

Role of Transformational leadership on Engineering Education Quality mediating by Teachers Quality

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Abstract:

Globally, there is need to develop the education system for enhancing the economic growth by developing the students. Now, the education system becomes the business for stake holders that affect the education quality. The education quality provide the vision for students for getting better jobs, managerial positions in the organization, enhancement in leading qualities. The purpose of this study is to examine the effect of transformational leadership on engineering education quality. The current study also examines the mediating role of teacher's quality, and how teacher's quality mediates the relationship of transformational leadership and engineering education quality. This study shows the engineering education quality of Indonesian students. Engineering education quality can be determined by the factors of transformational leadership. GAT (General aptitude test) is one of the factor of engineering education quality that is implemented by national testing service (Public institution) and are deliberated as the most trustworthy and identical assessments in the nation to measure student academic know-how. Under this study, quantitative analysis is perform and collecting data from fresh undergraduates students. The data is collected through administrated survey questionnaire, it is more appropriate method in this study because it will give factual data on numerical figure bases that can be evaluate easily and that is free from any type of the ambiguities. The simple random sampling technique is used under this study for selecting the sample from large population. By using simple random sampling technique the questionnaire is distributed among 250 college fresh undergraduates' students. From 250 questionnaires 200 questionnaires received back from students. The nature of the study is cross sectional only one time data is collected from students. This study used the Smart PLS software for analyzing the relationship among variables such as transformational leadership, engineering education quality and teacher's quality. The findings of the study reveals that transformational leadership and its factors such as idealized behavior, inspirational motivation, intellectual stimulation and individual attributes has significant and positive relationship with engineering education quality. It can be improved by providing best leadership characteristics like transformational leadership. The finding also reveals that teacher's quality has significant and

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positive relationship with transformational leadership and engineering education quality.

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I. INTRODUCTION

Quality education plays an important role for emerging characteristics and abilities to achieve according the prospective of individuals as human being or member of society. “Education is at the heart of both personal and community development; its mission is to enable each of us, without exception, to develop all our talents to the full and to realize our creative potential, including responsibility for our own lives and achievement of our personal aims”(UNESCO, 1996). In developing economy educations is one of the important factors for increasing the economic growth by providing best knowledge to the younger generation of the economy and prepare them for future challenges. In today world, education in engineering field provides employment opportunities in management level. Education for improving the engineering education quality there is needed to do some changes in educational system, because it is not theory based subject it’s a practical subject that need laboratory trainings. In the engineering education filed there is large number of students. The government institution cannot manage and train all the students so large number of students gets training from private institutes. The quality of training and education from private institute knowledge is different from the public institute knowledge, so it raised difference in quality of engineering education that move towards serious concern related to educational system (Choudhury, 2019). Having considered the importance of education Indonesia has already announced a 0 to 100% ownership of educational institutions. Education quality is still a big issue in Indonesia which can be judged from the following figure which is explaining the educational growth of the Indonesian students:

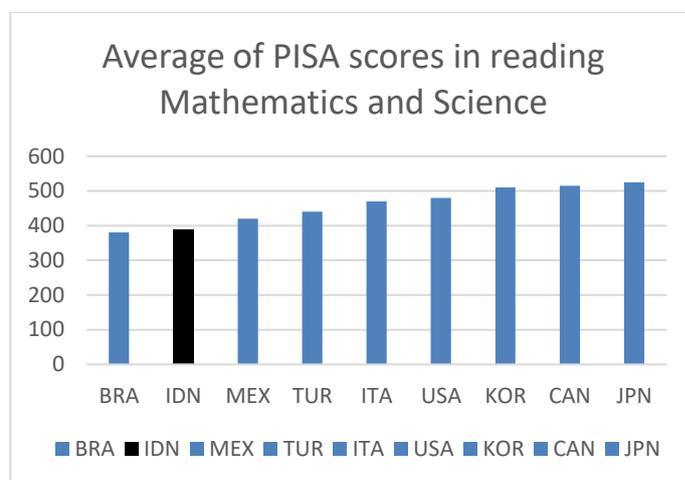


Figure 1

Source: OECD (2018)

