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An Investigation on Factors that Influencing Creative Problem Solving Styles among Principals in Malaysian Secondary Schools

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ABSTRACT

The main purpose of this study was to examine creative problem-solving styles among participants of the Malaysian National Principalship Qualification for Educational Leaders program. It sought quantitatively to examine factors influencing problem-solving styles and to validate the hypothesized construct. The premise of the construct assumed problem-solving styles were influenced by three factors: Personal Traits, Organizational factors and Change Management. From these domains a 40 item instrument was designed based on several theories: The Adaptive Innovative Inventory by Michael Kirton (1976), Diffusion of Innovation by Everett Rogers (2010) and the Theory of Organizational Creativity by Mumford and Gustafson (1988). The respondents consisted of two cohorts of the Malaysian National Principalship Qualification for Educational Leaders program. A pilot test was conducted on the first batch of 189 respondents and the data were tested using the Principal Component Analysis (PCA). Out of the 40 items, only 12 items remained. The remaining items were tested with the second batch of respondents using Confirmatory Factor Analysis to confirm the model fit. Finally, data was calculated for reliability and validity using discriminant validity test. Results indicated problem-solving styles among the respondents were not uni-dimensional and were influenced by the three domains. Thus, to be able to solve problems in schools, principals must have the right competencies especially in personal skills, organizational support from the Ministry and change management.

Keywords: Educational leadership, creativity and innovative, problem solving styles

INTRODUCTION

This paper is an exploration into creative problem-solving styles among participants of a Malaysian educational leadership program. Currently, the Malaysian Ministry of Education (MOE) encourages school leaders to display creativity especially in solving organizational issues. Many are unclear of the basic concept and the strategies towards becoming more creative. Evidently, school principals are indifferent towards policy changes in the education system and are perhaps suspicious of any new innovation the authority has implemented. This is because Malaysian schools today are faced with many challenges and issues, which include policy inconsistencies and new approaches to classroom teaching and assessment. In addition to managing the school, the principal has to juggle with various managing issues like students' discipline, teachers' working styles, organization's budget, complaining parents and other petty tasks.

Historically, looking back, there were changes that had taken place in the Malaysian education system: the utilization of technology in schools, the shift to English (then back to Malay) as the medium of instruction in science and mathematic subjects and new approaches in assessment for year 6 and Form 3. Today, the schools landscape has considerably changed and a good principal must realizes in order to face the challenges, they must prepare themselves with problem solving skills. School principals carry substantial responsibilities and inculcate new roles to be able to manage the schools. Nowadays, new skills are created and neededto be taught and learned. The education system has gone through significant innovations in the way learners are taught and

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knowledge is disseminated. The shift from teacher-centred towards learner-centred approached raised the question of teachers' role and pedagogical strategies.

Therefore, when a teacher is promoted to be a principal, it is usually assumed that the principal is knowledgeable in managing the school well. The principal is also expected to lead academic staffs in the curriculum and technical aspects of the teaching and learning process. Basically, a principal must be experienced in managing schools. With previous experiences, the tacit knowledge he had gathered when he was a senior teacher help in making decisions. Nevertheless, not all principals are excellent in managing schools. There are many examples of principals who have brought their schools to excellence and there are also principals who only "administer" their schools (Leithwood, 2007). Many excellent principals are praised on their achievements and are categorized as creative principals. Nevertheless, what does it mean when one is labelled as creative problem solver?

Thus, the researcher believed a comprehensive study should be done to examine how pricipals solve problems in a creative way. These strategies in turn could be applied by struggling principals to improve and excel at their own schools. To understand how to be a creative leader is the key to achieve excellence for the schools and consequently the leader will understand how to manage change in the school. Change occurs all the time especially in the education system. To resist change would likely create unproductive effects to the environment and this is detrimental for the progress of the schools. To persuade oneself and others to accept the changes and find different strategies to solve problems in schools are part of the process of an innovative principal. Thus, it is important principals know how to be creative and competent in solving the problems in schools. This is fundamental in the managing of schools.

