AN ANALYSIS OF INSTRUCTIONAL LEADERSHIP FOR IMPROVING PRIMARY SCIENCE TEACHING

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Abstract

The purposes of this study are (1) to study the extent of principals' instructional leadership practices perceived by teachers according to demographic data, school level and their knowledge level, (2) to study the extent of teachers' primary science teaching practices according to school level, (3) to study the relationship between principals' instructional leadership practices and teachers' primary science teaching practices, and (4) to reveal the best predictor of instructional leadership practices for primary science teaching. Descriptive method was used in this research. Two sets of questionnaires: questionnaire for principals and questionnaire for teachers were used in quantitative study. In qualitative study, interview, documentation and observation checklists were used. A proportional stratified sampling method was used to select 95 principals and 450 teachers from 10 selected townships in Yangon City Development Area. Among them, 7 principals and 21 teachers were purposively selected for qualitative study. Descriptive statistics, Item Percent Correct (IPC), independent samples *t*-test, one-way ANOVA, post-hoc test by Tukey, the Pearson product moment correlation and multiple regression, and cyclical process were used for the analysis of quantitative and qualitative data. It was found that there were significant differences in principals' instructional leadership practices according to gender, school level, and their knowledge level. a significant difference was found in teachers' primary science teaching practices according to school level. There was an association between principals' instructional leadership practices and teachers' primary science teaching practices. The first predictor of instructional leadership was giving incentives, and the second one monitoring the teaching/ learning process for improving primary science teaching. Qualitative study suggests that school level, extra work loads, and number of teachers may be the main reasons affecting instructional leadership.

Keywords: instructional leadership, science process skills

Introduction

To become the quality of education, school is important because it is about teaching and learning. To become effective teaching, the role of

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principal is very important. Principals play key role in the delivery of quality of instruction. Leading instructional efforts in a school has evolved into a primary role for school principals. In order to meet challenges, principals must focus on teaching and learning to a greater degree than heretofore. Instructional leadership is focused on the quality of teacher practice and creates the conditions for good teaching and teacher learning.

According to Hoy and Hoy in 2006, school leaders are responsible for creating learning organizations. The principal is responsible for developing a school climate that is conducive to providing the very best instructional practices. Thus, it is the principal who forge a partnership with teachers with the primary goal of the improvement of teaching and learning. Principals keep abreast of the latest developments in teaching, learning, motivation, classroom management, and assessment, and share the best practices in area with teachers.

The effectiveness of a school and teachers' performance are largely dependent upon the type of leadership the principal provides. Principals are responsible for the overall operations of their school. In particular, their duties to monitor instruction increased along their responsibilities to help teachers improve their teaching. The principals must lead their school to get high achievement for all students. Education leaders should build their schools' capacity for changes and improvement. The instructional leadership responsibilities of principals are very important to achieve educational objectives of the State and every principal and subject dean needs to become effective instructional leaders.

Besides, one of the aims of Basic Education in Myanmar is to give precedence to the teaching of science capable of strengthening and developing productive forces. So, fostering the development of science education is one of the most challenging and rewarding tasks instructional leaders will have to do in the twenty-first century (Victor, 1989). According to Fitzgerald (2011), teachers are key players in the reinvigoration of science education. Teaching science in primary schools is important as it arouses the curiosity among the children with regards to their surroundings. Thus, to improve primary science teaching, principals' instructional leadership is vitally important.

Purposes

(1) To study the levels of knowledge of principals' instructional leadership for improving primary teachers' science teaching

(2) To study the extent of practices of principals' instructional leadership for improving primary teachers' science teaching

(3) To study the variation on the extent of principals' instructional leadership practices perceived by teachers according to principals' instructional leadership knowledge

(4) To study the levels of knowledge of teachers' primary science teaching

(5) To study the extent of practices of teachers' primary science teaching

(6) To study the relationship between principals' instructional leadership practices and teachers' primary science teaching practices

(7) To investigate the predictors of instructional leadership for improving primary science teaching

Research Questions

(1) What are the levels of knowledge of principals' instructional leadership for improving primary teachers' science teaching?

(2) Are there any significant differences in principals' instructional leadership knowledge depending on demographic data and school level?

(3) To what extent do teachers perceive on the practices of principals' instructional leadership for improving primary science teaching?

(4) Are there any significant differences in principals' instructional leadership practices depending on demographic data and school level?

(5) Are there any significant differences in principals' instructional leadership practices according to their knowledge level?

(6) What are the levels of knowledge of primary teachers' science teaching?