The engineering learning is essential in industrial area. Moreover, engineering institutions stood expected to include technical demo, small group debate, laboratory work student demonstrations, field work and site official visit to industries in their program, as engineering science includes the use of critical or arithmetic techniques, displaying, imitation and appreciative the tentative procedure (Biswas, Chopra, Jha, & Singh, 2010). Therefore, to stimulate imaginative and visionary thinking among the students, there have a duty to also be an assimilation of engineering analysis, enterprise and engineering systems. There should be a positive change in method of learning and increase the motivational level among students by changing the way from lecture based education to student centered learning (Wang, 2004). According to the UNESCO report on engineering education, it mentioned that for increasing the student motivation, there is need to change the way how engineering was being educated, making it more applicable and exciting for the students. It was reported that it need huge change in syllabus and teaching method for engineering education and more related with problem solving tactic to engineering education as compare to the lecture based education (Unesco & Marjoram, 2010; UNESCO., 2010). Similarly, by changing the way of knowledge and convert from lecture based learning to student centered education, it enhance the creative abilities and engineer’s learn

entrepreneurial skills rather than technical knowledge and hard skills. It can be helpful in improving their employability in the organizational sector and mostly in labor market with modification in teaching learning in class room (Singh, SJ, & Kurtz, 2009). Furthermore, the engineering students also need the knowledge related to industrial psychology and sociology, so in the course of engineering there must be subject related to social and psychological sciences that work as helping tool for students to create a link with job and need of society. For performing their task effectively and efficiently in service industry, they must need the psychological knowledge more importantly while doing job in industries as electrical power distribution, irrigation and telecommunication (Choudhury, 2019; Sharan, 2004).

For achieving the target of organization and stimulating the followers there is need of leadership style and behavior. By using that leadership behavior and manner leader expressed externally to the public, followers, and community to influence them and behave on particular manner. In today world, there is number of different leadership style, with combination of different traits that is suitable in different situation. One leader is successful in one situation and other is successful in other situation, they can flourish in different situations. There is many type of leadership style according to different studies and researchers (Choudhury, 2019). Among all categories of leadership style, this study will focus on the effect of transformational leadership on engineering education quality in undergraduate's students of colleges in Indonesia. Leadership is key determinants for success in developing economies such as Pakistan, India, and Bangladesh etc. (Gill, Nisar, Azeem, & Nadeem, 2017).

Additionally, the notion of transformational leadership is thriving explained by (Bass & Avolio, 1994) who exercised the term "Four I's of Transformational Leadership" to pronounced this attractiveness. These four components are idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass & Avolio, 1994; Dionne, Yammarino, Atwater, & Spangler, 2004; Gill et al., 2017; Haider, Nisar, Gill, & Ali, 2017). These four constituents of the transformational leadership are dire key factors for communication development, problem solving management skills, and interconnection promotion inside the association and are carefully connected to overall group performance. Furthermore, transformational leadership is not inherent feature of leaders and it does not come by birth. It can be learn from training. Training of principals in colleges is crucial, because principals of educational institution must have communication skill, creative knowledge, problem solving skills, and many more. So, there is need to develop the flexible, decentralized leadership skills to manage and support the mission of the organization and followers also (Lynch, 2012; Tangkitvanich & Sasiwuttiwat, 2012). Number of

studies have been done on transformation leadership and teacher students relationship that can improves the motivation level, communication skill and commitment, but less studies available that focus on how transformational leadership affect the engineering education quality. Moreover, teachers were realized to be permitted to implement and develop their enactment and competences. Lastly, substantiation has revealed that transformational leadership supporters school productivity and positive school results.

Teacher quality can be consider as mediator under this study, if organization provide better leadership features then the quality of engineering education improves, and teaching quality also plays an important role for improving the upper management (principal) relationship. Moreover, teaching as profession is most important asset for any organization, and their competencies add values to institutions and create a competitive edge also. Furthermore, teachers consider as essential element and backbone of any educational institution. It can create quality students in the overall world. The student quality can be enhanced by providing best teacher and principal, if the quality of teachers and quality of principal improves the quality of education of students, because a good quality teachers and principal with leading abilities improves the student's effectiveness in class and in industrial area also. A good teacher can provide the quality students, qualified teachers can be created and trained by providing short training and courses, the more training the get the more quality of education they have. Today world changing rapidly so there is need to cope with change easily by changing the teachers quality and developing the best leadership skill (Choudhury, 2019). The quality teachers are the human that provided knowledge to the students, and many researchers define the quality education on the bases of their teacher's quality in different features such as performance, knowledge, skill, motivation and accountability. The qualification of the teachers is necessary for getting the competitive edge in other educational institutes. It is intense attribute and difficulty to asses (DuFour & Marzano, 2011).

The purpose of the current study is to examine the role of transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration on engineering education quality. It also examines the mediating role of teacher quality on transformational leadership and engineering education quality. To fulfill the purpose of the study, it has following some objectives.

1. To examine the effect of idealized behavior, on engineering education quality.
2. To examine the effect of inspirational motivation, on engineering education quality.

3. To examine the effect of intellectual stimulation, on engineering education quality.
4. To examine the effect of individual consideration, on engineering education quality.
5. To determine the effect of transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration on teacher's quality.
6. To elaborate the effect of transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration on engineering education quality while mediating by teacher's quality.