Looking at the differences between the concepts of innovation and creativity, there exists a general confusion between the two. There are distinctive differences between creativity and innovation. Ahmed and Sheppard (2010) defined creativity as, "the ability to consistently produce different and valuable results. A vital component in the production of valuable outcomes is a discipline process that helps to channel creativity and keep it focused to achieve results" (p. 43). They further argued one of the most important contributors to individual creativity in organizations is a sense of confidence in his or her creative abilities. When one is confident, then changes become a challenge. In addition, they suggested the characteristics of a creative person would include: Possessing intellectual interests and artistic values, attracted to complexity, concerned with work and achievement, perseverance, independence of judgment, tolerance of ambiguity, needs for autonomy, self-confidence and orientation towards risk-taking. Meanwhile, Puccio, Mance and Murdock (2011) described creative leadership as "the ability to deliberately engage one's imagination to define and guide a group towards a novel goal; a direction that is new for the group. As a consequence of bringing about this creative change, creative leaders have a profoundly positive influence in their context (workplace, community, school, family) and the individuals in that situation. (p. 28)

LITERATURE REVIEW

The idea of the phases of change acceptance was discussed in Rogers (2010) where he defined diffusion as the process by which change is communicated through a channel over time among the members of social system. The implementation of this process, according to Rogers is not easy as it takes time and acceptance. Rogers argued any new idea or innovation will take time to be accepted by the public but added another dimension to the equation; societal values and culture. In many examples, one of the pivotal factors that play an important part in change acceptance are the values and cultures that people have. This means change can only be accepted when the public has value and culture that considers change is good and beneficial. When negative values are present, then change would be resisted. Nevertheless, change is likely to be accepted later when people apply the wait-and-see attitude and when they see that everybody is utilising the change.

Consequently, there exists a kind of perceptions among Malaysian school principals that the agent of change is the policy maker in the Ministry of Education and schools only implement policies (Preliminary Report, PPPM, 2013). Most of the time, in the Malaysian setting, schools are required to implement projects handed from top officials. Principals and teachers make the policies work. Nevertheless, there are many school principals and teachers who are genuinely the agents of change striving towards excellence and coping with the changes in schools. Havelock and Hubermann (1986) explained "It is important to understand change is not adopted by people on the basis of intrinsic values of the change but rather on the basis of the adopters' perceptions of the changes they personally will be required to make. Those designing, administering and advising projects do not generally have to make very many changes themselves. It is others who will have to modify their behaviours and very often in a rapid manner. This is an example of showing dangers in cases where the change is separated from the public." (p. 303)

Empirically, creativity can be defined as, "the ability to consistently produce different and valuable results. A vital component in the production of valuable outcomes is a discipline process that helps to channel creativity and keep it focused to achieve results" (Ahmed and Sheppard. 2010. p. 43). While creativity is happening at a cognitive level, innovation is the extension and involves the process of implementing creativity in organisations. Tushman and Nadler (1996) defined innovation as, "creating any product, service or process which is new to the business unit" (p. 43). They argued innovation is a social process arising from the delivery of increased value to customers. This was what Havelock and Hubermann (1986) meant when they said the innovator is separated from the public. They further explicate on the four factors as being significant in determining the likely success or failure of innovative projects: Infrastructure, Authority, Consensus and Resources. Meanwhile, Puccio, Mance and Murdock (2012) described creative leadership as the ability to deliberately engage one's imagination to define and guide a group towards a novel goal; a direction that is new for the group. (p. 28)

According to Kirton (1999), this creativity could be seen in the decision-making and problem solving styles of school leaders. They are logically connected in such a way that creativity is the main criteria of innovativeness and it is used as an option in the decision-making processes (Kubes, 1989). Kirton (1989) developed a 33 item uni-dimension instrument called Adaptation-Innovation Inventory (KAI) and argued a dimension in an individual personality mirrors the attitude towards change in organizations. This Adaptation-Innovation theory was based on the assumption people are creative in solving problems. It is about problem solving style; or *how* people solve problems. This means innovators and adaptors can each be found at each end of the continuum. At the more adaptive end, these people prefer their problems to be associated with more structure than those who are more innovative. The KAI Inventory measures individual styles of problem solving definition and solving. Style, in this case, refers to being an adaptive person versus an innovative person.

Adaptive Characteristics

- Efficient, thorough, adaptable, methodical, organized, precise, reliable, dependable
- Accepts problem definition
- Do things better.
- Concerned with resolving problems rather than finding them
- Seeks solutions to problems in tried and understood ways
- Reduces problems by improvement and greater efficiency, while aiming at continuity and stability
- Seems impervious to boredom; able to maintain high accuracy in long spells of detailed work
- Is an authority within established structures?