(7) Are there any significant differences between teachers' primary science teaching practices depending on school level?

(8) Are there any relationship between principals' instructional leadership practices and teachers' primary science teaching practices?

(9) What are the predictors of instructional leadership practices for improving primary science teaching?

Definition of Key Terms

Key terms used in this study were enumerated and defined to easily comprehend.

(1) **Instructional leadership** (1) relates to the processes of instruction in which teachers, learners, and curriculum interact, (2) includes those activities taken on by the principal to produce satisfying working environments and conditions for both teachers and students, (3) consists of the actions that a principal takes and tasks that he or she delegates to promote student learning, (4) includes the involvement of teachers in the decision-making process, and (5) incorporates the principal's concern with the factors and conditions within a school that affect student learning, such as class size, quality of curricular materials, and sociological characteristics of the student (Wanzare and Da Costa (2001)).

(2) **Science process skills** are the skills that ensure active student participation, have students develop the sense of undertaking responsibility in their own learning, increase the permanence of learning, and also have students acquire research ways and methods, that is, they ensure thinking and behaving like a scientist (Ostlund, 1992).

Operational Definition

In this study, instructional leadership is operationally defined as the actions that the principals set the school goals and communicate with teachers, monitor the teaching/ learning process, provide opportunities for professional development and give incentives for improving primary science teaching.

Theoretical Framework of the Research

In this study, based on the related literature and research studies of instructional leadership for science education, instructional leadership for improving primary science teaching were classified as four areas:

(1) Setting the school goals and communicating with teachers

(2) Monitoring the teaching/ learning process

(3) Providing opportunities for professional development

(4) Giving incentives

1. Setting the school goals and communicating with teachers: The principals' major roles are in conceptualizing the school's goals, and in framing goals that promote high standard and expectation for all students. They set the goals annually and in collaboration with teachers. Principals frame these goals in term of staff responsibilities for meeting them. They need assessment for staff input. Principals develop these goals that are easily understood and teachers use these goals in the school. They are easily translated into classroom objectives. Principals must communicate a clear vision of instructional excellence and continuous professional development consistent with the goals of the improvement of teaching and learning. They give suggestions to teachers formally and informally for implementing the school goals. They also need to enhance teacher behaviors by distributing professional literature, encouraging teachers to attend workshops and conferences, and encouraging reflective discussions and collaboration with others. The instructional leaders must share with teachers an understanding of instructional goals.

2. Monitoring the teaching/ learning process: Principals should frequently observe classroom instruction in their role as supervisors for improving science teaching. They should also maintain a high level of accountability with respect to classroom instruction. They should work with teachers to insure that classroom objectives are directly connected to school goals and review classroom instruction using as many sources of information as formal and informal classroom observations, lesson plans, and student work products. They need to assist teachers in improving their instructional practices.

Principals should demonstrate teaching techniques in classrooms and during conferences. They must utilize coaching and mentoring. They often use an inquiry approach with teachers, and they frequently ask for the teachers' advice about instructional matters. Principals should actively encourage teachers to become peer coaches. They must work with teachers to help them improve their instructional practice. Principals need to spend time in classrooms as colleagues and engage teachers in conversations about learning and teaching. For improving science teaching, principals must know the objectives of science teaching, and characteristics of effective science teachers.

Principals and teachers should possess the expertise in science, gain innovative idea about teaching strategies, develop mutual respect and trust among their colleagues and change their classroom practices to meet the needs of students. They offer guidance to elementary teachers in planning and integrating effective questions. So they must know Bloom's Taxonomy that identifies the levels of thinking: knowledge, comprehension, application, analysis, synthesis and evaluation. Principals and teachers must ensure that scientific inquiry and the development of science process skills are essential components of instruction, encourage the use of a variety of teaching styles that emphasize constructivist approaches, including differentiated instruction and cooperative learning, encourage the use of student self-assessment in the classroom, regularly communicate progress in student learning to parents and students, and build capacities of principals and teachers to provide instructional leadership in science. Victor (1989) said that it is the duty of the principal to create the school environment as the safe and orderly learning environment supported to students' learning in science. And then, the lack of resources may be a barrier to the use of some instructional strategies by teachers and have a negative effect on the attainment of the students' science process skills.