For fulfilling the following objectives the current study research questions which are as follows:

1. Does idealized behavior effect on engineering education quality?
2. How inspirational motivation effect on engineering education quality?
3. Does intellectual stimulation effect on engineering education quality?
4. How individual consideration effect on engineering education quality?
5. Do transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration effect on teacher's quality?
6. To what extent, transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration on engineering education quality while mediating by teacher's quality?

Although after discussing short introduction of the study with research objectives and research questions, this study also provide the literature of engineering educational quality, transformational leadership and its factors such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration, and teacher quality in college undergraduates students. Further this paper cover the hypothesis and research framework, research methodology, findings of the study, discussion, limitation and future direction of this study discussed below.

II. LITERATURE REVIEW

Under the literature review, this study discussed all the variables such as transformational leadership and their four factors namely idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration, engineering education quality and teacher's quality. Further, relationship among all variables, hypothesis development and theoretical framework are discussed under the literature review.

Engineering Education Quality

The concept of education quality is similar with the concept of manufacturing and service sector quality. The education quality is not depending on single indicators, the education quality depends on multiple indicators because it is multidisciplinary idea. According to Cheong Cheng and Ming Tam (1997) education quality can be demonstrated as multi factors construct such as "the character of the set of elements in the input, process, and output of the education system that provide service that completely satisfy both internal and external strategic constituencies by meeting their explicit and implicit expectations." Moreover, education quality can be indicated by multiple factors, but all factors have similar significance and go to the same direction and show the importance of education quality for all the parties such as parents, policy makers, education institute management committees, students, teachers etc. Although, it has several importance and can be checked by using various type of factor. Similarly, Choudhury (2019) described that engineering education quality is also necessary in practical field because they are more related with practical knowledge rather than focuses on lecture based knowledge.

Additionally, for meeting the need of labor market and full fill the need of society the education quality must meet with the minimum standards, knowledge and skills. Quality education must be closely related with the structure of responsibility and performance appraisal (Saiti, 2012). In today world there is need to develop the quality education to gain the competitive edge in society by achieving the quality in education according to the desired level of stake holders for knowledge. The bench marks related to quality education strongly affects the strategies of educational institutes. It can be one of the important sources for driving change in educational institutes. The quality of education institute depends upon the entire staff member from top management (principal) and teachers and students. The quality is novel concept and has different constructs so all the stakeholders get benefit from the quality standards, and it should be clearly defined and relevant. By implementing quality in educational institution enable them to fulfill the requirements of parents and students and the entire external stake holder that directly and indirectly involved.

Moreover, quality can be achieved by responsibility, accountability, and ownership factors. Most of the period, an organization's criterions, a number of which are explicit to resources and procedure, will be recognized. A standard should noticeably define the educational institute factual competency so that it is probable to be attained and quantifiable. This statement has extended the characterization of education quality to shield the entire education process, that is the needed characteristics of learners (vigorous and enthused), procedures (capable teachers of by using energetic

teaching methods), system (good power and fair resource allocation), and content (suitable and accepted syllabuses). However, students considered motivation as an crucial component for the educational setting to advance education quality. Numerous management utensils have been used successfully (Stukalina, 2010). To fulfill these needs, several key contents have been identified by several educational experts. Even though the definitions of education quality and beliefs about quality in education are not sound acceptable, three standards are broadly acceptable in international conversation related to education quality betterment that is education must be more related, larger fairness of admittance and outcomes, and appropriate observation of individual rights. Several key elements of education quality are discussed below.

The educational institute key factor of quality firstly depends upon background of the person as student that affects the capability to learn new things it includes talent, consistency, enthusiasm, knowledge and social economic background, barriers, health and place of birth and many more. For education development in economic field this factor is very much crucial because it prepare the mind of student emotionally, logically and creative aptitudes. Secondly, enabling inputs are next dimension such as teaching and learning in educational sector is successful when sufficient amount of resources are available and achieved well also. The effectiveness of the institutes depends upon the resources that enable in place such as human resources, school governance, infrastructure and facilities also. The teaching and learning magnitudes include several elements such as learning period, teaching techniques, evaluation structure, and response, motivations, and class size. Lastly, the contextual dimensions included the environmental factors some environmental factors are controllable and some uncontrollable. The contextual factors include the labor market condition, religious factors, social-culture, globalization, philosophy of teacher and students, peer effects etc. These factors also have strong influence positively and negatively on student's background and resources of institutions effectively.

The engineering learning is vital in organizational area. Likewise, engineering institutions stood expected to include technical demo, small group debate, laboratory work student demonstrations, field work and site official visit to industries in their program, as engineering science includes the use of critical or arithmetic techniques, displaying, imitation and appreciative the tentative procedure (Biswas et al., 2010). The GAT must be cleared and necessary for getting the admission in engineering course work. The general aptitude test is national test that must be done by the 12 standard students. GAT organized by NIETS twice in year in March and October in most of the countries. It depends upon two parts reading comprehension and analytical skills and communication in

English. These test emphases on general knowledge and skills. Further, its main target is for the grade 12th students to practice the test marks as an amount of the standards for university admittance.