Innovative Characteristics

- Ingenious, original, independent, unconventional
- Challenges problem definition
- Does things differently
- Discovers problems and avenues for their solutions
- Manipulates problems by questioning existing assumptions
- Is catalyst to unsettled groups, irreverent of their consensual views
- Capable of routine work (system maintenance) for only short bursts; quick to delegate routine tasks
- Tends to take control in unstructured situations

Examining the change management aspect, O'Dwyer's (2004) studied on teachers' characteristics and technology. His study showed among the reasons why teachers resisted using the technology include: computer uneaseness and experience, age, teaching experience, lack of training, fear of experimenting, the fear of relinquishing the teachers' role, lack of support from administration, lack of support from colleagues, time constraints, state authority demands and lack of empathy and economy of the school. From his findings, the researcher identified a pattern of teaching he called: Entry, Adoption, Adaptation, Appropriation and Invention. In addition to that, the study concluded there were two essential conditions for genuine education reforms to be successful; first, teachers must be given opportunities to reflect on their beliefs about teaching and learning. Second, administrators must be willing to restructure the learning environment to facilitate teachers' professional development. He also asserted change is evolutionary and the process of technology integration is incremental and demands supports.

Thus, the theories that were connected with creative problem solving styles, were separately examining certain dimensions. This study's conceptual framework was the integration of these theories. All three dimensions are intertwined and influencing each other. In reality, all these dimensions are functioning together and influencing each other. Therefore, this study's objective was to determine if all observed variables in the creative problem solving measure the latent variable Personal Traits. There were sixteen observed variables in the first domain, which were built from Kirton's Theory of Innovativeness. The second domain was organisational factors

measured by twelve items based on Roger's Theory of Innovation Diffusion. This domain relates to organisational influences that include infrastructure, superior motivation and job's perks and rewards. The third domain was change management and had twelve items. Change management was related to the other two factors; how the respondents managed and strategised human and physical resources in the schools.

METHODOLOGY

This research utilised a quantitative approach. The main focus of this study was to probe into the factors that determined innovativeness among school leaders and to validate a measurement of innovation. The respondents consisted of 218 Malaysian school leaders from different states. The items went through several tests for validation. A pilot test was conducted on another batch of 198 respondents. The Principal Component Analysis (PCA) was utilised to determine items with high loadings. Consequently 12 items remained. The Confirmatory Factor Analysis (CFA) methods using AMOS was conducted on the remaining 12 items. Then, convergent and discriminant analysis were conducted to determine the reliability of the items. Next, this study validated the instrument that measured the creative problem solving among school principals. The study investigated a hypothesized model based on three dimensions in creative problem solving. Items for the instruments were the combination of three dimensions namely Personal traits, Organizational factors and Change management. Moreover, this study was also to find out whether each indicator had non-zero loading on the hypothesized factor. The hypothesized properties were verified by looking at the loadings for each relationship between the independent variables and the latent variables.

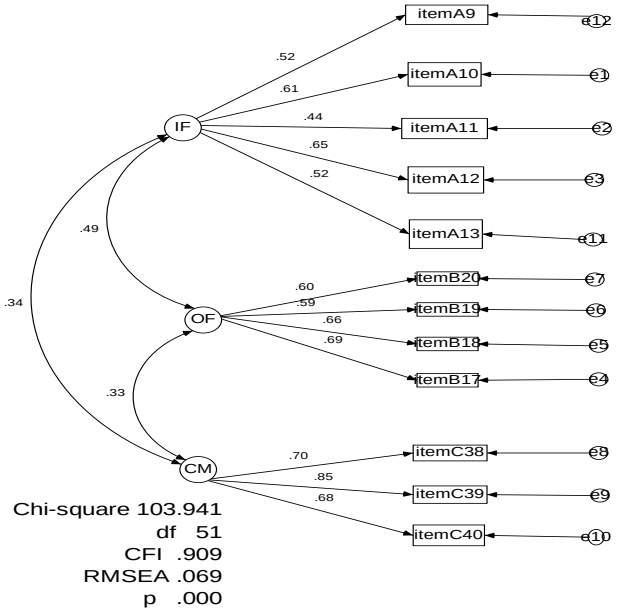
Consequently, what is the goodness of fit between the variables and latent variables? A value of $\geq .90$ indicates goodness of fit (Hair, 2010). Nevertheless, this study had set the threshold value of ≥ 0.40. The Goodness-of-fit (GFI) measures the amount of variance and covariance in S that is predicted by the reproduced matrix $\sum$. Meanwhile Tucker-Lewis Index (TLI) compares alternative models or proposed model against a null model. While the values of parsimony-adjusted index or RMSEA indicate the discrepancies. It includes correction for model complexity and discrepancy from the population. A value higher than zero indicates poor fit. (Byrne, 2001)