3. Providing opportunities for professional development: Principals should provide staff development opportunities which address emergent needs for teachers to improve primary science teaching. They frequently become learners themselves by participating in staff development sessions. They should support different approaches to teaching and learning as well as

flexibility with regard to teaching elements such as grouping and strategies. Principals must recognize a need to support resources and that new teachers need opportunities to work with more expert teachers as they begin to develop and grow in their teaching. Principals should also promote professional development by praising the teachers' efforts and providing awards to outstanding teachers in science, encouraging teachers to study professional literature for science, giving teachers time for independent studies, and using external sources such as college courses, district/ township-level workshops, and encouraging collaborative relationships. Principals need to create cultures of collaboration, inquiry, and lifelong learning.

Principals need to develop teacher leadership by sharing responsibilities or tasks to teachers and providing opportunities for teachers to become leaders in science instructional activities. According to Glickman, Gordan and Gordan (2009), teachers participate in leadership preparation programs and assist other teachers by assuming one or more leadership roles (workshop presenter, cooperating teacher, mentor, expert coach, instructional team leader, curriculum developer). The teacher leaders assist other teachers and experience professional growth as a result of being involved in leadership activities. Teacher leaders need to benefit schools by increasing expertise in teaching and learning, strengthening collaborative cultures, and increasing teachers' sense of professionalism and empowerment. They should impact student learning by implementing new practices in their own classrooms. Principals as instructional leaders are responsible for cultivating leadership among science teachers.

4. Giving incentives

Principals need to give praise on specific and concrete behaviors of teachers and students. Principals give praise that focuses on behaviors significantly affect teachers' and students' motivation. Giving rewards also fosters teacher reflective behavior, including reinforcement of effective teaching strategies, risk taking, and innovation/creativity (Blasé & Blasé, 1999). Hallinger and Murphy (1986) stated that principals in instructionally effective schools do not leave the task of rewarding students solely to individual teachers; they develop incentives for learning that are school-wide in orientation. Principals find ways to reward or recognize teachers for their

efforts. Some of these are informal – private words of praise; others are more formal such as recognition before peers, nomination for awards, or letters to the personnel files of teachers. Principals must reinforce outstanding performance by teachers in staff meeting, reward teachers privately for their efforts, or performance, obviously recognize teachers' noticeable performance and bring about professional learning opportunities for teachers as rewards. Principals and teachers must recognize and give rewards for outstanding students in school assemblies, in holding the Parent-Teacher Association, and in the School Family Day.

This theoretical framework will guide to the following research work.

Quantitative Methodology

Samples

School level was divided into three levels in this study. 58 Basic Education Primary Schools and 5 Basic Education Post Primary Schools were in Level 1, twenty Basic Education Middle Schools were in Level 2, and 11 Basic Education High Schools and one Basic Education Branch High Schools were in Level 3. 95 principals and 450teachers were included in this study by a proportional stratified sampling. 95 Basic Education Schools from 10 townships in Yangon City Development Area were selected to collect the data. There were 73 teachers from the Level 1 schools, 90 teachers from the Level 2 schools, and 287 teachers the Level 3 schools. 95 principals and 450 teachers who teach primary science from those schools were selected in this study.

Instruments

In this study, two main instruments were used to collect the required data. The first instrument was to investigate principals' instructional leadership knowledge for principals. For teachers who teach primary science, the second one was to investigate principals' instructional leadership practices, teachers' primary science teaching knowledge and practices.

Data Analysis

Descriptive statistics, Item Percent Correct (IPC), independent samples *t*-test, one-way ANOVA, post-hoc test by Tukey, the Pearson product moment

correlation and multiple regression were used for the analysis of quantitative data.

Qualitative Methodology

Samples

In order to keep the sample size manageable in this study, purposive sampling method was used to choose the participants. The researcher selected purposefully three schools (one primary school, one middle school, and one high school) based on lowest mean score and four schools (two primary schools, one middle school and one high school) based on highest mean score indicated by the results of quantitative data analysis. One principal and three teachers were selected from each school. Twenty-one teachers and seven principals from seven schools involved in this in-depth qualitative study.

Instrumentation

Instruments for qualitative methodology including interviews, observations and documentations were developed based on quantitative instruments.

To investigate principals' instructional leadership practices, the interview question comprised eight items. The observation checklist consisted of nine items to investigate teachers' primary science teaching practices. In documentation form, nine items were included.

Data Analysis

Data analysis was conducted based on categorizing and interpreting the observation, documentation, and interview. The cyclical process was used to analyze the qualitative data.

Research Findings

Quantitative Findings

In the quantitative study, the instructional leadership knowledge level of principals was investigated by using IPC values and scoring range. It was seen that most of the principals had above satisfactory level.