Transformational Leadership

Leadership is key element for the success of any organization (Jermisittiparsert & Urairak, 2019). Globally people consider differently for leadership concept. Some researchers consider that leadership is inherent in leaders by birth and it cannot be learn from environment, it is good gifted quality that cannot be either made or developed in person. There are number of different definition available for the concept leadership many researchers consider the leadership quality as behavior like leaders have some particular features such as authority, influence, power, management, supervision, status and much more (Bennis, 1959). These leading attitudes of the leaders influence the follower's behaviors and actions to follow the leaders and trust them (Northouse, 2017). Moreover, the concept of inherent qualities of person as leaders is not true, because every great leader is not born with leadership qualities for example Abraham Lincoln, Nelson Mandela, and Bill Gates. Many people that shy from crowd and not born with leadership qualities are made as great leaders after getting special training and experience. On the other hand, researchers define the leadership quality as transactional leaders. It means that leadership consider as transactional process and event between leaders and followers to fulfill the objectives of the organization to achieve the ultimate goal of the organization by taking actions and influencing them (Bo, 2013.) According to Saal and Knight (1988), described the leadership traits is not in born in human it can learn from proper and effective training, leadership is not only a ability, it consider as behavior that can be effected by different situations and that behavior can be learn from environment, it can be vary from situation to situation.

In today's competitive world, leadership plays a noteworthy role in education sector. According to the term leadership involves teacher and students, in which teacher influence the student to accomplish goals. The organizational success and failure largely depend upon the leaders (Bass, Stogdill, & Bass, 2008). The performance of student and climate of school can be changed by the principal leaders because the school leaders has clear vision, strategically manage all the goals and motivate the students (Bycio, Hackett, & Allen, 1995; Hartinah, Suharso, Umam, Syazali, Lestari, Roslina, & Jermisittiparsert, 2020). According to Creech 1914, the leadership in school can be increase the quality of schools and also have a great influence in schools total quality management. The humans in educational environment is important asset because the work as human capital and create value for the institution, quality of educational institution is

largely depends upon the quality of leadership that is provided by the upper management. Similarly, for chasing the goals of any organization the management of any organization needed leadership attitude. Therefore, the leadership role is a substantial feature in instructor improvement and involves education worth. The education unit is provided foundation for the younger generation because they have to serve in community. However, education quality can generate the quality students that create quality employees for the economy.

In today world organization face many challenges due to the rapid changes in organization at global level. The organization must adopt all the changes and accept the threats and avail the opportunities to meet the changes that come due to the globalization. However, for meeting the changes in environment, the organization needs the transformational leadership (Ismail, Mohamed, Sulaiman, Mohamad, & Yusuf, 2011; Siriattakul & Jermstittiparsert, 2019). For creating global competitiveness and achieving the organizational long term objectives and goal, the leadership style change from transactional type of leadership to the transformational leadership (Akbari et al., 2013). Transformational leadership can be defined as leaders work as trusted role models that encourage the followers to meet the challenges instead of avoiding the challenges in overall the organizational process (Bruce J Avolio, 2010). The term transformational leadership further described by the Bass and Avolio (1994), they well defined the term by introducing four "I". the name of four "I" that are described by them are as follows: idealized behavior, inspirational motivation, intellectual stimulation, and individual (Bass & Avolio, 1994; Gill et al., 2017; Pootrakul, 2014; Yu, 2000). These four factors of the transformational leadership are critical elements for communication improvement, conflict management abilities, and consistency campaign within the organization and are thoroughly related to the performance of group.

Teachers Quality

The teacher quality is one of the most important concerns for the quality education in engineering, because it is not the lecture based learning it based on practical knowledge provided by the institute. Laboratory training is more related teaching method for engineering students (Choudhury, 2019). Moreover, teacher consider as initially most important factor for providing best knowledge to the engineering students, it is consider as asset and human resource for the organization. The abilities of the teachers must create value in educational institutes. The more the capable of the teacher an institution have the more capable student they can produce. The knowledge, skill and abilities of teachers must relate with their task duties and responsibilities so they can enhance the value for organization. According to Ulrich, Brockbank,

Yeung, and Lake (1995) demonstrated that individual knowledge skill and ability consider as competencies of individuals. the competencies of teachers can be reveal in their daily task by creating new things, delivering ideas and programs and taking initiatives for the institutes more than their routine works.

