DEVELOPMENT OF A TEACHER EMPOWERMENT MODEL FOR IMPROVING TEACHING PRACTICES OF LOWER SECONDARY SCIENCE TEACHERS*

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Abstract

This paper intended to study the knowledge level of lower secondary science teachers, to study the empowerment level of lower secondary science teachers, to investigate the variation of science teaching practices in terms of teacher empowerment levels, and to develop the teacher empowerment model for improving teaching practices of lower secondary science teachers in Yangon Region. Quantitative and qualitative research methods were used. A set of questionnaire to collect the required data was developed based on **School Participant Empowerment Scale (SPES)** of Short and Rinehart (1992). The reliability coefficient (Cronbach α) was 0.98 for the teacher empowerment questionnaire and 0.87 for science teaching practice questionnaire which was developed based on literature. Three hundred and twenty lower secondary science teachers were selected by using the cluster sampling method. The descriptive statistics was used to analyze the collected data. The level of knowledge (satisfactory level, Mean=10.42, SD=2.17), empowerment (somewhat empowerment level, Mean=2.96, SD=.42) and teaching practice (moderately high level, Mean=3.87, SD=.54) that perceived by teachers and the relationship between empowerment and teaching practice were identified in this study. There was a typical association between science teachers' empowerment and science teachers' teaching practice (r=0.430, p<.01). Professional development and autonomy could be identified as the best predictors of science teaching practice in lower secondary level (R^2=.22, F(5,314)=17.65). Qualitative findings also suggested that the higher the teacher empowerment level of science teachers, the better the teaching practice of science teachers. Finally, the teacher empowerment model for improving teaching practices of lower secondary science teachers could be developed.

Keywords: Teacher Empowerment, Teaching Practice, Science Process Skills

Introduction

The term "empowerment" became a dominant theme in many organizations during the 1980's. Gradually, the idea of empowering teachers

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entered education field in the 1990's. Therefore, the slogan of World Teachers' Day, 2015 was "*Empowering Teachers; Building Sustainable Societies*". In this case, empowering teachers includes involving them in various decision making processes, valuing them through proper respect and salary and enriching their knowledge through training and professional growth. Moreover, Frymier (cited in Behera, 2011) rightly stated that **"**In any attempt to improve education, teachers are central"**.** In addition, Ekanayake (n.d.) explained that the core of an excellent education system is based on talented teachers. When teachers play the change agent in the school, teacher's empowerment is the need of the hour. According to Copp and Pfeiffer (2003), empowerment is achieved when employees are provided with freedom at work, self-control and esteem in their work, adequate training, rewards and effective management that involves them in decision-making. Reeves(2004) also stated that teachers need to be empowered to reflect on instructional practices and make instructional decisions in the classrooms aimed at increasing student achievement. Short (1994) mentioned that an incorporation of empowerment gives teachers a sense of ownership and opportunities to improve the quality of instruction. Glickman (1991) also summed up the idea that successful schools empower teachers to be at forefront of school improvement initiatives. Therefore, development the teacher empowerment model for improving teaching practices needs to be considered as a vital role in order to improve the quality of instruction.

Significance of the Research

Dr. Khin Zaw (2001) pointed out that no educational system can ever be better than its teachers. For the development of the education system and the quality of education, it solely depends on the quality of teachers. To become quality teachers, teachers' empowerment is one of the most important factors in education field. Leo (n.d.) asserted that empowerment is helping teachers to use their personal, professional or situational powers that they possess and to be quality teachers. Thus, the area of teacher empowerment is major area of concern for the immediate future and crucial element to be successful education.

Moreover, today's science teachers play vital roles in educating, inspiring, and guiding students to become responsible scientifically literate

citizens (Lanier, 2009). Otherwise, Secondary Education Modernization Program, Republic of Trinidad and Tobago (2008) described that at the lower secondary level, students' experiences in science will lead them to have a conceptual understanding of the natural world, of man's place in it, and of his responsibility to maintain and preserve it. Thus, teaching science at the lower secondary level is incredibly important because this level connects the knowledge from primary level to secondary level. If the teachers can instill love to learn science at lower secondary level, children will go on to learn further studies of science with enthusiasm.