Table 1: Number and Percentages of Principals' Knowledge Level of Instructional Leadership

Percentage of Scoring Range	Number of Principals	Remark
< 50%	1(1.1%)	Below Satisfactory Level
50% - 74%	48 (50.5%)	Satisfactory Level
≥ 75%	46 (48.4%)	Above Satisfactory Level

In table 4.2, 1 (1.1%) of principals were in below satisfactory level, 48 (50.5%) of principals were in satisfactory level, and 46 (48.4%) of principals were in above satisfactory level.

Table 2: Independent Samples *t*-Test Result Showing Principals' Instructional Leadership Knowledge Grouped by Qualification

Variable	Qualification	Mean (SD)	*t*	*df*	*p*
Principals' instructional leadership knowledge	BEd / MPhil / MEd	25.56 (2.19)	2.01	93	.047*
	BA/ BSc	24.67 (2.44)			

* p <.05, ** p <.01, *** p <.001, ns = not significant

In order to analyze and evaluate whether there were significant differences in principals' instructional leadership practices for improving primary science teaching between two groups of principals, an independent samples t-test was utilized. A significant difference in principals' instructional leadership knowledge was found by their qualifications at .047.

Table 3: One-Way ANOVA Result Showing Principals' Instructional Leadership Knowledge Grouped by School Level

Variable	School Level	Mean(SD)	*F*	*p*
Principals' Instructional Leadership Knowledge	Level 1	24.86(2.55)	6.565	.002**
	Level 2	24.50(1.61)		
	Level 3	27.25(1.06)		
	Total	25.08(2.38)		

* p <.05, ** p <.01, *** p <.001, ns = not significant

According to the One-Way ANOVA result in Table 3, a significant difference was found in principals' instructional leadership knowledge among school level.

Table 4: Mean Values and Standard Deviations of Principals' Instructional Leadership Practices

Variables	Mean	SD
Setting the goals and communicating with teachers	2.65	.72
Monitoring the teaching/ learning process	2.90	.78
Providing opportunities for professional development	2.68	.68
Giving incentives	2.68	.82
Total instructional leadership practices	**2.74**	**.64**

In practicing instructional leadership, it was found that principals sometimes performed setting the goals and communicating with teachers, monitoring the teaching/ learning process, providing opportunities for professional development and giving incentives (See Table 4).

Table 5: Independent Samples *t*-Test Result Showing Principals' Instructional Leadership Practices Perceived by Teachers according to Qualification

Variables	Qualification	Mean(SD)	*t*	*df*	*p*
Providing opportunities for professional development	BEd / MPhil /MEd	2.79(.76)	3.746	448	.000***
	BA / BSc	2.55(.57)			

* p <.05, ** p <.01, *** p <.001, ns = not significant

One-way ANOVA was conducted to analyze whether there were significant differences in principals' instructional leadership practices perceived by teachers according to their qualifications. In Table 5, there was a significant difference in providing opportunities for professional development between principals who got BEd / MPhil / MEd Degree and BA/ BSc Degree.

Table 6: One-Way ANOVA Result Showing Principals' Instructional Leadership Practices Perceived by Teachers according to Professional Qualification

Variables	Professional Qualifications	Mean (SD)	F	*p*
Setting the goals and communicating with teachers	PTTC	1.82 (.14)	2.65	.048*
	JTTC	2.65 (.75)		
	DTEC	2.31 (.22)		
	BEd / MPhil / MEd	2.68 (.69)		
Providing opportunities for professional development	PTTC	2.36 (.28)	4.34	.005**
	JTTC	2.56 (.58)		
	DTEC	2.44 (.29)		
	BEd / MPhil / MEd	2.78 (.76)		

* p <.05, ** p <.01, *** p <.001, ns = not significant

Table 6 indicated the one-way ANOVA result that principals' instructional leadership practices for improving primary science teaching according to the professional qualifications they attended. There was no significant difference in instructional leadership practices according to the professional qualifications principals attended.

Table 7: One-Way ANOVA Result Showing Principals' Instructional Leadership Practices Perceived by Teachers according to School Level

Variable	School Level	Mean(SD)	*F*	*p*
Total Principals' Instructional Leadership Practices	Level 1	2.77(.62)	8.291	.000***
	Level 2	2.51(.69)		
	Level 3	2.89(.62)		
	Total	**2.74(.64)**		

* p <.05, ** p <.01, *** p <.001, ns = not significant

A one-way ANOVA test was conducted to analyze the differences among school level. As shown in Table 7, a significant difference was found among school level concerning principals' instructional leadership practices.