For creating a sustainable competitive advantage for the organization, the teacher work as human capital in economy. Specifically in educational sector, teachers are considering as backbone of the institutions. Educational institutes provide morality, confidence, skills, ability and knowledge and many other features to the students to survive in the economy by providing benefit to the economy in long run. Furthermore, the quality of educational institute teachers and their principals affect the quality of educational system that is provided to the student in the class room and in the practical laboratory trainings. Teacher of the educational sector plays a key role in institutes efficiently and effectively that produce the quality students in society. The quality of teacher is only a human that can deliver the quality learning and students get quality education. (Harris & Sass, 2011; Remijan, 2014).

Sustainable organizations can be achieved in the present economy by introducing worthy point in any organization. The organization worth can be improved by overcome the threats and introduced the benefits of organization that helpful for organization to create a competitive edge.

All organizations and many others need to discover out their competitive advantages; if not then they will face an critical situation and become the firms that perform low from standards (Barney, 1995). The organization can survive in the world by creating best competitive advantage as compare to the other organizations. The education institutes can create that edge in institutes by providing knowledgeable and quality teachers to the students. The competitive advantage considers as resources and teacher as human is one of the important resource that give benefits to the institution.

Moreover, competitive benefit can be in many shapes that may be tangible or intangible assets, and should be inside created, such as stability in finance, raw resources, talents, aptitudes, capability, know-how, up-to-date equipment, amenities or even bright employees in the organizations. Moreover, from the institute viewpoint, teachers can be calculated as a competitive advantage. Consequently, institutes principals have to yield the issue of teacher quality into version as well. Qualified teachers can be produced or taught. The training is best method for producing quality teachers, the more the institute provide training to teachers the more the quality outcome they have. While, the high qualified teachers can be considered as valuable resource for the institutes (Pootrakul, 2014).

Recently, educational institutes face many challenges due to the rapid changes so, the upper management of the institutes

cannot handle all the changes by single handed thus they need other members skills and talent for holding and solving these changes. The educational institutes must consider the strength and weak point of their firms and overcome the barriers to reduce the weakness of the institute and efficiently enhance the opportunities to strengthen the organization. Similarly, educational institutes can be generate competencies by using learning resources, modern technology and provided practical training to the engineering students. Teachers are the drivers for producing the quality students. Some of researchers explained that teacher attitude must be influenced by the external environment and personal attributes such as satisfaction, commitment and behavior are highly affected by the environment. Therefore, if the teachers behavior effected by the attitude, commitment and satisfaction it will have ultimate effect on the student satisfaction , behavior and commitment that effect their quality (Anderson, 1982; Hoy, Hannum, & Tschannen-Moran, 1998; Hoy, Tarter, & Bliss, 1990; Tschannen-Moran, Parish, & Dipaola, 2006).

Even so, there has been solid indication that student performance is significantly enhanced with the teacher’s proficiency that is proper attitudes, behaviors, and insights, obligation to students, commitment in the coaching procedure, and willingness to collaborate with others (Tschannen-Moran et al., 2006). By the same demonstration, Darling-Hammond (2000) stated that teacher quality is worthy pointers of that have strongly influence the performance of students. Another study indicated that teacher’s abilities have significantly positive relationship with student’s mathematical and reading abilities (Heck, 2009). This finding is similar to the another study that shows the relationship with teachers quality and student performance in a university in Italy, the findings of the study shows that teacher’s quality has significant relationship with student performance (De Paola, 2009).

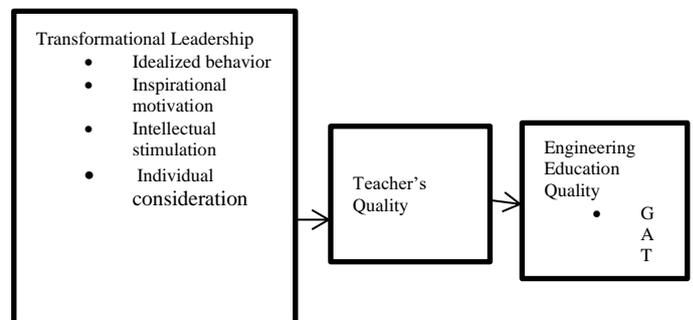
Hypothesis Development

- H1. Idealized behavior has significant and positive relationship with engineering education quality.
- H2. Inspirational motivation has significant and positive relationship with engineering education quality.
- H3. Intellectual stimulation has significant and positive relationship with engineering education quality.
- H4. Individual consideration has significant and positive relationship with engineering education quality.
- H5. Transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration has significant and positive relationship with teacher’s quality.
- H6. Transformational leadership such as idealized behavior, inspirational motivation, intellectual stimulation, and individual consideration has significant and positive relationship with engineering education quality.

relationship with engineering education quality while mediating by teacher’s quality.

