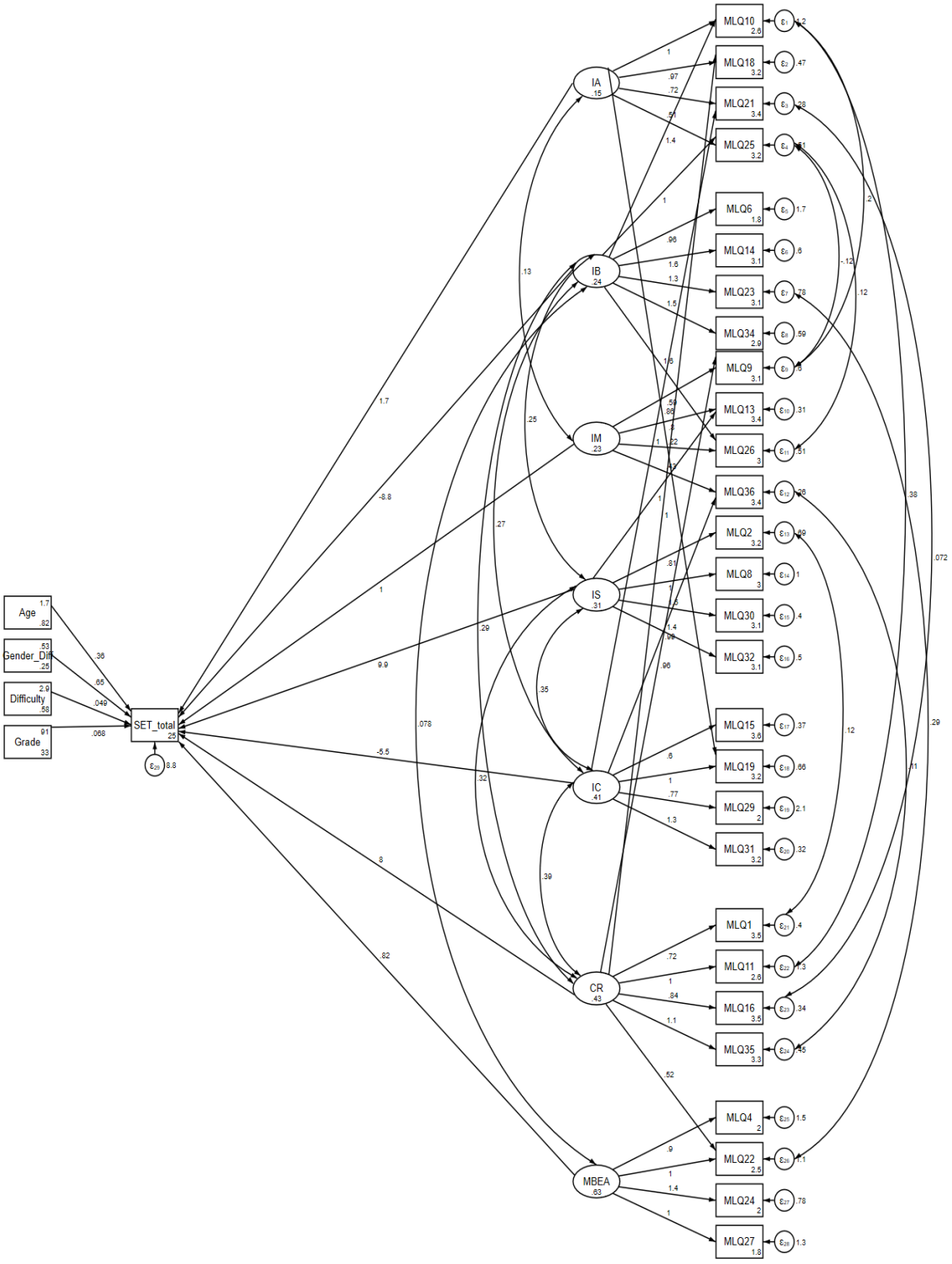

Figure 6. Path diagram for SEM fitted model.

The second model tested using SEM was the effect of different perceptions about leadership styles, from perspectives of students and faculty on SET scores. The difference variable (MLQ_diff) calculated as the difference between student and faculty total leadership scores, which is the summation of all transformational and transactional item scores. I treated this variable as an observed variable. Since we no longer have any exogenous variables and only a single dependent variable (SET_total), I used Standard Linear Structural Equation Modeling (GSEM) technique, which is technically a linear regression model. I report the results in the format of a regression model and the path diagram from SEM model builder (Figure 7).

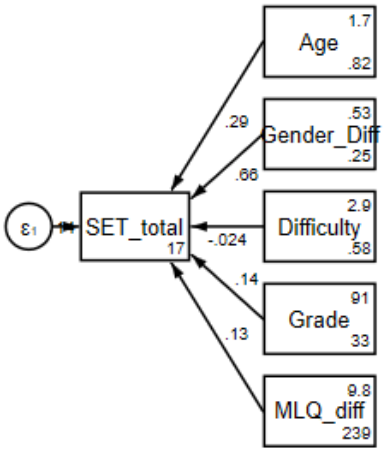

Figure 7. Path diagram for GSEM fitted model.

The results indicated predictors explained almost 27% of variance in dependent variable ($R^2 = .267$, $F(5,355) = 25.97$, $p < .05$). It was found that MLQ_diff significantly predicted SET scores ($\beta = .13$, $p < .001$), and also Grades significantly defined SET scores ($\beta = .14$, $p < .001$). Other variables, some despite having strong correlations, failed to show any significance.

Chapter 5: Discussions

In this chapter, findings are discussed as well as limitations and concerns of the research and recommendations for higher education administrators and for future research.

Discussion

Since the beginning, the MLQ has been used in numerous studies. Some of these studies mainly focused on the structural validity of factors in this questionnaire, including the authors themselves. The MLQ manual refers to a study that completed a CFA with about 6,525 participants (Antonakis et al., 2003). This study concluded that the nine-factor MLQ model is valid. In another confirmatory factor analysis (Muenjohn & Armstrong, 2008), authors confirmed the validity of the structure in a 9 factor-model.

There are some other studies that question the validity of the nine-factor model, in different contexts. Heinitz et al. (2005) recommended the reduced factor version of MLQ to be used rather than the full-factor. This is to confirm findings by Tejeda et al. (2001) which recommended a reduced item version to achieve a better fit model. A very recent study in the nursing context also called for a revision in MLQ in this context (Boamah, & Tremblay, 2019). They stated that when using transactional and transformational leadership as separate latent variables, the model failed to show a good fitted model, but transformational leadership alone can be defined by MLQ in valid way. Studies carried out in different countries also sometimes support a revision in the questionnaire, like the study in UK which recommend using a revised version of MLQ instead of the original version (Edwards et al., 2012).

The finding of this research is more aligned with the second group that suggest low construct validity for MLQ factors in its original form. When running confirmatory factor analysis on transformational and transactional factors, some cross loadings can be seen across

items of one variable to another variable and some correlations between residuals of the items. However, literature suggests that cross loadings may not be big issues when the correlations are less than 0.5, there are still some strong cross loads in the context of this research.

When examining the relationship between leadership factors and SET, past works used correlation techniques to study the matter (Adhikary, 2017; Pounder, 2006). In this study, structural equation modeling was used to not only examine the strength of the correlation but also the structure and test a conceptual model of how leadership can affect SET. The results show there is no significant relationship between SET scores and the leadership factors in the MLQ questionnaire as I modeled it. Among covariates, age ($\beta = .36$, p=.04) and gender difference ($\beta = .65$, $p = .04$) significantly predict SET scores. This means the older a student is the chances are higher they rate their teacher better. At the same time, students of the opposite gender are more likely to rate their faculty higher.

Testing a third model to examine the relationship between SET scores and differences on leadership concept between student and faculty, the results show the MLQ_diff can predict the SET scores ($\beta = .13$, $p < 001$). This variable is an aggregate difference calculation from all items in the questionnaire. Since the factors which measure leadership styles are not well structured as recommended by developers, I could not measure the differences between student and faculty perception about their leadership style for each factor independently. This result indicates where student perception from faculty leadership style is rated higher than what the way the faculty may rate him/herself, there is a higher possibility for the faculty to receive higher evaluation scores from students. Among the same covariates, this time only grade expectation significantly predicts the SET scores ($\beta = .13$, $p < 001$). This means the higher is the grade expectation, the possibility of the student rating the faculty with a higher score is greater.

Conclusions

In this research, it was demonstrated MLQ may not have a valid construct as suggested by developers in every context and situations. So, MLQ must be utilized with cautious and even adjustment before use and after use needs confirmatory factor analysis. This is in line with works some previous literature (Boamah, & Tremblay, 2019; Edwards et al., 2012; Tejeda et al., 2001). Here leadership style was tested and can affect SET scores. The results indicate there are no significant relationships between leadership factors and SET scores. This is not in line with findings of Pounder (2006) and Adhikary (2017). They both show some leadership factors can positively predict the SET ratings. This can have different reasons.

A possible reason can be due to the validity of the questionnaire. We have to ask if the leadership questionnaire is valid and conceptually suitable for the context and the target population. Another reason can be this instrument is designed for business organizations rather than educational settings. There is a possibility wording and phrasing of the items do not always make sense for students who are rating faculty. Another reason can be the fact that some non-academic factors (e.g., age, gender difference, grade, and etc.) may have strong effects on defining SET scores (Boring, Ottoboni, & Stark, 2016; Freng & Webber, 2009; Kindred & Mohammed, 2005; Marsh, 2007; Merritt, 2008; Zabaleta, 2007). The effect of these variables can be strong enough to eliminate the effect of other variables. This means that for example the grade at the end of semester may be more important to students than the transformative leadership style of the faculty in the classroom when evaluating their teacher.