Table 8: One-Way ANOVA Result Showing Principals' Instructional Leadership Practices Perceived by Teachers according to their Knowledge Level

Variables	Groups of principals	Mean(SD)	F	*p*
Total instructional leadership practices	Group 1	**2.62 (.29)**	3.631	.027**
	Group 2	**2.72 (.66)**		
	Group 3	**2.769 (.64)**		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ns = not significant
Group 1= group of principals in below satisfactory level
Group 2= group of principals in satisfactory level
Group 3= group of principals in above satisfactory level

A one-way ANOVA result showed that a significant difference was found in principals' instructional leadership practices perceived by teachers according to their knowledge as shown in Table 8.

Teachers' primary science teaching knowledge was investigated by using IPC values and scoring range. It was found that a few teachers' primary science teaching knowledge had above satisfactory level.

Table 9: Number and Percentage of Teachers Showing their Level of Knowledge on Primary Science Teaching

Percentage of Scoring Range	Number of Teachers	Remark
< 50 %	321 (71.3 %)	Below Satisfactory Level
50 %-74 %	127 (28.2 %)	Satisfactory Level
≥75 %	2 (0.4 %)	Above Satisfactory Level

As shown in Table 9, 321 (71.3%) teachers were in below satisfactory level. 127 (28.2%) teachers were in satisfactory level and 2 (0.4%) of teachers were in above satisfactory level.

Table 10: One-Way ANOVA Result Showing Teachers' Primary Science Teaching Practices by School Level

Variable	School Level	Mean (SD)	F	*p*
Teachers' primary science teaching practices	Level 1	2.62 (.56)	6.465	.002**
	Level 2	2.40 (.58)		
	Level 3	2.69 (.65)		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ns = not significant

According to the one-way ANOVA result in Table 10, there was a significant difference in primary science teaching practices of teachers by school level.

The Pearson-product moment correlation was utilized to find out the relationship between principals' instructional leadership practices and teachers' primary science teaching practices. In Table 11, the Pearson Correlation coefficient is .559; the significant level is .000. It was seen that there is an association between principals' instructional leadership practices and teachers' primary science teaching practices.

Table 11: Relationship between the Principals' Instructional Leadership Practices and Teachers' Primary Science Teaching Practices

	ILP	TP
Principals' instructional leadership practices (ILP)	1	.559**
Teachers' primary science teaching practices (TP)	.559**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Table 12: Means, Standard Deviations and Inter-correlations for Science Teaching Practices and Predictors

Variables	Mean (SD)	SGCT	MTLP	POGD	GI
Primary Science Teaching practices	2.69 (.63)	.401***	.524***	.462***	.525***
Predictor Variables Setting the school goals and communicating with teachers	2.66 (.71)	----	.66***	.52***	.64***
Monitoring the teaching/ learning process	2.91 (.79)		----	.67***	.71***
Providing opportunities for professional development	2.69 (.69)			----	.67***
Giving incentives	2.69 (.83)				----

* $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$, ns = not significant

The beta coefficients were presented in Table 13. Monitoring the teaching/ learning process and giving incentives significantly predict science teaching practices when all four variables were included. The adjusted R squared value was .26. This indicated that 26% of the variance in science teaching practices was explained by the model. According to Cohen (1988), this is a large effect.

Table 13: Simultaneous Multiple Regression Analysis Summary for Factors Predicting Science Teaching Practices

Variables	B	SEB	β
Setting the school goals and communicating with teachers	.026	.051	.003
Monitoring the teaching/ learning process	.164	.054	.261**
Providing opportunities for professional development	.059	.055	.105
Giving Incentives	.206	.050	.268**
Constant	1.274	.103	

$R = .508$, $R^2 = .26$; $F(4, 445) = 38.632$

* $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$, ns= not significant

Qualitative Findings

In the qualitative study, classroom observation, interview and documentation methods were used to be perfect the data obtained from the quantitative study.

All principals take their teachers' advice and suggestions and allow teachers to give advice and suggestions in setting the school goals. 5 (71.42%) of principals discuss with primary teachers about their teaching based on students' exam results, primary science teaching objectives, how to teach and implement primary science teaching for the whole academic year. Most of the principals supervise classroom teaching.

There was no record about classroom observation. Some principals give support teachers to make needed teaching aids. Most of the principals just hold the board of study monthly. Some books are provided for teachers. Most of the teachers discuss the teaching/ learning activities informally. Four principals give teachers rewards due to their outstanding practices in school meetings and the Parent-Teacher Gathering annually.