According to Mishra and Mishra (2011), it can be regarded that teachers are the prime source of knowledge who gives the strength to the students with their capabilities and competencies. If such teachers are given empowerment, then no doubt they will certainly do more efforts toward their students to make them resourceful persons and also they will show their brighter performance side of and extra role behavior are also seen in their academic attitudes. In addition, science education developers recognized that teachers' instructional practices must change in order to reach the goal of science literacy for all. Thus, the researcher intends to develop teacher empowerment model for improving teaching practices of lower secondary science teachers in Yangon Region.

Theoretical Framework

In this study, teacher empowerment was investigated with five dimensions based on teacher empowerment dimensions developed by Paula M. Short and James S. Rinehart, 1992. These five dimensions of teacher empowerment are (1) decision making, (2) professional development, (3) status, (4) self efficacy, and (5) autonomy.

These dimensions of empowerment are described in detail as follows.

***Decision making*:** To be empowered in decision making concerned with science teaching, science teachers' involvement is authentic and their opinion has an impact on the outcome of the decision. Principals need to help the teachers to develop their knowledge and skills needed to make effective decisions, and then give them the authority to make decisions. Moreover, principals can also develop shared decision making in their organization for science teacher empowerment to occur.

***Professional development*:** The professional science teachers should be knowledge-able about their subject to be more empowered. There are some suggestions for leaders who want to implement professional growth opportunities as follows:

1. relating the activities to the school's vision,
2. providing a variety of opportunities,
3. respecting science teacher judgments regarding implementation,
4. being knowledgeable of trends,
5. striving for embedded activities within the school day, and
6. avoiding staleness in opportunities.

Science teachers need to involve in ***formal process*** such as a conference, seminar, or workshop conducted for the science teachers; collaborative learning among members of a science work team; or a science course at a college or university and ***informal contexts*** such as discussions among work colleagues, independent reading and research, observations of a colleague's work, or other learning from a peer for their professional development.

Science teachers can be provided various activities to promote their development in a certain area in accordance with three categories of science teacher professional development (TPD) such as Standardized TPD (centralized approach), Site-based TPD (takes place in school, resource centers or teacher colleges) and Self-directed TPD (initiating and designing their own development).

Status: Principals should frequently praise to recognize the contributions of science teachers, the difficulties and challenges associated with the work of science teachers, and recognize special successes. To increase employee motivation and morale, principals should make time for their employees. In order to be effective, praise must be genuine, personal, and address a specific accomplishment.

Self-efficacy: Science teachers need to know their competences to make a difference and have to develop these competences. Science teachers must

have strong skills and abilities to be more empowered. Science teachers can learn to be effective by watching the behaviors of others being effective. Social persuasion by colleagues and superiors that a science teacher can teach successfully will enhance the science teacher's self-efficacy. To impact on self-efficacy including feelings of confidence and the tendency to try new and innovative science teaching techniques, professional development opportunities must be provided and supported to science teachers.

Autonomy: Science teachers should be provided with a vacuum of space to carry out their duties and freedom to decide on their action. Science teachers need professional autonomy in order to carry out their duties diligently without any short comings.

There are three characteristics of autonomy as science teachers being in control of

1. instructional areas within the classroom,
2. non-instructional areas such as classroom discipline, and
3. the determination of needs for supplies and materials.

Moreover, Science teachers should know and practice the following factors in their teaching to be effective.

Regarding Lesson Preparation, the first instructional decision the science teachers must make is determination of the learning objective. Science teachers should use a variety of teaching strategies, activities and teaching aids to enhance students' learning. Activities such as projects, field trips, and science fairs have a definite place in science instruction. The inquiry approach to science course instruction requires a skilled science teacher who can arrange the learning environment so that students can find out. Process skills are grouped into two types- basic and integrated. Basic processes skills are discovery processes and integrated processes skills are inquiry processes. The teachers should play a major role in developing and maintaining a well-disciplined laboratory environment.