Concerns and Limitations

Like any other doctoral student at this stage, I would also love to solve the problem in a perfect way but soon I recognized the real world limitations on a research project. I would have

liked this project to be a multi-level study where I could study at student and faculty level. As the MLQ manual mentions, the MLQ is suitable to be used in three different levels, a person above the organizational rank, a person below the organizational rank (e.g., students), and self-report (e.g., faculty). For this purpose, I needed to have minimum of 20 faculty to participate in the study with their students. Unfortunately, with all the efforts and all the supports, which I am grateful for, I could not have this number of faculty participate. This is one of the shortcomings of my research.

Not having enough number of faculty participate in the study also had another effect, in that it did not let me to run confirmatory factor analysis on the faculty when they evaluated their own leadership style using MLQ.

Quality of the collected data is another subject that needs to be addressed. There might be a selection bias among the faculty and their students that I reached out to. Presumably this group of people who responded positively to the invitations to participate in the study, they may have certain characteristics that might be leaned toward transformative leadership traits. There have been attempts to link leadership styles with personality traits (e.g., Bono & Judge, 2003; Judge and Bono, 2001). These researchers have showed that extraversion, agreeableness and openness positively correlate with transformative leadership styles. Other researchers have shown how transformative leaders can affect their followers to be more engaging and also influence on their behavior using contemporary theories like self-concordance theory (Bono & Judge, 2003; Cable & Judge, 2003). These researches imply in the case of a research dealing with psychological characteristics of human beings like this project where sampling is not completely random, there are concerns of possible hidden selection bias.

Going to classes, and collecting data myself, I noticed that students sometimes are not engaged in the participation as much as you would expect. Sometimes, they do it and then they decide not to fill-out the questionnaires completely, or they answer questions in a simple recognizable pattern (e.g., selecting same answer to all questions). Unfortunately, in research where there is not a significant incentive as the participation reward, these issues may happen more often, as it was the case in my research.

Probably the biggest issue in my research, which we were aware of from the beginning, was the abnormal distribution of the data. This is specially the case with SET in general. There is literature that suggests that normality assumption should not act as an obstacle to run the analysis if it is not met as a primary condition when the sample size is large enough (Li, Wong, Lamoureux, & Wong, 2012; Habeck, Brickman, & Box, 2014). Habeck et al. (2014) even suggest being cautious about transforming variables, recommending transforming to be appropriate in case of better interpretability or prior model constrains.

Recommendations

Given limitations mentioned in this research, I would like to recommend more research on the confirmatory factory analysis of MLQ. This instrument is a valuable tool that needs to be utilized with caution, considering that in different contexts there might be a need to change the factors or items, or even interpretation of the factors. In any case, I suggest all researchers to run CFA to confirm the construct validity of any instrument that they use even if it has established validity, as the starting point.

SET is still an instrument for university and colleges. It can provide valuable feedback to faculty, but it must be treated with cautious if the purpose is to help the faculty to improve. If the

administration would like to use SET results for any decision making, I would recommend using other instruments. A good replacement for SET could be class environment surveys.

I am sure by now, with all the discussions around SET, the majority of higher education administers are familiar with its weaknesses and strength and bias factors that can potentially SET results. Relaying these issues to faculty can help them understand SET better and interpret it in a more meaningful way.

Summary

In this research, I attempted to show that behaviors or conceptions about behaviors that are influenced by leadership style do not have any effects on SET when controlling for more common factors like age, gender differences or grade expectation. But when there are differences in conception of students versus faculty about behaviors that will have some effects on the SET. In this study, I did not try evaluating or devaluating any of the instruments used, instead, I tried to understand if they are applicable in this research or not.

Data collection in universities can be a challenge. One would expect it to be less challenging since we are no longer working with minors, and they can decide about themselves, and faculty understand each other better and willing to support scholarly activities. But this is the case always, especially if the environment of the university is geared toward research.

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Appendices

Appendix A
The Survey

Dear participant,
As part of this study, I need to collect some background data about your demographics and this course. This information will not be disclosed to university official nor the instructor of the class. The results will be used only for research purposes. You can freely opt-out to participate by simply not filling this questionnaire.

Participant ID#..... Instructor ID# ……..

1. Age: What is your age?
   - ☐ 18-20
   - ☐ 21-23
   - ☐ 24-26
   - ☐ 27 or older
2. Gender: What is your gender?
   - ☐ Male
   - ☐ Female
   - ☐ Transgender
   - ☐ Other
   - ☐ Prefer not to respond
3. Class Standing: What is your class standing?
   - ☐ Freshman
   - ☐ Sophomore
   - ☐ Junior
   - ☐ Senior
   - ☐ Masters/Doctoral
   - ☐ Professional Student
   - ☐ Continuing Education Student
   - ☐ Non-degree seeking
4. What is your College?
   - ☐ College of Humanities, Arts & Social Sciences
   - ☐ Dreeben School of Education
   - ☐ Feik School of Pharmacy
   - ☐ H-E-B School of Business and Administration
   - ☐ Ila Faye Miller School of Nursing and Health Professions

- ☐ Rosenberg School of Optometry
- ☐ School of Mathematics, Science & Engineering
- ☐ School of Media and Design
- ☐ School of Osteopathic Medicine
- ☐ School of Physical Therapy
- ☐ School of Professional Studies

5. How do you rate the degree of the difficulty of this course comparing to the other college courses you had so far?
    a. Very easy
    b. Easy
    c. Not difficult/not easy
    d. Difficult
    e. Very difficult
6. What is your expected grade at the end of the semester?

    ……..

Student Evaluation of Teaching Form

Dear student,
As part of this study, please rate you instructor by choosing the best option that describes your instructor for this class. This information will not be disclosed to university official nor the instructor of the class. The results will be used only for research purposes. You can freely opt-out to participate by simply not filling this questionnaire.

(scale: Not at All, Rarely, About half the time, Frequently, Always)

1. The instructor was enthusiastic about the subject matter.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

2. The instructor encouraged active participation in class.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

3. The instructor communicated the subject matter clearly.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

4. The instructor was well prepared for class.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

5. The instructor was available outside of class.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

6. The instructor was clear about the assignments in this course.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

7. The instructor provided timely feedback.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

8. The instructor's evaluation methods were fair.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

---

9. The instructor treated you with respect.

☐ Not at All, ☐ Rarely, ☐ About half the time, ☐ Frequently, ☐ Always

MLQ Multifactor Leadership Questionnaire
Rater Form (5x-Short)

Name of Leader: _____ Date: _____

Organization ID #: _____ Leader ID #: _____

This questionnaire is to describe the leadership style of the above-mentioned individual as you perceive it. Please answer all items on this answer sheet. **If an item is irrelevant, or if you are unsure or do not know the answer, leave the answer blank.** Please answer this questionnaire anonymously.

IMPORTANT (necessary for processing): Which best describes you?

___ I am at a higher organizational level than the person I am rating.
___ The person I am rating is at my organizational level.
___ I am at a lower organizational level than the person I am rating.
___ I do not wish my organizational level to be known.

Forty-five descriptive statements are listed on the following pages. Judge how frequently each statement fits the person you are describing. Use the following rating scale:

Not at all	Once in a while	Sometimes	Fairly often	Frequently, if not always
0	1	2	3	4

THE PERSON I AM RATING. . .

1.	Provides me with assistance in exchange for my efforts	0	1	2	3	4
2.	Re-examines critical assumptions to question whether they are appropriate	0	1	2	3	4
3.	Fails to interfere until problems become serious	0	1	2	3	4
4.	Focuses attention on irregularities, mistakes, exceptions, and deviations from standards	0	1	2	3	4
5.	Avoids getting involved when important issues arise	0	1	2	3	4
6.	Talks about their most important values and beliefs	0	1	2	3	4
7.	Is absent when needed	0	1	2	3	4
8.	Seeks differing perspectives when solving problems	0	1	2	3	4
9.	Talks optimistically about the future	0	1	2	3	4
10.	Instills pride in me for being associated with him/her	0	1	2	3	4
11.	Discusses in specific terms who is responsible for achieving performance targets	0	1	2	3	4
12.	Waits for things to go wrong before taking action	0	1	2	3	4
13.	Talks enthusiastically about what needs to be accomplished	0	1	2	3	4
14.	Specifies the importance of having a strong sense of purpose	0	1	2	3	4
15.	Spends time teaching and coaching	0	1	2	3	4

Continued =>

Not at all	Once in a while	Sometimes	Fairly often	Frequently, if not always
0	1	2	3	4