Research framework

Based on purpose of the study that is, to examine the effect of transformational leadership and their Four “I” on the engineering education quality while mediating by teacher’s quality. The following are research framework of this study:



III. METHODOLOGY

The sample of study is the educational institute’s fresh undergraduates of Indonesia. The academic sectors gain much attention because future of the economy is depending on the younger generation. The engineering education quality plays a vital role in emerging technological world. The data will be collected from the fresh undergraduates of academic institutes, so the unit of analysis of the study is individuals. The sector of the study is colleges and universities of Indonesia where students get admission after 12th class collected data from the students related to effect of transformational leadership on engineering education quality and also collected data from students related to teaching quality as intervening variable. The study is descriptive in which all the variable of the study well described. The nature of the study is cross sectional only one time data is collected from students of academic institutions. There are number of private and public academic institution in Indonesia that provides engineering education it means that large number of population was available. The sample is selected from large population that represents the overall population. There are different methods and techniques available for selecting the sample size. By using these techniques generalized sample can be created that represent the overall population. Moreover, Kotrlik and Higgins (2001), can be demonstrated one of sample size technique that sample size at least 20% of the whole population. Although very frequently the total number of population is limited in such circumstances it suits much at ease to select the sample and collect data. For the limited population the (Krejcie & Morgan) table is used for selecting the sample size (Krejcie & Morgan, 1970). Discussing to Raune (2005) for sample size

the scholar fundamentals to practice the ratio, from the large population size there is small ratio sample size. However, in present study the population was boundless. Similarly, for structural equation model of 200 to 400 respondents is enough for sample size (Oke, Ogunsami, & Ogunlana, 2012). On the bases of above mentioned arguments the 250 students was determined to collect the data as sample size in current study from academic institutions.

Next, the next question after selecting the sample size is to take decision about the sampling technique that is which sampling technique is more suitable and easy for doing this research. There are number of different techniques available in research but under this study simple random sampling technique is used by using the randomized online for collecting data from the public and private education institutes. The data was collected from students through administrated questionnaires. The questionnaire distributed through electronic mail, post mail and face to face distribution. The questionnaire depends on two parts, the part "A" related with demographics of the respondents and part "B" consisted on the entire variable related with this study. In this study the scale was adopted from previous studies, the 5 point Likert scale is used under this study for collecting the response from students and evaluating the relationship among variables. The 16 items scale was used under this study for transformational leadership and their factors. Transformational leadership was measured with Multifactor Leadership Questionnaire (Bass & Avolio, 1994). Most of studies adopted this scale for measurement of transformational leadership. Teacher quality can be measured by using seven items scale (Pootrakul, 2014), and the engineering education quality can be measured by using the five items scale. The smart PLS was used under this study for analysis. Next section of the study discusses the results of the current study.

IV. RESULTS

Confirmatory Factor Analysis

Table 1

Constructs	Items	Loadings	Alpha	CR	AVE
Engineering Education Quality	EE Q1	0.776	6	51	54
	EE Q2	0.818			
	EE Q3	0.846			
	EE Q4	0.835			
	EE Q5	0.295			
Idealized Behavior	IB1	0.832	7	84	5
			0.71	0.7	0.5

	IB2	0.629			
	IB3	0.749			
Individual Consideration	IC1	0.896	8	08	67
	IC2	0.824			
	IC3	0.906			
Inspirational Motivation	IM1	0.786	0.7	27	15
	IM2	0.826			
	IM3	0.738			
Intellectual Stimulation	IS1	0.834	7	86	62
	IS2	0.839			
	IS3	0.704			
	IS4	0.868			
Teacher's Quality	TQ1	0.787	5	84	26
	TQ2	0.81			
	TQ3	0.725			
	TQ4	0.469			
	TQ5	0.742			
	TQ6	0.785			
	TQ7	0.705			

Table is showing the results for the confirmatory factor analysis which is executed to assess the measurement model fitness. First of all convergent validity is assessed based on the three parameters namely; factor loadings, composite reliability and average variance extract. The values for the factor loadings must be greater than 0.7. As per the table all the values for the factor loadings are greater than 0.7 which fulfilled the first condition of convergent validity.

Secondly the values for the composite reliability and average variance extract must be greater than 0.8 and 0.5 respectively. As per the table 1 all the values are satisfying the criterion. Findings in table 1 has fulfilled all the conditions of convergent validity, therefore it is stated that there is no issue regarding the convergent validity in the scale.

Discriminant Validity

Table 2
Fornell-Larcker Criterion

	EEQ	IB	IC	IM	IS	TQ
EEQ	0.744					
IB	0.408	0.742				
IC	0.71	0.393	0.876			
IM	0.269	0.627	0.239	0.784		

IS	0.556	0.504	0.523	0.303	0.814	
TQ	0.586	0.254	0.578	0.231	0.465	0.725

According to Fornell-Larcker Criterion for the discriminant validity the values of correlation of one variable should be greater than its correlation with all other variables. Findings in table 2 are satisfying the condition of Fornell-Larcker Criterion. Therefore, it affirms the discriminant validity.