Finally, the Convergent and Discriminant Validity were computed on these values. Convergent validity was reached when the values of AVE was over 0.5. For Discriminant Validity, the values of Shared Variance SV (**Shared Variances SV =** x^2) were computed by squaring the loadings between the constructs. Thus, the values of the estimates between the variances were obtained. Whereupon x were the loadings of the covariances. The values of Shared Variances SV were less than the values of AVE. This indicated good standing as far as Discriminant Validity (DV) was concerned.

RESEARCH FINDINGS

Results from sample, which consisted of 218 respondents, were somewhat promising. Using the construct taken from the pilot study using the Principal Component Analysis, data were fed and analysed for Confirmatory Factor Analysis (CFA). In CFA, the selected items were analysed to determine the Goodness-of-Fit (GFI) values for test purposes. For the first dimension (Personal Trait) the scores were 0.52, 0.61, 0.44, 0.65 and 0.52. For the second dimension (Organisational Factor) the loadings were 0.60, 0.59, 0.66 and 0.69. Finally, the third dimension (Change Management) scores were 0.70, 0.85 and 0.68. The results indicated the structural model generated in the study was fit and matched the variance-covariance matrix based on the sample data. The value of Chi-Squared is $\chi 2 = 103.879$, p=000, df =51. Meanwhile to test for Incremental Fit Index IFI, values of CFI and RMSEA stood at .909 and .069 respectively. These findings indicated further support that the structural model hypothesized in the study was fit. Furthermore, positive degrees of freedom showed the structural model was over identified with generalisability.

TABLE 1
Average Variance Extracted AVE and Construct Reliability CR values



	Component 1		Component 2		Component 3	
Loading12	0.520	0.270	0.600	0.360	0.700	0.490
Loading22	0.610	0.372	0.590	0.348	0.850	0.723
Loading32	0.440	0.194	0.660	0.436	0.680	0.462
Loading42	0.650	0.423	0.690	0.476		
Loading52	0.520	0.270				
SUM (loading^2)	2.740	1.529	2.540	1.620	2.230	1.675
1-loading1^2		0.730		0.640		0.510
1-loading2^2		0.628		0.652		0.278
1-loading3^2		0.806		0.564		0.538
1-loading4^2		0.578		0.524		
1-loading5^2		0.730				
SUM (1-loading^2)		3.471		2.380		1.325
AVE		0.510		0.540		0.558
Squared	7.5076		6.452		4.973	
Construct Reliability	0.6838		0.7305		0.7896	

To indicate convergent reliability of the items, values must be over the threshold of > 0.5. Low values of under this threshold showed the level of reliability of the items. From table 1, the AVE values were 0.510 for the first construct, 0.540 for the second and 0.558 for the third construct. For the CR values, 0.6838, 0.7305 and 0.7896 obtained were shown respectively which indicated good values, as they were more than 0.6 thresholds.

To determine discriminant validity, the values of Shared Variance SV were computed by squaring the loadings between the constructs **(Shared Variances SV = $X^{2)}$**. Before that, the values of the estimates between the variances had to be obtained:

			Estimate
PT	<-->	OF	.490
OF	<-->	CM	.330
PT	<-->	CM	.340

TABLE 2:
Computations for the Shared Variances SV

	Comp1	Comp2	Comp3
Comp1	0.510	0.240	0.115
Comp2		0.540	0.108
Comp3			0.558

Evidently, the values for discriminant validity showed both factors scored well as the value of AVE was more than the value of Shared Value (SV). For the first factor (IF and OF), the value was 0.240, which was below the value of AVE (0.510) and for the second factor (IF and CM), the value of 0.115 was lower than the value of AVE (0.540). Finally, the third factor (OF and CM), the value of 0.108 was lower than the AVE value.