16.	Makes clear what one can expect to receive when performance goals are achieved	0	1	2	3	4
17.	Shows that he/she is a firm believer in "If it ain't broke, don't fix it."	0	1	2	3	4
18.	Goes beyond self-interest for the good of the group	0	1	2	3	4
19.	Treats me as an individual rather than just as a member of a group	0	1	2	3	4
20.	Demonstrates that problems must become chronic before taking action	0	1	2	3	4
21.	Acts in ways that builds my respect	0	1	2	3	4
22.	Concentrates his/her full attention on dealing with mistakes, complaints, and failures	0	1	2	3	4
23.	Considers the moral and ethical consequences of decisions	0	1	2	3	4
24.	Keeps track of all mistakes	0	1	2	3	4
25.	Displays a sense of power and confidence	0	1	2	3	4
26.	Articulates a compelling vision of the future	0	1	2	3	4
27.	Directs my attention toward failures to meet standards	0	1	2	3	4
28.	Avoids making decisions	0	1	2	3	4
29.	Considers me as having different needs, abilities, and aspirations from others	0	1	2	3	4
30.	Gets me to look at problems from many different angles	0	1	2	3	4
31.	Helps me to develop my strengths	0	1	2	3	4
32.	Suggests new ways of looking at how to complete assignments	0	1	2	3	4
33.	Delays responding to urgent questions	0	1	2	3	4
34.	Emphasizes the importance of having a collective sense of mission	0	1	2	3	4
35.	Expresses satisfaction when I meet expectations	0	1	2	3	4
36.	Expresses confidence that goals will be achieved	0	1	2	3	4
37.	Is effective in meeting my job-related needs	0	1	2	3	4
38.	Uses methods of leadership that are satisfying	0	1	2	3	4
39.	Gets me to do more than I expected to do	0	1	2	3	4
40.	Is effective in representing me to higher authority	0	1	2	3	4
41.	Works with me in a satisfactory way	0	1	2	3	4
42.	Heightens my desire to succeed	0	1	2	3	4
43.	Is effective in meeting organizational requirements	0	1	2	3	4
44.	Increases my willingness to try harder	0	1	2	3	4
45.	Leads a group that is effective	0	1	2	3	4

Appendix B
Permission to Use the MLQ Instrument

www.mindgarden.com

To Whom It May Concern,

The above-named person has made a license purchase from Mind Garden, Inc. and has permission to administer the following copyrighted instrument up to that quantity purchased:

Multifactor Leadership Questionnaire

The three sample items only from this instrument as specified below may be included in your thesis or dissertation. Any other use must receive prior written permission from Mind Garden. The entire instrument may not be included or reproduced at any time in any other published material. Please understand that disclosing more than we have authorized will compromise the integrity and value of the test.

Citation of the instrument must include the applicable copyright statement listed below.
Sample Items:

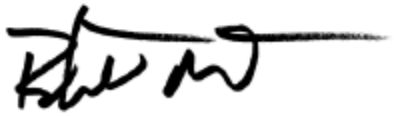
As a leader ….

I talk optimistically about the future.
I spend time teaching and coaching.
I avoid making decisions.

The person I am rating….

Talks optimistically about the future.
Spends time teaching and coaching.
Avoids making decisions

Sincerely,



Robert Most
Mind Garden, Inc.
www.mindgarden.com

Appendix C
IRB Approval

September 6 2019

To: Mr Sadeq Sohrabie

From: University of the Incarnate Word Institutional Review Board, FWA00009201

Sadeq:

Your request to conduct the study titled Dissertation: THE EFFECT OF FACULTY LEADERSHIP STYLE ON THE RESULTS OF STUDENT EVALUATION OF TEACHERS was approved by exempt review on 09/06/2019. Your IRB approval number is 19-09-002. You have approval to conduct this study through 9/6/2020.

The stamped informed consent document is uploaded to the Correspondence section in the Research Ethics Review system. Please use only the stamped version of the informed consent document.

Please keep in mind the following responsibilities of the Principal Investigator:

1. Conducting the study only according to the protocol approved by the IRB.
2. Submitting any changes to the protocol and/or consent documents to the IRB for review and approval prior to the implementation of the changes. Use the **IRB Amendment Request** form.
3. Ensuring that only persons formally approved by the IRB enroll subjects.
4. Reporting immediately to the IRB any severe adverse reaction or serious problem, whether anticipated or unanticipated.
5. Reporting immediately to the IRB the death of a subject, regardless of the cause.
6. Reporting promptly to the IRB any significant findings that become known in the course of the research that might affect the willingness of the subjects to participate in the study or, once enrolled, to continue to take part.
7. Timely submission of an annual status report (for exempt studies) or a request for continuing review (for expedited and full Board studies). Use either the **IRB Study Status Update** or **IRB Continuing Review Request** form.
8. Completion and maintenance of an active (non-expired) CITI human subjects training certificate.
9. Timely notification of a project's completion. Use the **IRB Closure** form.

Approval may be suspended or terminated if there is evidence of a) noncompliance with federal regulations or university policy or b) any aberration from the current, approved protocol.

If you need any assistance, please contact the UIW IRB representative for your college/school or the Office of Research Development.

Sincerely,

Mary Jo Bilicek
Research Compliance Coordinator
University of the Incarnate Word
(210) 805-3565
bilicek@uiwtx.edu

Appendix D
Stata Analysis Codes and Outputs

Descriptive Statistics

```
tabstat Gender_Diff Difficulty Grade SET_total IA IB IM IS IC CR MBEA MLQ_diff,stat( n mean
median min max variance sk k)
```

stats	Gender~f	Diffic~y	Grade	SET_to~l	IA	IB	IM	IS
N	361	361	361	361	361	361	361	361
mean	.5263158	2.850416	90.6205	31.84488	3.126731	2.716759	3.230609	3.081717
p50	1	3	92	33	3.25	2.75	3.5	3.25
min	0	1	65	14	.25	0	0	.25
max	1	5	100	36	4	4	4	4
variance	.25	.5831179	33.54725	19.00365	.6090682	.6815309	.5812202	.6030259
skewness	-.1054093	-.0036751	-.8668417	-1.430082	-1.028414	-.6316828	-1.343473	-1.062047
kurtosis	1.011111	3.221783	3.688575	5.060298	3.806201	3.451024	5.253838	4.261555

stats	IC	CR	MBEA	MLQ_diff
N	361	361	361	361
mean	3.006233	3.227839	2.072022	9.844875
p50	3	3.25	2	11
min	.25	.25	0	-47
max	4	4	4	43
variance	.5876347	.5047159	1.060423	239.8592
skewness	-.7703499	-1.177058	-.1174786	-.6028955
kurtosis	3.526105	4.501429	2.282021	3.491474

Reliability: Cronbach's α

```
. * for IA
. alpha MLQ10 MLQ18 MLQ21 MLQ25
Test scale = mean(unstandardized items)
Average interitem covariance:     .4389838
Number of items in the scale:            4
Scale reliability coefficient:      0.7207

. * for IB
. alpha MLQ6 MLQ14 MLQ23 MLQ34
Test scale = mean(unstandardized items)
Average interitem covariance:     .4524674
Number of items in the scale:            4
Scale reliability coefficient:      0.6639

. * for IM
. alpha MLQ9 MLQ13 MLQ26 MLQ36
Test scale = mean(unstandardized items)
Average interitem covariance:     .4638491
Number of items in the scale:            4
Scale reliability coefficient:      0.7981

. * for IS
. alpha MLQ2 MLQ8 MLQ30 MLQ32
Test scale = mean(unstandardized items)
Average interitem covariance:     .4329319
Number of items in the scale:            4
Scale reliability coefficient:      0.7179

. * for IC
. alpha MLQ15 MLQ19 MLQ29 MLQ31
Test scale = mean(unstandardized items)
```

```
Average interitem covariance:     .3601852
Number of items in the scale:            4
Scale reliability coefficient:      0.6129

. * for CR
. alpha MLQ1 MLQ11 MLQ16 MLQ35
Test scale = mean(unstandardized items)
Average interitem covariance:     .3487971
Number of items in the scale:            4
Scale reliability coefficient:      0.6911

. * for MBEA
. alpha MLQ4 MLQ22 MLQ24 MLQ27
Test scale = mean(unstandardized items)
Average interitem covariance:     .7478673
Number of items in the scale:            4
Scale reliability coefficient:      0.7053

. * for SET_total
. alpha SET1-SET9
Test scale = mean(unstandardized items)
Average interitem covariance:     .2058809
Number of items in the scale:            9
Scale reliability coefficient:      0.8775
```