Most of the teachers ask the previous knowledge. All of the teachers use question and answer method. Half of the teachers use the appropriate teaching aids. Some teachers ask questions during the teaching. Most of the teachers use summative tests at the end of teaching period. A few teachers finish their teaching by winding up the lesson.

Discussion

Alimuddin (2010) stated that the responsibility of the principal as an instructional leader is to ensure that teaching-learning and academic activities are planned and implemented well, conducted in a good and orderly manner and carry out academic management in order to help teachers teach effectively (cited in Abdullah and Kassim, 2012). Leithwood and Prestine (2002, cited in Sherman and MacDonald (2008)) stated that principals must analyze the way they encourage teachers to think critically about their teaching and assessment approaches for students.

The findings of this study highlighted that there was a strong correlation between the principals' instructional leadership practices in their

school and teachers' primary science teaching practices. However, it was found that most of the principals perform instructional leadership practices to some extent. Through the results of interview and open-ended responses, major problems of why those principals put less emphasis on instructional leadership practices such as too much clerical work, insufficient teachers, no enough time to study, and financial support were also analyzed.

In setting the school goals for improving primary science teaching, it is important that the principals must communicate and cooperate with teachers. In the findings of quantitative questionnaires, principals can be assumed to establish the school goals to improve the students' exam pass-rate. But, setting the goals to develop students' science process skills was rarely found. Hallinger and Murphy (1986) stated that the principal can communicate school goals by referring to them often and in a variety of school contexts. On the other hand, teachers should be allowed to participate in setting the school goals, and the formulated goals needed to be clearly communicated with teachers. Most of middle school principals were also found that they put little stress on setting the goals and communicating with teachers than any other middle and high school principals do. To run a school smoothly, setting the school goals is of vitally importance. In qualitative findings, there was no objective for improving students' science process skills. In implementing these goals, the principals should give the needed suggestions and advice to science teachers. According to Hallinger and Murphy (1986), the principal plays a key role in framing goals in such a way that they are easily translated into classroom objectives. Weber in 1987 stated that an instructional leader must attend to each of these levels of objectives (from the school to each unit), reviewing and monitoring them for consistency and relevance. Therefore, it is important that principals and teachers should lay down the classroom objectives that are consistent with the school goals. The principals should evaluate whether teachers' teaching practices are congruent with the objectives they laid down or not.

In the findings, principals' practice in monitoring the teaching/ learning process was in satisfactory level. Hallinger and Murphy in 1986 stated that principals review classroom instruction through formal and informal classroom observations, and lesson plans. Therefore, principals

should examine the teachers' lesson preparation consistent with the school goals they set. In order to know whether the teachers' practices are congruent with the objectives or not, principals should perform classroom observation carefully. Glickman, Gordan and Gordan (2009) described that the supervisor can use official records of classroom observation to assess need of teachers' primary science teaching. Weber (1989) stated that principals themselves should make a list of classroom observation for improving instruction. So, principals should have the records of classroom observation. According to Hallinger and Murphy (1986), principals need to offer concrete suggestions to teachers and assist them in improving their instructional practices. In findings, principals gave the necessary advice to teachers and support the needed teaching aids (books and materials) for improving primary science teaching. Moreover, principals should arrange to keep a safe learning environment for the students. In quantitative finding, high school principals mostly practiced monitoring the teaching/ learning process. Since monitoring the teaching/ learning process is very conducive to giving concrete suggestions to teachers, this practice should not be ignored. In qualitative findings, middle school principals placed little emphasis on supporting teaching aids for improving primary science teaching and on giving instruction that evaluation of the students' understanding is relevant with the lesson objectives. According to the documentation result, records of classroom observation were not found in most schools. In fact, every school should keep those records and arrange them to be available for teachers in order to reflect their primary science teaching practices. As one more important thing for an instructional leader, Hallinger and Murphy (1986) described that principals can increase student learning opportunities by reducing interruptions in their classroom and by working with teachers to develop more effective classroom management practices. Therefore, principals should arrange science teaching period free from interruptions, and should manage to get enough time for science teaching.