Cross Loadings

Table 3

	EEQ	IB	IC	IM	IS	TQ
EEQ1	0.776	0.284	0.545	0.204	0.414	0.482
EEQ2	0.818	0.343	0.571	0.243	0.411	0.461
EEQ3	0.846	0.352	0.631	0.206	0.507	0.504
EEQ4	0.835	0.324	0.585	0.19	0.487	0.494
EEQ5	0.295	0.215	0.182	0.217	0.144	0.097
IB1	0.379	0.832	0.422	0.378	0.514	0.287
IB2	0.224	0.629	0.164	0.408	0.25	0.085
IB3	0.268	0.749	0.209	0.689	0.279	0.129
IC1	0.601	0.31	0.896	0.182	0.464	0.539
IC2	0.588	0.336	0.824	0.228	0.453	0.442
IC3	0.674	0.386	0.906	0.222	0.458	0.532
IM1	0.183	0.537	0.138	0.786	0.236	0.119
IM2	0.212	0.524	0.153	0.826	0.189	0.138
IM3	0.226	0.428	0.243	0.738	0.27	0.251
IS1	0.446	0.391	0.404	0.259	0.834	0.341
IS2	0.415	0.303	0.354	0.174	0.839	0.373
IS3	0.41	0.564	0.461	0.336	0.704	0.386
IS4	0.524	0.385	0.473	0.221	0.868	0.406
TQ1	0.517	0.197	0.531	0.133	0.403	0.787
TQ2	0.372	0.148	0.395	0.163	0.349	0.81
TQ3	0.41	0.2	0.383	0.178	0.367	0.725
TQ4	0.323	0.269	0.252	0.297	0.223	0.469
TQ5	0.479	0.184	0.469	0.139	0.326	0.742
TQ6	0.339	0.125	0.371	0.14	0.305	0.785
TQ7	0.469	0.187	0.453	0.176	0.345	0.705

Table 3 is showing the values for the cross loadings as per the parameter the cross loadings of a particular variables must be greater than all other variables in the same column. Findings reported in table 3 are satisfying the criterion which also strengthen the discriminant validity.

HTMT

Table 4

	EEQ	IB	IC	IM	IS	TQ
EEQ						
IB	0.59					
IC	0.852	0.486				
IM	0.389	1.008	0.294			
IS	0.672	0.649	0.623	0.389		
TQ	0.686	0.321	0.668	0.296	0.55	

HTMT is the latest technique to measure the discriminant validity. As per this technique all the correlation values must be less than 0.85. Findings reported in table 4 are affirming that all the values are less than 0.85; therefore it can be stated that discriminant validity is established. Following figure 3 is showing the outcome of the confirmatory factor analysis:

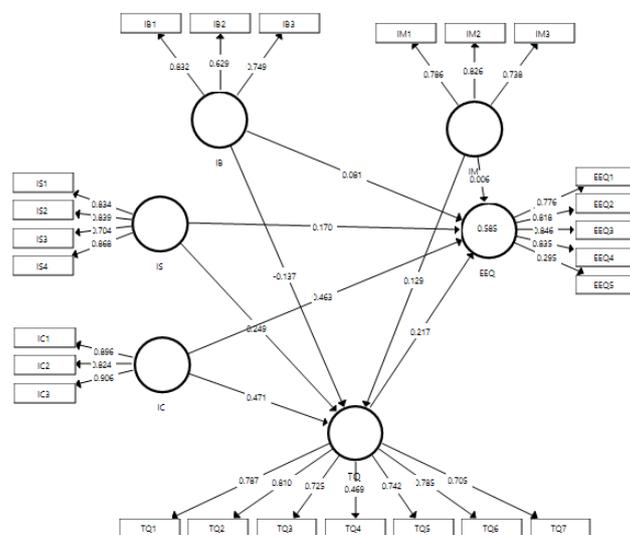


Figure 3

Structural Equation Modeling

Table 5

Relationships	Beta	SD	t value	p value
IB -> EEQ	0.081	0.039	2.059	p<0.05
IB -> TQ	-0.137	0.046	2.978	p<0.05
IC -> EEQ	0.463	0.035	13.299	p<0.05
IC -> TQ	0.471	0.038	12.446	p<0.05
IM -> EEQ	0.006	0.031	0.199	p>0.05
IM -> TQ	0.129	0.036	3.595	p<0.05
IS -> EEQ	0.17	0.032	5.301	p<0.05
IS -> TQ	0.249	0.034	7.324	p<0.05
TQ -> EEQ	0.217	0.034	6.453	p<0.05

Table 5 is showing the results for the direct relationship between the variables. Interestingly the relationship between idealized behavior and teaching quality found to be significant but its negative which is opposed to the hypothesis. Similarly the results also showed insignificant relationship between inspirational motivation and engineering education quality. Besides all the relationships are significant and thus the hypothesis are accepted.