CFA Base Model

```
. sem (IA -> MLQ10, ) (IA -> MLQ18, ) (IA -> MLQ21, ) (IA -> MLQ25, ) (IB -> MLQ6, ) (IB -> MLQ14,
>  ) (IB -> MLQ23, ) (IB -> MLQ34, ) (IM -> MLQ9, ) (IM -> MLQ13, ) (IM -> MLQ26, ) (IM -> MLQ36,
> ) (IS -> MLQ2, ) (IS -> MLQ8, ) (IS -> MLQ30, ) (IS -> MLQ32, ) (IC -> MLQ15, ) (IC -> MLQ19, )
> (IC -> MLQ29, ) (IC -> MLQ31, ) (CR -> MLQ1, ) (CR -> MLQ11, ) (CR -> MLQ16, ) (CR -> MLQ35, ) (
> MBEA -> MLQ4, ) (MBEA -> MLQ22, ) (MBEA -> MLQ24, ) (MBEA -> MLQ27, ), covstruct(_lexogenous, di
> agonal) iterate(50) latent(IA IB IM IS IC CR MBEA ) nocapslatent
note: The following latent variable names are also present in the data: IA, IB, IM, IS, IC, CR,
      MBEA.

Endogenous variables

Measurement:  MLQ10 MLQ18 MLQ21 MLQ25 MLQ6 MLQ14 MLQ23 MLQ34 MLQ9 MLQ13 MLQ26 MLQ36 MLQ2 MLQ8
              MLQ30 MLQ32 MLQ15 MLQ19 MLQ29 MLQ31 MLQ1 MLQ11 MLQ16 MLQ35 MLQ4 MLQ22 MLQ24 MLQ27

Exogenous variables

Latent:       IA IB IM IS IC CR MBEA

Fitting target model:

Iteration 0:   log likelihood = -14182.055
Iteration 1:   log likelihood = -14119.613
Iteration 2:   log likelihood = -14056.727
Iteration 3:   log likelihood = -14045.846
Iteration 4:   log likelihood =  -14045.32
Iteration 5:   log likelihood = -14045.285
Iteration 6:   log likelihood = -14045.285

Structural equation model                       Number of obs     =        361
Estimation method  = ml
Log likelihood     = -14045.285

 ( 1)  [MLQ10]IA = 1
 ( 2)  [MLQ6]IB = 1
 ( 3)  [MLQ9]IM = 1
 ( 4)  [MLQ2]IS = 1
 ( 5)  [MLQ15]IC = 1
 ( 6)  [MLQ1]CR = 1
```

```
 ( 7)  [MLQ4]MBEA = 1
------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Measurement  |
  MLQ10      |
          IA |          1  (constrained)
       _cons |   2.623269   .0719563    36.46   0.000     2.482237      2.7643
  -----------+----------------------------------------------------------------
  MLQ18      |
          IA |   .9439202   .1111369     8.49   0.000      .726096    1.161745
       _cons |   3.216066   .0537958    59.78   0.000     3.110629    3.321504
  -----------+----------------------------------------------------------------
  MLQ21      |
          IA |   .9237512   .1144475     8.07   0.000     .6994382    1.148064
       _cons |   3.443213   .0461105    74.67   0.000     3.352838    3.533588
  -----------+----------------------------------------------------------------
  MLQ25      |
          IA |   .6981949   .0911246     7.66   0.000     .5195939    .8767959
       _cons |   3.224377   .0465856    69.21   0.000     3.133071    3.315683
  -----------+----------------------------------------------------------------
  MLQ6       |
          IB |          1  (constrained)
       _cons |   1.795014   .0723853    24.80   0.000     1.653141    1.936886
  -----------+----------------------------------------------------------------
  MLQ14      |
          IB |   1.529077   .2643811     5.78   0.000       1.0109    2.047254
       _cons |   3.074792   .0588257    52.27   0.000     2.959496    3.190089
  -----------+----------------------------------------------------------------
  MLQ23      |
          IB |   1.067187   .1930723     5.53   0.000     .6887721    1.445602
       _cons |   3.088643   .0564417    54.72   0.000     2.978019    3.199266
  -----------+----------------------------------------------------------------
  MLQ34      |
          IB |   1.546895   .2666275     5.80   0.000     1.024314    2.069475
       _cons |   2.908587    .056903    51.11   0.000     2.797059    3.020115
  -----------+----------------------------------------------------------------
  MLQ9       |
          IM |          1  (constrained)
       _cons |   3.138504   .0547801    57.29   0.000     3.031137    3.245871
  -----------+----------------------------------------------------------------
  MLQ13      |
          IM |   .9356796   .0849909    11.01   0.000     .7691005    1.102259
       _cons |   3.412742   .0463111    73.69   0.000     3.321974     3.50351
  -----------+----------------------------------------------------------------
  MLQ26      |
          IM |   1.034008    .098719    10.47   0.000     .8405221    1.227493
       _cons |   2.969529   .0566795    52.39   0.000     2.858439    3.080619
  -----------+----------------------------------------------------------------
  MLQ36      |
          IM |   .9305397   .0831353    11.19   0.000     .7675976    1.093482
       _cons |   3.401662   .0442138    76.94   0.000     3.315005    3.488319
  -----------+----------------------------------------------------------------
  MLQ2       |
          IS |          1  (constrained)
       _cons |   3.171745   .0496573    63.87   0.000     3.074419    3.269072
  -----------+----------------------------------------------------------------
  MLQ8       |
          IS |   1.420077   .2298273     6.18   0.000     .9696242    1.870531
       _cons |   2.975069    .060231    49.39   0.000     2.857019     3.09312
  -----------+----------------------------------------------------------------
  MLQ30      |
```

```
          IS |   2.040423   .2945587     6.93   0.000     1.463099    2.617748
       _cons |   3.077562   .0549726    55.98   0.000     2.969818    3.185307
-------------+----------------------------------------------------------------
MLQ32        |
          IS |   2.044681   .2819552     7.25   0.000      1.49206    2.597303
       _cons |   3.102493    .056445    54.96   0.000     2.991863    3.213123
-------------+----------------------------------------------------------------
MLQ15        |
          IC |          1  (constrained)
       _cons |   3.612188   .0379518    95.18   0.000     3.537804    3.686573
-------------+----------------------------------------------------------------
MLQ19        |
          IC |    2.07355   .2908989     7.13   0.000     1.503398    2.643701
       _cons |   3.227147   .0576666    55.96   0.000     3.114122    3.340171
-------------+----------------------------------------------------------------
MLQ29        |
          IC |   1.604446   .3181086     5.04   0.000     .9809647    2.227928
       _cons |   1.980609   .0801346    24.72   0.000     1.823548     2.13767
-------------+----------------------------------------------------------------
MLQ31        |
          IC |   2.192207   .3083427     7.11   0.000     1.587867    2.796548
       _cons |   3.204986   .0533434    60.08   0.000     3.100435    3.309537
-------------+----------------------------------------------------------------
MLQ1         |
          CR |          1  (constrained)
       _cons |   3.457064   .0416052    83.09   0.000     3.375519    3.538608
-------------+----------------------------------------------------------------
MLQ11        |
          CR |   1.357476    .194236     6.99   0.000     .9767799    1.738171
       _cons |   2.645429   .0683383    38.71   0.000     2.511489     2.77937
-------------+----------------------------------------------------------------
MLQ16        |
          CR |    1.16271   .1305563     8.91   0.000      .906824    1.418595
       _cons |   3.476454   .0420149    82.74   0.000     3.394107    3.558802
-------------+----------------------------------------------------------------
MLQ35        |
          CR |   1.405109   .1682234     8.35   0.000     1.075397    1.734821
       _cons |    3.33241   .0507848    65.62   0.000     3.232874    3.431946
-------------+----------------------------------------------------------------
MLQ4         |
        MBEA |          1  (constrained)
       _cons |   1.952909   .0754663    25.88   0.000     1.804997     2.10082
-------------+----------------------------------------------------------------
MLQ22        |
        MBEA |   1.246525   .1754488     7.10   0.000     .9026515    1.590398
       _cons |   2.534626   .0734891    34.49   0.000      2.39059    2.678662
-------------+----------------------------------------------------------------
MLQ24        |
        MBEA |    1.58734   .2194084     7.23   0.000     1.157307    2.017372
       _cons |    2.00277   .0740704    27.04   0.000     1.857595    2.147945
-------------+----------------------------------------------------------------
MLQ27        |
        MBEA |   1.151672   .1666523     6.91   0.000     .8250395    1.478304
       _cons |   1.797784   .0741347    24.25   0.000     1.652483    1.943085
-------------+----------------------------------------------------------------
 var(e.MLQ10)|   1.319955   .1150934                      1.112599    1.565956
 var(e.MLQ18)|   .5553996   .0587126                      .4514639    .6832633
 var(e.MLQ21)|   .2989103   .0445117                       .223247    .4002176
 var(e.MLQ25)|   .5157286   .0458941                      .4331853    .6140005
  var(e.MLQ6)|   1.620163   .1287702                      1.386454    1.893268
 var(e.MLQ14)|   .6148038   .0786241                      .4784987    .7899369
 var(e.MLQ23)|   .8409942   .0730761                         .7093    .9971398
 var(e.MLQ34)|   .5196069   .0762101                      .3897896    .6926591
```

```
  var(e.MLQ9)|   .5974917   .0556138                      .4978553    .7170686
 var(e.MLQ13)|   .3489102   .0369449                      .2835195    .4293826
 var(e.MLQ26)|   .6403134   .0595417                      .5336306    .7683241
 var(e.MLQ36)|   .2850318   .0331746                      .2268939    .3580666
  var(e.MLQ2)|   .7246464   .0577024                      .6199353    .8470438
  var(e.MLQ8)|   .9758267    .080318                      .8304477    1.146656
 var(e.MLQ30)|   .4018022   .0638373                      .2942901    .5485913
 var(e.MLQ32)|   .4581457   .0661854                      .3451723    .6080948
 var(e.MLQ15)|   .3933514    .033379                      .3330807    .4645279
 var(e.MLQ19)|   .6561046   .0849581                      .5090402    .8456567
 var(e.MLQ29)|   1.992256   .1581425                       1.70521    2.327621
 var(e.MLQ31)|   .4187695   .0804184                      .2874184    .6101484
  var(e.MLQ1)|   .3942391   .0376417                      .3269547      .47537
 var(e.MLQ11)|   1.260889   .1073889                       1.06704    1.489954
 var(e.MLQ16)|   .3254448   .0385947                      .2579484    .4106028
 var(e.MLQ35)|   .4756782   .0568837                      .3762902    .6013173
  var(e.MLQ4)|    1.57215   .1318556                      1.333841    1.853036
 var(e.MLQ22)|   1.197885   .1167606                      .9895703    1.450053
 var(e.MLQ24)|   .7615856   .1298564                      .5452329    1.063789
 var(e.MLQ27)|   1.342346   .1219558                       1.12339    1.603979
      var(IA)|   .5491991    .115314                      .3639193    .8288093
      var(IB)|   .2713444   .0855237                      .1462968    .5032769
      var(IM)|   .4858179   .0750931                      .3588417    .6577247
      var(IS)|   .1655249   .0436026                      .0987734    .2773876
      var(IC)|   .1266109   .0299598                      .0796255    .2013215
      var(CR)|   .2306486   .0431056                      .1599084     .332683
    var(MBEA)|   .4838043   .1158324                      .3026043     .773507
------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(350) =   2633.26, Prob > chi2 = 0.0000
.
. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
        chi2_ms(350) |   2633.259   model vs. saturated
            p > chi2 |      0.000
        chi2_bs(378) |   4673.381   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
               RMSEA |      0.135   Root mean squared error of approximation
 90% CI, lower bound |      0.130
         upper bound |      0.139
               pclose |      0.000   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |  28258.570   Akaike's information criterion
                 BIC |  28585.236   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.468   Comparative fit index
                 TLI |      0.426   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.304   Standardized root mean squared residual
                  CD |      1.000   Coefficient of determination
------------------------------------------------------------------------------
```