Principals' practice in providing opportunities for professional development (reflecting teaching, attending seminars, etc.) was at the satisfactory level. In quantitative findings, middle school principals' practice in providing professional development was higher than those of any other principals. But, in qualitative findings, middle school principals put less

emphasis on providing professional development although high school principals emphasized providing professional development. As the primary school principals, they informally perform providing professional development. According to Sherman and MacDonald (2008), a good instructional leader will encourage teachers to be engaged in professional development and focused on self-reflection. Therefore, the more teachers are encouraged to reflect their teaching, the more they convince that what their strengths and weaknesses are in their teaching. Hallinger and Murphy (1986) stated that principals work with teachers directly by conducting in-service workshops for their staff and by working in the classroom with teachers who are learning new skills. They need to arrange for teachers to observe their colleagues' teaching. So, principals should try teachers to attend workshops and in-service training. Teachers should observe their teaching mutually. And then, principals should provide teaching resources (books, journals, etc.) to teachers for their professional development. Abdullah and Kassim (2012) described that principals need to promote the professional development of teachers by allocating time in the meeting to share ideas, and provide professional development opportunities. Principals should arrange the time to share ideas for teachers by holding the board of study for science teaching. In the board of study for science, principals should attempt to discuss the literature related to science teaching with teachers and share the knowledge they get from in-service training courses.

Principals' practice in giving incentives was in satisfactory level. In quantitative findings, high school principals mostly perform giving incentives than any other schools do. In qualitative findings, high school principals and primary school principals gave rewards for teachers who take part in the selecting examinations of outstanding teachers. And then, if those teachers received prize, principals gave recognition to teachers in front of their colleagues as well. But, middle school teachers put less emphasis on giving incentives. Hallinger and Murphy in 1986 stated that principals as instructional leaders provide incentives to individual teachers in order to improve their teaching practices and find ways to reward or recognize teachers for their efforts informally and formally. Thus, principals should give recognition to teachers' efforts to improve primary science teaching. Weber (1989) described that rewards and recognitions not only add to motivation but

also enhance the effort. Blasé and Blasé (1999) stated that praise significantly affected teacher motivation, efficacy, and creativity. Sherman and MacDonald in 2008 described that good instructional leaders praise effective teaching. Therefore, principals should give recognition to teachers' outstanding efforts. Teachers should be believed that they could teach students to understand well. Principals should choose and recommend teachers for the scholarship program based on their outstanding performances.

In the findings of knowledge about instructional leadership, there were a lot of principals who were above satisfactory level. But it was not found that principals did not perform instructional leadership practices as equal with their knowledge of instructional leadership. Because of too much clerical work, less financial support and insufficient teachers, they could not practice instructional leadership well. Results reflected that there were significant differences in principals' instructional leadership knowledge and practices depending on demographic data and school level. Findings showed that there were significant differences in principals' instructional leadership knowledge and practice in providing professional development depending on qualification. The result of the research findings indicated that the groups of principals who got the BEd/ MPhil/ MEd Degree had much knowledge about instructional leadership than those of principals who got the BA/ BSc Degree. The practice in providing professional development of the groups of principals who got the BEd/ MPhil/ MEd Degree was better than that of principals who got the BA/ BSc Degree. Thus, the findings highlighted that the principals need to get the educational degrees as much as possible. There were significant differences in principals' instructional leadership knowledge depending on school level. High school principals had much knowledge about instructional leadership than that of primary and middle school principals. The findings pointed out that most of primary and middle school principals should get chances as high school principals do.

According to the findings, there were significant differences in principals' practices, setting the goals and communicating with teachers and providing opportunities for professional development, depending on professional qualification. It is apparent that professional qualification highly affects principals' instructional leadership practices.

The results showed that there were significant differences in principals' instructional leadership practices depending on their knowledge. Therefore, it is important to get much knowledge about instructional leadership. In order to get a lot of knowledge, principals should attend the educational trainings as much as possible.

According to the findings, there were a few teachers who were in above satisfactory level of knowledge about primary science teaching. In classroom observations, it was found that a few teachers apply appropriate teaching aids, and gave students opportunities to learn science by using their science process skills.

Thus, it can be concluded that systematically designed professional development activities are vitally important for the development of teachers' knowledge about primary science teaching. In the findings, there were significant differences in teachers' primary science teaching practices depending on school level. High school principals assign junior teachers to help primary science teaching when their schools do not have enough primary teachers. But, primary school primary had difficulties in arranging that practice because they do not have other teachers to get support. Because of this, science teaching practices of primary teachers in high schools are higher than those of primary teachers in primary and middle schools. Thus, principals' instructional leadership practices are important.

Findings suggested that there was an association between principals' instructional leadership practices and teachers' primary science teaching practices. Thus, principals need to perform succinctly, effectively and systematically arranged instructional leadership activities for improving teachers' primary science teaching practices.