Specific Indirect Effects

Table 6

Relationships	Beta	SD	t value	p value
IB -> TQ -> EEQ	-0.03	0.012	2.46	p<0.05
IC -> TQ -> EEQ	0.102	0.019	5.352	p<0.05
IM -> TQ -> EEQ	0.028	0.009	3.028	p<0.05
IS -> TQ -> EEQ	0.054	0.011	4.946	p<0.05

Table 6 is showing the results for the mediation relationship between the variables. Teaching quality is found to be a significant mediator between all dimension of transformational leadership and engineering education quality. However the mediation of teaching quality between idealized behavior and engineering education quality is negative, thus being negative and opposed to the hypothesis proposed it is rejected. Importantly, results have proved the teaching quality as a significant mediator for the improved education quality. Following figure 4 is showing the outcome of the structural equation modeling:

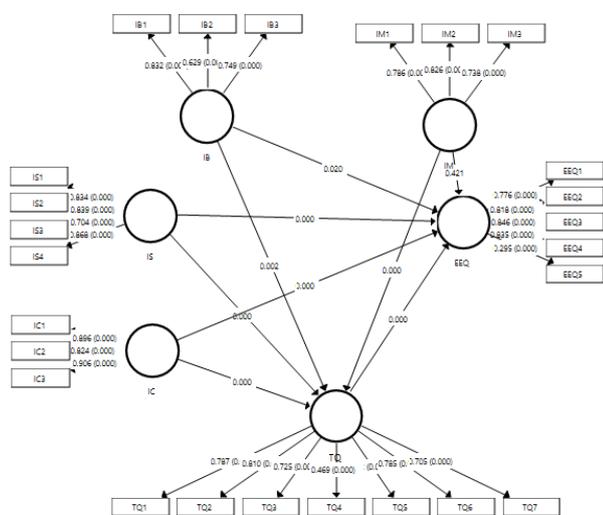


Figure 4

V. DISCUSSION

Globally, the academic sector must need attention from researcher to promote the younger generation latest creative task to make the developing country into developed country. The focus of this study is to examine the effect of

transformational leadership and their four “I” on engineering education quality while being mediated by teacher quality. Similarly, this study is one of the few studies that investigate relationship among transformational leadership and their factor such as idealized behavior, inspirational motivation, intellectual stimulation and individual attributes on engineering education quality while intervening by teachers quality. The results of the study show that transformational leadership and their factors such as idealized behavior, inspirational motivation, intellectual stimulation and individual attributes has significantly and positively correlated with engineering educational quality. The hypothesis H1, H2, H3, and H4 is accepted in this way that shows that positive and significant relationship between them. The results of this research also harmony with the previous research (Choudhury, 2019; Darling-Hammond, 2000; Pootrakul, 2014).

Moreover, the hypothesis H5 is also accepted that shows the positive and significant relationship between transformational leadership and their factors namely idealized behavior, inspirational motivation, intellectual stimulation and individual attributes with teacher quality. The empirical evidence facilitated significant influence of transformational leadership on teacher quality (Dionne et al., 2004; Hoy et al., 1998; Pootrakul, 2014; Wang, 2004). The H6 hypothesis of this study is also accepted that shows the positive and significant relationship with transformational leadership and their factors idealized behavior, inspirational motivation, intellectual stimulation and individual attributes on engineering education quality. It shows that teachers quality play an significant role as mediator between transformational leadership and engineering education quality. Previous research also empirically shows the same results with this study (De Paola, 2009; Harris & Sass, 2011; Heck, 2009; Singh et al., 2009).

Future Direction and Limitation

Nothing is perfect overall but researchers did their best to upgrade the study. Thus, this study has limitations and on the hand has some future direction for the researchers. The quantitative method is used under this study for data collection the researcher can used the other methods for future studies. The face to face interview provides more insight about the quality of education. The unit of analysis of the study is individual in future researcher can collect the data from dyadic unit of analysis from students and the top management and CEO of the educational institutes. The data of this study purely collected from academic sector from public and private universities in future research will be perform on the comparison bases with public and private universities. The data is collected from fresh undergraduates students, in future data can be collected from the all students

to get more in depth view of the students about education quality. Due to shortage of time and energy resources, data was collected from only one point of time in future data can be collected from same students after getting admission in engineering courses. It means that in future researcher will collect the data more than one point of time. The economies like Malaysia, Bangladesh, Pakistan, China, and India facing the challenges of economic downturn. So, there is need to do the studies in Asian economies to increase the productivity and performance of the country by developing their youth.

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