CFA Fitted Model

```
. sem (IA -> MLQ10, ) (IA -> MLQ18, ) (IA -> MLQ21, ) (IA -> MLQ25, ) (IA -> MLQ19, ) (IB -> MLQ10
> , ) (IB -> MLQ25, ) (IB -> MLQ6, ) (IB -> MLQ14, ) (IB -> MLQ23, ) (IB -> MLQ34, ) (IB -> MLQ26,
>  ) (IM -> MLQ9, ) (IM -> MLQ13, ) (IM -> MLQ26, ) (IM -> MLQ36, ) (IS -> MLQ13, ) (IS -> MLQ2, )
>  (IS -> MLQ8, ) (IS -> MLQ30, ) (IS -> MLQ32, ) (IC -> MLQ21, ) (IC -> MLQ36, ) (IC -> MLQ15, )
> (IC -> MLQ19, ) (IC -> MLQ29, ) (IC -> MLQ31, ) (CR -> MLQ18, ) (CR -> MLQ9, ) (CR -> MLQ1, ) (C
```

```
> R -> MLQ11, ) (CR -> MLQ16, ) (CR -> MLQ35, ) (CR -> MLQ22, ) (MBEA -> MLQ4, ) (MBEA -> MLQ22, )
>  (MBEA -> MLQ24, ) (MBEA -> MLQ27, ), covstruct(_lexogenous, diagonal) iterate(50) latent(IA IB
> IM IS IC CR MBEA ) cov( IA*IM e.MLQ10*e.MLQ9 e.MLQ25*e.MLQ9 e.MLQ25*e.MLQ26 IB*IC IB*CR e.MLQ36*
> e.MLQ35 IS*IB IS*IC IS*CR IC*CR e.MLQ1*e.MLQ2 e.MLQ11*e.MLQ10 e.MLQ16*e.MLQ21 MBEA*IB e.MLQ22*e.
> MLQ23) nocapslatent
note: The following latent variable names are also present in the data: IA, IB, IM, IS, IC, CR,
      MBEA.

Endogenous variables

Measurement:  MLQ10 MLQ18 MLQ21 MLQ25 MLQ19 MLQ6 MLQ14 MLQ23 MLQ34 MLQ26 MLQ9 MLQ13 MLQ36 MLQ2
              MLQ8 MLQ30 MLQ32 MLQ15 MLQ29 MLQ31 MLQ1 MLQ11 MLQ16 MLQ35 MLQ22 MLQ4 MLQ24 MLQ27

Exogenous variables

Latent:       IA IB IM IS IC CR MBEA

Fitting target model:

Iteration 0:   log likelihood = -14113.597  (not concave)
Iteration 1:   log likelihood = -13958.023  (not concave)
Iteration 2:   log likelihood =  -13883.85  (not concave)
Iteration 3:   log likelihood = -13533.778  (not concave)
Iteration 4:   log likelihood = -13275.395  (not concave)
Iteration 5:   log likelihood = -13255.703  (not concave)
Iteration 6:   log likelihood = -13197.153  (not concave)
Iteration 7:   log likelihood =  -13094.42  (not concave)
Iteration 8:   log likelihood = -13058.001  (not concave)
Iteration 9:   log likelihood = -13050.075
Iteration 10:  log likelihood =  -13044.44
Iteration 11:  log likelihood = -13039.863
Iteration 12:  log likelihood = -13037.203
Iteration 13:  log likelihood =  -13036.91
Iteration 14:  log likelihood = -13036.615
Iteration 15:  log likelihood = -13036.508
Iteration 16:  log likelihood =  -13035.32  (not concave)
Iteration 17:  log likelihood = -13035.162
Iteration 18:  log likelihood = -13034.637
Iteration 19:  log likelihood = -13033.663  (not concave)
Iteration 20:  log likelihood = -13033.146  (not concave)
Iteration 21:  log likelihood = -13032.982
Iteration 22:  log likelihood = -13032.454
Iteration 23:  log likelihood = -13031.672  (not concave)
Iteration 24:  log likelihood = -13031.406
Iteration 25:  log likelihood = -13031.223
Iteration 26:  log likelihood = -13031.164
Iteration 27:  log likelihood = -13031.162
Iteration 28:  log likelihood = -13031.162

Structural equation model                       Number of obs     =        361
Estimation method  = ml
Log likelihood     = -13031.162

 ( 1)  [MLQ10]IA = 1
 ( 2)  [MLQ18]CR = 1
 ( 3)  [MLQ21]IC = 1
 ( 4)  [MLQ25]IB = 1
 ( 5)  [MLQ26]IM = 1
 ( 6)  [MLQ13]IS = 1
 ( 7)  [MLQ22]MBEA = 1
------------------------------------------------------------------------------
                    |                 OIM
                    |      Coef.  Std. Err.     z    P>|z|     [95% Conf. Interval]
--------------------+---------------------------------------------------------
Measurement         |
  MLQ10             |
                 IA |          1  (constrained)
                 IB |   1.443361   .1720747     8.39   0.000     1.106101    1.780622
              _cons |   2.623269   .0708669    37.02   0.000     2.484372    2.762165
  ------------------+---------------------------------------------------------
  MLQ18             |
                 IA |   1.087994   .3223619     3.38   0.001     .4561766    1.719812
```

```
              CR |          1  (constrained)
           _cons |   3.216066   .0536466    59.95   0.000     3.110921    3.321212
-----------------+------------------------------------------------------------------
MLQ21            |
              IA |   .7287134   .2145384     3.40   0.001     .3082259    1.149201
              IC |          1  (constrained)
           _cons |   3.443213   .0459586    74.92   0.000     3.353136    3.533291
-----------------+------------------------------------------------------------------
MLQ25            |
              IA |   .4746565   .1824128     2.60   0.009     .1171339    .8321791
              IB |          1  (constrained)
           _cons |   3.224377   .0465241    69.31   0.000     3.133191    3.315562
-----------------+------------------------------------------------------------------
MLQ19            |
              IA |   .9345869   .2882679     3.24   0.001     .3695922    1.499582
              IC |   1.018109   .0852066    11.95   0.000     .8511074    1.185111
           _cons |   3.227147   .0576138    56.01   0.000     3.114226    3.340068
-----------------+------------------------------------------------------------------
MLQ6             |
              IB |   .9598146   .1687502     5.69   0.000     .6290703    1.290559
           _cons |   1.795014   .0722372    24.85   0.000     1.653432    1.936596
-----------------+------------------------------------------------------------------
MLQ14            |
              IB |   1.634751    .166257     9.83   0.000     1.308893    1.960608
           _cons |   3.074792   .0582964    52.74   0.000     2.960533    3.189051
-----------------+------------------------------------------------------------------
MLQ23            |
              IB |   1.250267   .1458069     8.57   0.000      .964491    1.536044
           _cons |   3.088643   .0563166    54.84   0.000     2.978264    3.199021
-----------------+------------------------------------------------------------------
MLQ34            |
              IB |   1.542018   .1591107     9.69   0.000     1.230167     1.85387
           _cons |   2.908587   .0564164    51.56   0.000     2.798013    3.019161
-----------------+------------------------------------------------------------------
MLQ26            |
              IB |   1.619766   .1413965    11.46   0.000     1.342634    1.896898
              IM |          1  (constrained)
           _cons |   2.969529   .0560947    52.94   0.000     2.859585    3.079473
-----------------+------------------------------------------------------------------
MLQ9             |
              IM |   2.892244   1.662453     1.74   0.082    -.3661033    6.150591
              CR |   .9683215   .0887894    10.91   0.000     .7942974    1.142346
           _cons |   3.138504   .0545829    57.50   0.000     3.031524    3.245485
-----------------+------------------------------------------------------------------
MLQ13            |
              IM |   3.203817   1.842391     1.74   0.082    -.4072033    6.814837
              IS |          1  (constrained)
           _cons |   3.412742     .04627    73.76   0.000     3.322055     3.50343
-----------------+------------------------------------------------------------------
MLQ36            |
              IM |   1.773569      1.052     1.69   0.092     -.288313     3.83545
              IC |   .9823961   .0663677    14.80   0.000     .8523178    1.112474
           _cons |   3.401662   .0440175    77.28   0.000     3.315389    3.487935
-----------------+------------------------------------------------------------------
MLQ2             |
              IS |   .7983881   .0976487     8.18   0.000     .6070002    .9897759
           _cons |   3.171745   .0496367    63.90   0.000     3.074459    3.269031
-----------------+------------------------------------------------------------------
MLQ8             |
              IS |   .9937031   .1192927     8.33   0.000     .7598936    1.227513
           _cons |   2.975069    .060231    49.39   0.000     2.857019     3.09312
-----------------+------------------------------------------------------------------
MLQ30            |
              IS |   1.476906   .1198267    12.33   0.000      1.24205    1.711762
           _cons |   3.077562   .0549726    55.98   0.000     2.969818    3.185307
-----------------+------------------------------------------------------------------
MLQ32            |
              IS |   1.441246    .121667    11.85   0.000     1.202783    1.679709
           _cons |   3.102493    .056445    54.96   0.000     2.991863    3.213123
-----------------+------------------------------------------------------------------
MLQ15            |
```

```
              IC |   .5847967   .0611778     9.56   0.000     .4648904     .704703
           _cons |   3.612188   .0379518    95.18   0.000     3.537804    3.686573
-----------------+------------------------------------------------------------------
MLQ29            |
              IC |   .7823503    .131706     5.94   0.000     .5242113    1.040489
           _cons |   1.980609   .0801346    24.72   0.000     1.823548     2.13767
-----------------+------------------------------------------------------------------
MLQ31            |
              IC |   1.327687   .0852356    15.58   0.000     1.160628    1.494746
           _cons |   3.204986   .0533434    60.08   0.000     3.100435    3.309537
-----------------+------------------------------------------------------------------
MLQ1             |
              CR |    .710137   .0732792     9.69   0.000     .5665123    .8537617
           _cons |   3.457064   .0415928    83.12   0.000     3.375543    3.538584
-----------------+------------------------------------------------------------------
MLQ11            |
              CR |   1.004342   .1183321     8.49   0.000     .7724156    1.236269
           _cons |   2.645429   .0682661    38.75   0.000      2.51163    2.779228
-----------------+------------------------------------------------------------------
MLQ16            |
              CR |   .8312292   .0760343    10.93   0.000     .6822047    .9802537
           _cons |   3.476454   .0421037    82.57   0.000     3.393933    3.558976
-----------------+------------------------------------------------------------------
MLQ35            |
              CR |   1.051969   .0920712    11.43   0.000      .871513    1.232425
           _cons |    3.33241   .0506193    65.83   0.000     3.233198    3.431622
-----------------+------------------------------------------------------------------
MLQ22            |
              CR |   .5028845    .104408     4.82   0.000     .2982485    .7075205
            MBEA |          1  (constrained)
           _cons |   2.534626   .0722576    35.08   0.000     2.393004    2.676248
-----------------+------------------------------------------------------------------
MLQ4             |
            MBEA |   .8883754   .1231631     7.21   0.000     .6469802    1.129771
           _cons |   1.952909   .0754663    25.88   0.000     1.804997     2.10082
-----------------+------------------------------------------------------------------
MLQ24            |
            MBEA |   1.376919   .1560787     8.82   0.000      1.07101    1.682827
           _cons |    2.00277   .0740704    27.04   0.000     1.857595    2.147945
-----------------+------------------------------------------------------------------
MLQ27            |
            MBEA |   1.017867   .1278739     7.96   0.000      .767239    1.268496
           _cons |   1.797784   .0741347    24.25   0.000     1.652483    1.943085
-----------------+------------------------------------------------------------------
     var(e.MLQ10)|   1.183009   .0993141                      1.003528    1.394591
     var(e.MLQ18)|   .4422398   .0535243                      .3488486     .560633
     var(e.MLQ21)|   .2800034   .0285838                       .229229    .3420243
     var(e.MLQ25)|   .5150056   .0426188                      .4378966    .6056927
     var(e.MLQ19)|   .6524773   .0583217                      .5476218    .7774098
      var(e.MLQ6)|   1.667727   .1263623                      1.437574    1.934728
     var(e.MLQ14)|   .6001213    .052138                      .5061595    .7115258
     var(e.MLQ23)|   .7783424   .0615818                       .666537     .908902
     var(e.MLQ34)|   .5913526   .0503455                      .5004705    .6987383
     var(e.MLQ26)|   .5078863   .0449269                      .4270419    .6040357
      var(e.MLQ9)|   .5662982   .0550387                      .4680763    .6851312
     var(e.MLQ13)|   .3287594   .0447894                      .2517169     .429382
     var(e.MLQ36)|   .2661447    .024265                      .2225931    .3182174
      var(e.MLQ2)|    .689785   .0527703                      .5937378    .8013694
      var(e.MLQ8)|   1.000349   .0769694                      .8603156    1.163175
     var(e.MLQ30)|   .4077447   .0380767                      .3395471    .4896397
     var(e.MLQ32)|    .499561   .0437256                      .4208084    .5930517
     var(e.MLQ15)|   .3806332   .0294152                      .3271343    .4428812
     var(e.MLQ29)|   2.068819   .1558611                      1.784821    2.398008
     var(e.MLQ31)|   .3090695   .0310848                      .2537734    .3764143
      var(e.MLQ1)|   .4080138   .0326469                       .348792    .4772908
     var(e.MLQ11)|   1.249297   .0979836                      1.071285    1.456888
     var(e.MLQ16)|   .3433185   .0287791                      .2913025    .4046226
     var(e.MLQ35)|    .449896    .039179                      .3793024    .5336281
     var(e.MLQ22)|   1.141474   .1062975                      .9510416    1.370038
      var(e.MLQ4)|    1.55497   .1314721                      1.317508    1.835231
     var(e.MLQ24)|   .7770969   .1268346                       .564346    1.070052
```

```
        var(e.MLQ27)|   1.326361   .1215004                      1.108378    1.587214
             var(IA)|   .1414044   .0662131                      .0564787    .3540307
             var(IB)|   .2345176   .0432389                      .1633941    .3366004
             var(IM)|   .0127526   .0140304                      .0014761    .1101762
             var(IS)|   .3132112   .0482917                      .2315245    .4237187
             var(IC)|     .40741   .0523348                      .3167295    .5240526
             var(CR)|   .4293187   .0662168                      .3173168    .5808533
           var(MBEA)|   .6347919   .1171592                      .4421106    .9114478
--------------------+------------------------------------------------------------------
 cov(e.MLQ10,e.MLQ9)|   .2019906   .0503221     4.01   0.000      .103361    .3006202
cov(e.MLQ10,e.MLQ11)|    .379996   .0701207     5.42   0.000     .2425619    .5174302
cov(e.MLQ21,e.MLQ16)|   .0765058   .0198361     3.86   0.000     .0376277    .1153838
cov(e.MLQ25,e.MLQ26)|   .1195047   .0316656     3.77   0.000     .0574412    .1815682
 cov(e.MLQ25,e.MLQ9)|  -.1176433   .0304305    -3.87   0.000    -.1772859   -.0580007
cov(e.MLQ23,e.MLQ22)|    .286668    .058123     4.93   0.000      .172749     .400587
cov(e.MLQ36,e.MLQ35)|   .1149729   .0226964     5.07   0.000     .0704887    .1594571
  cov(e.MLQ2,e.MLQ1)|   .1228067   .0300314     4.09   0.000     .0639463    .1816672
          cov(IA,IM)|   .0291255   .0188707     1.54   0.123    -.0078604    .0661113
          cov(IB,IS)|   .2487307   .0345778     7.19   0.000     .1809594     .316502
          cov(IB,IC)|   .2675801   .0358682     7.46   0.000     .1972798    .3378804
          cov(IB,CR)|   .2868399   .0399601     7.18   0.000     .2085196    .3651602
        cov(IB,MBEA)|   .0774365   .0190724     4.06   0.000     .0400552    .1148177
          cov(IS,IC)|    .351561   .0421119     8.35   0.000     .2690232    .4340988
          cov(IS,CR)|    .324956    .043403     7.49   0.000     .2398877    .4100242
          cov(IC,CR)|   .3919724   .0481866     8.13   0.000     .2975285    .4864163
------------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(324) =    605.01, Prob > chi2 = 0.0000
.
. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
        chi2_ms(324) |    605.013   model vs. saturated
            p > chi2 |      0.000
        chi2_bs(378) |   4673.381   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
               RMSEA |      0.049   Root mean squared error of approximation
 90% CI, lower bound |      0.043
         upper bound |      0.055
              pclose |      0.591   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |  26282.324   Akaike's information criterion
                 BIC |  26710.101   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.935   Comparative fit index
                 TLI |      0.924   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
                SRMR |      0.054   Standardized root mean squared residual
                  CD |      0.998   Coefficient of determination
------------------------------------------------------------------------------
```