DISCUSSION

Consequently, findings from this study showed creative problem solving involved the embracing of holistic approach of leadership in organizations to inspire subordinates to produce creative ideas and solutions. The pivotal role in the practice of creative problem solving is the important role of the principal. In several instances in this study, creative problem solving approach could be used to enhance the achievement of schools. In an environment that is ever changing with new technological breakthrough, it is becoming crucial for school leaders to solve problems creatively in order to ensure their continued success. In order to acclimatize to new changes, the need for innovations in schools has resulted in a new attention on the role of leaders in shaping the nature and success of school administration. Without creative problem solving, schools are likely to struggle. This new demand for creative problem solving represents the shift from the 20th century, traditional view of school performance, which discouraged principals' creative behaviours, to the 21st century view of valuing creative thinking as a potentially powerful influence on organizational performance.

To have a distinct grasp of how to solve problems creatively, one must first comprehend the concept of innovation. Although there are school leaders who are unsure of what innovation means, through general consensus from conversations, it can be described as new ideas of viable products that are put into operation. Another definition is the process of decision-making. Creative leaders are bold leaders who see the different ways of doing things or solving organizational problems as the solutions. It could be seen from this study, creative leaders were influenced by three different factors: Personal traits, Organizational factors and Change management. It was illustrated from the findings; creative traits and exploratory behaviours involved thinking brand new ideas, which were related to ideas of creativity. These contrast with exploitative behaviour, which denotes modifying ideas that are already the norm. It is vital to note the ideas generated need to be beneficial in order to be considered innovative. It is important to remember innovation is different from creativity, which is basically the generation of a new ideas that may not inevitably be put into operation. The formation of work environment through innovative leadership involves the use of holistic leadership styles which resemble the leader behaviours proposed by Path-goal theory; for example, top-down influence and supportive interactive subordinates. In innovative leadership, these behaviours are considered to encourage the creative team to generate as many novel ideas as possible and lead to evaluation and implementation of these ideas. These exchanges between leaders and subordinates exacerbate the climate of innovativeness. Innovative leadership is also a process of thinking in a problem-solving environment as educational leaders are constantly faced with

administrative problems. As a consequence, creative problem solving incorporates different behaviours interrelating with one another to produce an innovative solution.

A leader who motivates is the most frequently mentioned factor in this study. It stems from the leaders to the subordinates and influenced by the leaders' interests, experiences and exposure. The quality of the school leaders through training plays an important part in the mindset and approach to leadership. Organizational encouragement is very important. This entails encouragement of taking risks and ideas generated from all levels of management, supportive evaluation of new ideas, recognition and reward of creativity, and collaborative efforts in problem solving. Each of these are equally important aspects of leadership encouragement but the third aspect, recognition and reward of creativity, may have antagonistic effects if the sole purpose is to gain reward. This is true in Malaysian schools, the support of the Ministry of Education plays a crucial role in innovative projects. Monetary rewards are continually expected and lack of it is a barrier to innovation in schools.

Innovations flourish under team efforts. Mixture of team members' experiences and readiness to explore and accept new ideas affect creativity. In this context, teachers are exposed to a variety of new and unusual ideas and such exposures had been demonstrated to have positive effects on creative thinking. In this study, the expertise of the team members played an important part in the dynamics of the team. The more skilful the members are, the more successful the team will be. This is true in a skill-based team that depends upon the expertise of the members. The highly skilled members act as the prime movers on collectively agreed projects. The principal is simply the catalyst for new ideas and gives supports for the implementation of the projects. Thus, the quality of the team depends upon the level of skills or experiences the members have that determine the success of the school.

A competent workforce is needed in order for creative problem solving to be successful. Creative people have expertise on the subject requiring creativity and tend to use work as a source of identity. Because of this, they are powerfully intrinsically motivated by professional achievement opportunities and recognitions. Creative workers are also commonly characterized as highly valuing their autonomy; additional dispositional attributes include openness, flexibility, cognitive complexity, self-confidence, dominance, and introversion. The patterns of the characteristics of creative workers typically allow them to confidently explore alternative ideas under ambiguous conditions.