Recommendations

It is essential to enhance principals' instructional leadership practices so that they can give their teachers detail instructions for improving their science teaching practices. As instructional leaders, principals need to allow teachers to make decisions and participate in setting the school goals. Principals should supervise teachers' setting classroom objectives to be in-lined with the objectives for improving the students' science process skills.

Principals need to supervise teachers' primary science teaching in accordance with the objectives they laid down. Principals should have classroom observation records in order to know how teachers use approaches for improving science process skills. Principals need to give suggestion to teachers about their science teaching.

Principals should try to provide teachers the necessary teaching aids and should urge the teachers to create new teaching aids on their own. Principals should encourage teachers to reflect about their science teaching. Principals should try and force teachers to attend workshops, seminars, and in-service trainings concerning science teaching skills. Principals should arrange the time and place for teachers to share ideas and knowledge from in-service training with their colleagues and discuss the literature they read. Principals should arrange plans to be able to invite the science teaching experts from outside so that those experts are able to lecture the teachers. Principals should provide recognitions to teachers for participating in the contest of creating teaching aids, and outstanding performance in science teaching. Principals should give praise and rewards to teachers individually, in the meetings, and in the parent-teacher gatherings. Principals should arrange teachers to attend the educational programs for improving their science teaching. Too much extra workloads that can waste energy and time for instructional leaders should be reduced as much as possible so that principals can perform instructional leadership practices well, specifically and systematically.

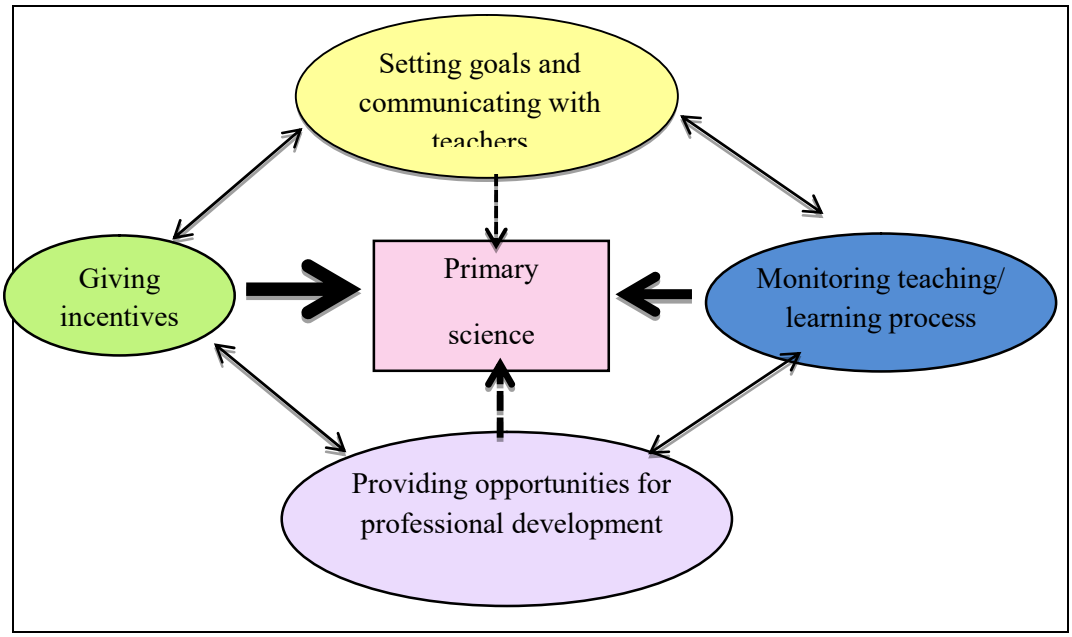

Figure 1: Proposed Model of Instructional Leadership for Improving Primary Science Teaching

⟷ Inter-correlation between two coponents (statistically significant)

⋯⋯→ Predicting on primary science teaching practices (not significant)

⟶ Predicting on primary science teaching practices (statistically significant)

Need for Further Research

This study tried to explore the analysis of instructional leadership for improving primary science teaching. Besides, instructional leadership practices were investigated based on demographic data, school level and principals' instructional leadership knowledge. And then, the predictors of instructional leadership practices were also investigated in this study.

The samples of this study were principals and teachers who were only from Yangon City Development Area. It is necessary to investigate principals' instructional leadership practices for improving primary science teaching in other states and regions to represent the whole country.

In addition, since this study examined the instructional leadership for improving primary science teaching identifying the four dimensions,

exploring the factors affecting principals' instructional leadership practices would be recommended as further studies.

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