SEM Fitted Model

```
. sem (IA -> MLQ10, ) (IA -> MLQ18, ) (IA -> MLQ21, ) (IA -> MLQ25, ) (IA -> MLQ19, ) (IA -> SET_t
> otal, ) (IB -> MLQ10, ) (IB -> MLQ25, ) (IB -> MLQ6, ) (IB -> MLQ14, ) (IB -> MLQ23, ) (IB -> ML
> Q34, ) (IB -> MLQ26, ) (IB -> SET_total, ) (IM -> MLQ9, ) (IM -> MLQ13, ) (IM -> MLQ26, ) (IM ->
>  MLQ36, ) (IM -> SET_total, ) (IS -> MLQ13, ) (IS -> MLQ2, ) (IS -> MLQ8, ) (IS -> MLQ30, ) (IS
> -> MLQ32, ) (IS -> SET_total, ) (IC -> MLQ21, ) (IC -> MLQ36, ) (IC -> MLQ15, ) (IC -> MLQ19, )
> (IC -> MLQ29, ) (IC -> MLQ31, ) (IC -> SET_total, ) (CR -> MLQ18, ) (CR -> MLQ9, ) (CR -> MLQ1,
> ) (CR -> MLQ11, ) (CR -> MLQ16, ) (CR -> MLQ35, ) (CR -> MLQ22, ) (CR -> SET_total, ) (MBEA -> M
> LQ4, ) (MBEA -> MLQ22, ) (MBEA -> MLQ24, ) (MBEA -> MLQ27, ) (MBEA -> SET_total, ) (Age -> SET_t
> otal, ) (Gender_Diff -> SET_total, ) (Difficulty -> SET_total, ) (Grade -> SET_total, ), covstru
> ct(_lexogenous, diagonal) cov(_lexogenous*_oexogenous@0) iterate(50) latent(IA IB IM IS IC CR MB
> EA ) cov( IA*IM e.MLQ10*e.MLQ9 e.MLQ25*e.MLQ9 e.MLQ25*e.MLQ26 IB*IC IB*CR e.MLQ36*e.MLQ35 IS*IB
```

```
> IS*IC IS*CR IC*CR e.MLQ1*e.MLQ2 e.MLQ11*e.MLQ10 e.MLQ16*e.MLQ21 MBEA*IB e.MLQ22*e.MLQ23) nocapsl
> atent
note: The following latent variable names are also present in the data: IA, IB, IM, IS, IC, CR,
      MBEA.

Endogenous variables

Observed:     SET_total
Measurement:  MLQ10 MLQ18 MLQ21 MLQ25 MLQ19 MLQ6 MLQ14 MLQ23 MLQ34 MLQ26 MLQ9 MLQ13 MLQ36 MLQ2
              MLQ8 MLQ30 MLQ32 MLQ15 MLQ29 MLQ31 MLQ1 MLQ11 MLQ16 MLQ35 MLQ22 MLQ4 MLQ24 MLQ27

Exogenous variables

Observed:     Age Gender_Diff Difficulty Grade
Latent:       IA IB IM IS IC CR MBEA

Fitting target model:

Iteration 0:   log likelihood = -17524.701  (not concave)
Iteration 1:   log likelihood = -17472.342  (not concave)
Iteration 2:   log likelihood = -17431.766  (not concave)
Iteration 3:   log likelihood = -17038.855  (not concave)
Iteration 4:   log likelihood = -16868.279  (not concave)
Iteration 5:   log likelihood = -16799.578  (not concave)
Iteration 6:   log likelihood = -16599.632  (not concave)
Iteration 7:   log likelihood = -16517.423  (not concave)
Iteration 8:   log likelihood = -16420.959  (not concave)
Iteration 9:   log likelihood = -16307.326  (not concave)
Iteration 10:  log likelihood = -16261.134  (not concave)
Iteration 11:  log likelihood =  -16250.41  (not concave)
Iteration 12:  log likelihood = -16243.368  (not concave)
Iteration 13:  log likelihood = -16236.582  (not concave)
Iteration 14:  log likelihood = -16226.408  (not concave)
Iteration 15:  log likelihood =  -16220.87  (not concave)
Iteration 16:  log likelihood = -16219.449
Iteration 17:  log likelihood = -16212.147  (not concave)
Iteration 18:  log likelihood = -16211.269
Iteration 19:  log likelihood = -16208.437
Iteration 20:  log likelihood =  -16207.73  (not concave)
Iteration 21:  log likelihood = -16207.713  (not concave)
Iteration 22:  log likelihood = -16207.711
Iteration 23:  log likelihood = -16207.697
Iteration 24:  log likelihood = -16207.671
Iteration 25:  log likelihood = -16207.664
Iteration 26:  log likelihood = -16207.656
Iteration 27:  log likelihood = -16207.651
Iteration 28:  log likelihood =  -16207.65
Iteration 29:  log likelihood = -16207.649
Iteration 30:  log likelihood = -16207.649

Structural equation model                       Number of obs     =        361
Estimation method  = ml
Log likelihood     = -16207.649

 ( 1)  [MLQ10]IA = 1
 ( 2)  [MLQ18]CR = 1
 ( 3)  [MLQ21]IC = 1
 ( 4)  [MLQ25]IB = 1
 ( 5)  [SET_total]IM = 1
 ( 6)  [MLQ13]IS = 1
 ( 7)  [MLQ22]MBEA = 1
------------------------------------------------------------------------------
                    |                 OIM
                    |      Coef.  Std. Err.     z    P>|z|     [95% Conf. Interval]
--------------------+---------------------------------------------------------------
Structural          |
  SET_total         |
                Age |    .360059   .1747745     2.06   0.039     .0175072    .7026108
        Gender_Diff |   .6532603   .3179626     2.05   0.040     .0300651    1.276456
         Difficulty |   .0488719   .2115506     0.23   0.817    -.3657596    .4635035
              Grade |   .0679796   .0285075     2.38   0.017      .012106    .1238533
                 IA |   1.676296   1.181614     1.42   0.156    -.6396256    3.992218
```

```
                IB |  -8.776858   8.036699    -1.09   0.275     -24.5285    6.974782
                IM |          1  (constrained)
                IS |   9.875066   11.75558     0.84   0.401    -13.16545    32.91558
                IC |  -5.523025   10.95692    -0.50   0.614    -26.99818    15.95214
                CR |   7.993225   6.527534     1.22   0.221    -4.800507    20.78696
              MBEA |   .8200629   1.061267     0.77   0.440    -1.259983    2.900109
             _cons |   24.59598   2.863564     8.59   0.000      18.9835    30.20847
--------------------+------------------------------------------------------------------
Measurement         |
  MLQ10             |
                IA |          1  (constrained)
                IB |   1.432051   .1706293     8.39   0.000     1.097624    1.766479
             _cons |   2.623269    .070777    37.06   0.000     2.484548    2.761989
  ------------------+------------------------------------------------------------------
  MLQ18             |
                IA |   .9736482   .2977508     3.27   0.001     .3900673    1.557229
                CR |          1  (constrained)
             _cons |   3.216066   .0535912    60.01   0.000      3.11103    3.321103
  ------------------+------------------------------------------------------------------
  MLQ21             |
                IA |   .7205147   .2137392     3.37   0.001     .3015936    1.139436
                IC |          1  (constrained)
             _cons |   3.443213   .0459015    75.01   0.000     3.353248    3.533179
  ------------------+------------------------------------------------------------------
  MLQ25             |
                IA |   .5054349   .1820529     2.78   0.005     .1486179     .862252
                IB |          1  (constrained)
             _cons |   3.224377    .046569    69.24   0.000     3.133103     3.31565
  ------------------+------------------------------------------------------------------
  MLQ19             |
                IA |   .8639583   .2745692     3.15   0.002     .3258126    1.402104
                IC |   1.019733   .0854143    11.94   0.000     .8523244    1.187142
             _cons |   3.227147   .0575707    56.06   0.000      3.11431    3.339983
  ------------------+------------------------------------------------------------------
  MLQ6              |
                IB |   .9555807   .1684101     5.67   0.000      .625503    1.285658
             _cons |   1.795014   .0722399    24.85   0.000     1.653426    1.936601
  ------------------+------------------------------------------------------------------
  MLQ14             |
                IB |   1.629277   .1658174     9.83   0.000      1.30428    1.954273
             _cons |   3.074792    .058305    52.74   0.000     2.960517    3.189068
  ------------------+------------------------------------------------------------------
  MLQ23             |
                IB |    1.25071   .1456506     8.59   0.000     .9652405     1.53618
             _cons |   3.088643   .0563439    54.82   0.000     2.978211    3.199075
  ------------------+------------------------------------------------------------------
  MLQ34             |
                IB |    1.54065   .1587897     9.70   0.000     1.229428    1.851872
             _cons |   2.908587   .0564219    51.55   0.000     2.798002    3.019172
  ------------------+------------------------------------------------------------------
  MLQ26             |
                IB |   1.615919   .1409299    11.47   0.000     1.339701    1.892136
                IM |   .2197367   .2721087     0.81   0.419    -.3135865      .75306
             _cons |   2.969529   .0560947    52.94   0.000     2.859585    3.079473
  ------------------+------------------------------------------------------------------
  MLQ9              |
                IM |   .5866055   .6568071     0.89   0.372    -.7007129    1.873924
                CR |   .9582892   .0900606    10.64   0.000     .7817737    1.134805
             _cons |   3.138504   .0545137    57.57   0.000     3.031659    3.245349
  ------------------+------------------------------------------------------------------
  MLQ13             |
                IM |   .8021963   .7966533     1.01   0.314    -.7592155    2.363608
                IS |          1  (constrained)
             _cons |   3.412742   .0462299    73.82   0.000     3.322133    3.503351
  ------------------+------------------------------------------------------------------
  MLQ36             |
                IM |   .4302089   .4380918     0.98   0.326    -.4284353    1.288853
                IC |   .9904167   .0662415    14.95   0.000     .8605858    1.120248
             _cons |   3.401662     .04397    77.36   0.000     3.315482    3.487842
  ------------------+------------------------------------------------------------------
  MLQ2              |
```