This study found barriers to innovations include internal conflicts, sticking to old-fashioned paradigm and austere management bureaucracy within schools. These were seen as working against autonomy and tended to have negative effects. This third dimension in this investigation of change management influenced the way the school principal was managing the school. It was understood not all succumbed to the new ideas and it took time for the ideas to sink. What the principal did in the mean time, determined the acceptance of his subordinates. Thus, it is important to form an environment that can create the climate and later more staff will follow. When principals understand not all would accept new innovations, small steps should be considered. In time, when everybody sees the benefits of innovations, the number of acceptance would rise. Change management is about changing people and realizing they are humans with feelings. It is crucial that principals use the humanistic approach when dealing with subordinates. The principals must realize the human touch is important in getting the respect from teachers. Thus, to be able to change subordinates, principals have to narrow the gap between the them and the teachers.

Uniqueness in problem solving could take place in managing schools where there are complicated problems requiring innovative solutions. The fact the problems are inexplicit make the creative solution uncertain and it usually involves the risk factor. It is also in demand of resources especially funds and time consuming requiring high levels of motivation and often requires team efforts. This also involves both new solution generation and bold implementation, which requires experienced members.

Consequently, for creative problem solving to exist, a school leader must possess certain traits. These include expertise in managing resources and people, high level of creativity, ability to carry out holistic leadership styles and empathy towards subordinates. All of these can be ingrained into leaders through customised programs. One example is Institut Aminuddin Baki's (IAB) National Professional Qualification for Educational Leadership Program (NPQEL). Candidates are trained and guided to learn the innovative behaviours in schools. It is asserted that creativity traits can be learnt and several programs could be organised to train creative and innovative behaviours especially in a school managing environment. Lessons from other innovative leaders could be analysed and repeated in a different environment.

As mentioned previously, a holistic leadership style plays a pivotal role in creative problem solving, each of which are used at different situations of the school management system

Most of the time, creative problem solving relates to transactional and transformational leadership styles. In this study, the leadership style was transactional and strongly associated with innovation. This type of leadership was more of the top-down structure which was suitable to the Malaysian education culture. Teachers were afraid to be creative and the principal was the catalyst for innovative behaviour for he assigned tasks for teachers to accomplish. Nevertheless creativity was achieved although in a structural way.

Generally creative problem solving basically consists of the generation of improved ideas, strategies, and solutions through the use of strictly closed behaviours exhibited most often by transactional leadership. The foundation of creative problem solving is characterized by finding solutions, experimentation, and risk taking. It is the principal's focus on generating improved ideas, solutions and strategies; in contrast to product innovation, which focuses on building and extending unique ideas. Creative problem solving entails flexibility, resourcefulness, adaptability, and for principals to provide intellectual inspirations to the subordinates. In this approach to problem solving, the leadership style is primarily transactional. The behaviours exhibited are believed to achieve the desired creative outcomes from teachers through the application of individualized consideration, charisma, and inspirational motivation.

As mentioned, different types of leadership styles may be more appropriate at different stages of the creative problem solving. Current studies support the idea generation process. The creative problem solving actually requires a leader to use a more transformational style of leadership. During this stage, principals need to promote safe situations for teachers to voice their ideas and original thinking as well as provide teachers with sufficient funds. Research has also found leaders who engaged in original behaviours and associated with transformational leadership, were seen as strong role models and, as a result, increase creative performance in their teachers. For example the principal who started a band in her school because she thought it was a unique thing to do. These open leadership behaviours convey unconventional and original ideas and behaviours were not only accepted but also encouraged.

Finally, in providing a climate conducive for idea generation, creative problem solving also requires principals to ensure the process of idea generation does not overshadow the evaluation and implementation processes. During these phases, principals must support some ideas while discarding other ideas and implement the supported ideas. The role of the principals must shift away from the transformational style to a more transactional style of leadership, which involves more direct and critical to ideas generated. The principals now need to ensure constructive discussions of innovative ideas are taking place among their teachers. This helps to evaluate the usefulness of each idea, eliminating those that do not appear viable to the organization or goal, and discard the ones that do appear practical in the production phase. The principals needs to adopt what are known as closed leadership environment in order to achieve this; instead of stimulating idea generation, he or she must shift the focus away from generating new ideas toward fine-tuning existing ideas in the interest of achieving progress toward the objectives and ultimately implementing the idea.

- The findings were mainly results of statitical analysis. So what were the factors that influenced creative problem solving styles of the principles?
- The factors were scattered in the discussion.
- Discussion should be based on the findings of this study. What you have written are all in the literature. Most of what are written are taken word by word from original sources without paraphrasing.
- Where are the conclusion and suggestion?

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