IS	.8052894	.0985648	8.17	0.000	.6121058	.9984729
_cons	3.171745	.0497016	63.82	0.000	3.074332	3.269159
MLQ8						
IS	1.005014	.1207399	8.32	0.000	.7683678	1.24166
_cons	2.975069	.060231	49.39	0.000	2.857019	3.09312
MLQ30						
IS	1.4867	.1213632	12.25	0.000	1.248832	1.724567
_cons	3.077562	.0549726	55.98	0.000	2.969818	3.185307
MLQ32						
IS	1.44764	.1228893	11.78	0.000	1.206781	1.688498
_cons	3.102493	.056445	54.96	0.000	2.991863	3.213123
MLQ15						
IC	.5986265	.0611791	9.78	0.000	.4787176	.7185354
_cons	3.612188	.0379518	95.18	0.000	3.537804	3.686573
MLQ29						
IC	.7701294	.1314911	5.86	0.000	.5124116	1.027847
_cons	1.980609	.0801346	24.72	0.000	1.823548	2.13767
MLQ31						
IC	1.32083	.0851532	15.51	0.000	1.153933	1.487727
_cons	3.204986	.0533434	60.08	0.000	3.100435	3.309537
MLQ1						
CR	.7235726	.0738356	9.80	0.000	.5788575	.8682877
_cons	3.457064	.0415749	83.15	0.000	3.375578	3.538549
MLQ11						
CR	.9967798	.118323	8.42	0.000	.764871	1.228689
_cons	2.645429	.0682208	38.78	0.000	2.511719	2.77914
MLQ16						
CR	.8361733	.0763267	10.96	0.000	.6865758	.9857708
_cons	3.476454	.0420877	82.60	0.000	3.393964	3.558945
MLQ35						
CR	1.05817	.09246	11.44	0.000	.8769513	1.239388
_cons	3.33241	.0506469	65.80	0.000	3.233144	3.431676
MLQ22						
CR	.5164921	.104755	4.93	0.000	.3111761	.7218081
MBEA	1	(constrained)				
_cons	2.534626	.0722829	35.07	0.000	2.392954	2.676298
MLQ4						
MBEA	.8989408	.1245758	7.22	0.000	.6547767	1.143105
_cons	1.952909	.0754663	25.88	0.000	1.804997	2.10082
MLQ24						
MBEA	1.380839	.1554614	8.88	0.000	1.07614	1.685537
_cons	2.00277	.0740704	27.04	0.000	1.857595	2.147945
MLQ27						
MBEA	1.028814	.1295158	7.94	0.000	.7749674	1.28266
_cons	1.797784	.0741347	24.25	0.000	1.652483	1.943085
var(e.MLQ10)	1.174335	.1000041			.993814	1.387645
var(e.MLQ18)	.4662252	.0522708			.3742512	.5808021
var(e.MLQ21)	.2767309	.0277541			.2273465	.3368426
var(e.MLQ25)	.5088051	.0426545			.4317109	.5996667
var(e.MLQ19)	.6621018	.0576011			.5583064	.7851941
var(e.SET_total)	8.766416	2.171467			5.394821	14.24515
var(e.MLQ6)	1.668902	.1264488			1.438591	1.936085
var(e.MLQ14)	.6021503	.0522985			.507897	.7138948
var(e.MLQ23)	.7777046	.0615358			.6659834	.9081675
var(e.MLQ34)	.5903111	.0502916			.4995314	.6975883
var(e.MLQ26)	.5099482	.0450242			.4289158	.6062895

```
         var(e.MLQ9)|   .6011195   .0556229                      .501415    .7206498
        var(e.MLQ13)|   .3128785   .0519711                     .2259361    .4332772
        var(e.MLQ36)|   .2576198   .0232947                     .2157801    .3075723
         var(e.MLQ2)|   .6905076   .0528838                     .5942615    .8023416
         var(e.MLQ8)|   .9961663   .0768649                     .8563524    1.158807
        var(e.MLQ30)|   .4049962   .0380777                      .336838     .486946
        var(e.MLQ32)|   .4997891    .043811                     .4208926    .5934748
        var(e.MLQ15)|   .3746847   .0289251                      .322073    .4358906
        var(e.MLQ29)|   2.077739    .156323                     1.792872     2.40787
        var(e.MLQ31)|   .3199706   .0312939                      .264156    .3875784
         var(e.MLQ1)|   .4002758   .0321411                     .3419875    .4684988
        var(e.MLQ11)|   1.255594   .0982129                      1.07713    1.463627
        var(e.MLQ16)|   .3407214   .0284437                     .2892947      .40129
        var(e.MLQ35)|   .4475753   .0387884                     .3776575    .5304373
        var(e.MLQ22)|   1.143745   .1061094                     .9535865    1.371823
         var(e.MLQ4)|    1.54812   .1313352                      1.31097     1.82817
        var(e.MLQ24)|   .7823571   .1260346                     .5705318    1.072828
        var(e.MLQ27)|   1.318869   .1215087                      1.10098    1.579878
             var(IA)|   .1511607   .0706999                     .0604395    .3780568
             var(IB)|    .235468    .043386                     .1640947    .3378853
             var(IM)|   .2304667   .4643317                     .0044428    11.95535
             var(IS)|   .3103418   .0481861                     .2289159    .4207309
             var(IC)|   .4054027   .0521153                     .3151106    .5215672
             var(CR)|   .4272757    .066098                     .3155226      .57861
          var(MBEA)|   .6284339    .116305                      .437247    .9032177
--------------------+------------------------------------------------------------------
 cov(e.MLQ10,e.MLQ9)|   .2047787   .0508176     4.03   0.000      .105178    .3043795
cov(e.MLQ10,e.MLQ11)|   .3813932   .0704787     5.41   0.000     .2432574     .519529
cov(e.MLQ21,e.MLQ16)|   .0717885   .0193441     3.71   0.000     .0338747    .1097023
cov(e.MLQ25,e.MLQ26)|   .1207397   .0315259     3.83   0.000       .05895    .1825294
 cov(e.MLQ25,e.MLQ9)|  -.1173047   .0309166    -3.79   0.000    -.1779001   -.0567094
cov(e.MLQ23,e.MLQ22)|   .2854831   .0581342     4.91   0.000     .1715422    .3994239
cov(e.MLQ36,e.MLQ35)|   .1082198    .022043     4.91   0.000     .0650164    .1514233
  cov(e.MLQ2,e.MLQ1)|   .1214909   .0298079     4.08   0.000     .0630685    .1799133
          cov(IA,IM)|   .1262436   .1264183     1.00   0.318    -.1215318    .3740189
          cov(IB,IS)|   .2478271   .0346551     7.15   0.000     .1799043    .3157499
          cov(IB,IC)|   .2676683   .0359825     7.44   0.000      .197144    .3381927
          cov(IB,CR)|   .2868462   .0400157     7.17   0.000     .2084168    .3652756
        cov(IB,MBEA)|   .0775116   .0190554     4.07   0.000     .0401637    .1148595
          cov(IS,IC)|   .3485059   .0420097     8.30   0.000     .2661685    .4308434
          cov(IS,CR)|   .3224035   .0432001     7.46   0.000     .2377329    .4070741
          cov(IC,CR)|   .3920715   .0480728     8.16   0.000     .2978506    .4862924
------------------------------------------------------------------------------------
LR test of model vs. saturated: chi2(457) =    842.69, Prob > chi2 = 0.0000
.
. estat gof, stats(all)

------------------------------------------------------------------------------
Fit statistic        |      Value   Description
---------------------+--------------------------------------------------------
Likelihood ratio     |
        chi2_ms(457) |    842.691   model vs. saturated
            p > chi2 |      0.000
        chi2_bs(522) |   5199.233   baseline vs. saturated
            p > chi2 |      0.000
---------------------+--------------------------------------------------------
Population error     |
               RMSEA |      0.048   Root mean squared error of approximation
 90% CI, lower bound |      0.043
         upper bound |      0.054
              pclose |      0.689   Probability RMSEA <= 0.05
---------------------+--------------------------------------------------------
Information criteria |
                 AIC |  32661.298   Akaike's information criterion
                 BIC |  33139.630   Bayesian information criterion
---------------------+--------------------------------------------------------
Baseline comparison  |
                 CFI |      0.918   Comparative fit index
                 TLI |      0.906   Tucker-Lewis index
---------------------+--------------------------------------------------------
Size of residuals    |
```

```
                SRMR |      0.060   Standardized root mean squared residual
                  CD |      0.998   Coefficient of determination
------------------------------------------------------------------------------
```

GSEM Fitted Model

```
. gsem (Age -> SET_total, ) (Gender_Diff -> SET_total, ) (Difficulty -> SET_total, ) (Grade -> SET
> _total, ) (MLQ_diff -> SET_total, ), iterate(50) nocapslatent

Iteration 0:   log likelihood = -986.97066
Iteration 1:   log likelihood = -986.97066

Generalized structural equation model           Number of obs     =        361
Response       : SET_total
Family         : Gaussian
Link           : identity
Log likelihood = -986.97066

------------------------------------------------------------------------------
             |      Coef.  Std. Err.     z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
SET_total    |
         Age |   .2877105   .2213044     1.30   0.194    -.1460381    .7214592
 Gender_Diff |   .6607037   .4011139     1.65   0.100    -.1254652    1.446873
  Difficulty |  -.0236463   .2664922    -0.09   0.929    -.5459613    .4986688
       Grade |   .1381913   .0357232     3.87   0.000     .0681751    .2082074
    MLQ_diff |   .1321241   .0128825    10.26   0.000     .1068747    .1573734
       _cons |   17.25706   3.598497     4.80   0.000     10.20414    24.30999
-------------+----------------------------------------------------------------
 var(e.SET_total)|   13.87522   1.032764                      11.99176     16.0545
------------------------------------------------------------------------------

.
.
. regress SET_total Age Gender_Diff Difficulty Grade MLQ_diff

      Source |       SS           df       MS      Number of obs   =       361
-------------+----------------------------------   F(5, 355)       =     25.97
       Model |  1832.35915         5   366.47183   Prob > F        =    0.0000
    Residual |  5008.95387       355  14.1097292   R-squared       =    0.2678
-------------+----------------------------------   Adj R-squared   =    0.2575
       Total |  6841.31302       360  19.0036473   Root MSE        =    3.7563

------------------------------------------------------------------------------
   SET_total |      Coef.  Std. Err.     t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         Age |   .2877105   .2231667     1.29   0.198    -.1511846    .7266056
 Gender_Diff |   .6607037   .4044894     1.63   0.103    -.1347931    1.456201
  Difficulty |  -.0236463   .2687348    -0.09   0.930    -.5521586     .504866
       Grade |   .1381913   .0360238     3.84   0.000     .0673444    .2090381
    MLQ_diff |   .1321241    .012991    10.17   0.000     .1065752     .157673
       _cons |   17.25706   3.628779     4.76   0.000     10.12046    24.39367
------------------------------------------------------------------------------

.
```