Science teachers can use positive reinforcers and negative reinforcers to foster desired behaviors in science teaching. Science teachers must teach many things besides book studies. To carry out evaluation objectives, there

are three major types of evaluation approaches with which the teacher should become familiar: diagnostic, formative, and summative. The significance of giving feedback is to help students understand the reasons for the results received and show them ways to do better next time.

Aims of the Research

Main Aim

The main aim of this study is to develop a teacher empowerment model for improving teaching practice of lower secondary science teachers.

Specific Aims

The specific aims of this study are:

(1) To study the knowledge level of lower secondary science teachers

(2) To study the empowerment level of lower secondary science teachers

(3) To investigate the variation of science teaching practice in terms of teacher empowerment levels

(4) To develop the teacher empowerment model for improving teaching practice of lower secondary science teachers in Yangon Region

Research Questions

This research deals with the following questions regarding teacher empowerment to improve teaching practice of lower secondary science teachers.

(1) What are the knowledge levels of lower secondary science teachers in Yangon Region?

(2) What are the empowerment levels of lower secondary science teachers in Yangon Region?

(3) Is there any variation in science teaching practice in terms of teacher empowerment levels of lower secondary science teachers in Yangon Region?

(4) What is the teacher empowerment model for improving teaching practice of lower secondary science teachers in Yangon Region?

Definition of Key Terms

Important terms are carefully defined in explaining the concepts underlying the development of the investigation.

(1) ***Teacher empowerment*** refers to the opportunity and confidence to act upon one's ideas, to influence the way one performs in one's profession.(Melenyzer, 1990)

(2) ***Teaching practice*** refers to something that teachers do often, especially a particular way of teaching something.

(3) ***Science process skills*** refers to the skills that ensure active student participating, 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).

Limitations of the Study

Participants of the study are lower secondary science teachers from Basic Education schools of Yangon Region.

Operational Definition

In this study, teacher empowerment refers to the ability, opportunity and desire to act upon one's ideas, to influence the way one performs in one's profession. Perceived teacher empowerment was examined by the mean responses of teachers from Basic Education Schools on four-point Likert-scale questionnaire consisting of forty-eight items about the perceptions of participants in their profession. The higher the mean values of responses, the greater the level of perceived teacher empowerment.

Review of Related Literature

A review of related literature deals with two main parts: (1) Teacher Empowerment and (2) Science Education.

Teacher Empowerment

Conger and Kanungo (1988) viewed empowerment as a motivational construct. Empowerment is an enabling rather than a delegating process. Enabling, from this perspective, involves creating conditions for enhancing motivation for task accomplishment through the development of a strong sense of personal efficacy.

Empowerment is most often viewed as a process through which people become powerful enough to engage in, share control of, and influence events and institutions affecting their lives. In part, empowerment requires that people gain the knowledge, skills, and power necessary to influence their lives and the lives of those they care about, as in the professional life cycle of teachers (Hobbs, *et al*, 2010).

Bolin (1989) stated that teacher empowerment is defined as investing teachers with the right to participate in the determination of school goals and policies and to exercise professional judgment about what and how to teach.

Melenyzer (1990) defines that teacher empowerment is the opportunity and confidence to act upon one's ideas and to influence the way one performs in one's profession.

Kirby (1992)defined true empowerment as the involvement in decision making, authority over classroom and school level issues, and opportunity to acquire the knowledge necessary for these types of authority. Kirby (1992) also explained there are three key elements of empowerment: (a) the ability to act,(b) the opportunity to act, and (c) the desire to act.

Short and Rinehart (1992) identified six dimensions of teacher empowerment as follows.

1. *decision-making* - teachers' participation in critical decisions that directly affect their work, involving issues related to budgets, teacher selection, scheduling, and curriculum
2. *professional growth*- the teachers' perception that the school provides them opportunities to grow and develop professionally, to continue to learn, and to expand their skills during their work in school

3. *autonomy* - teachers' feeling that they have control over various aspects of their working life, including scheduling, curriculum development, selection of textbooks and planning instruction
4. *status* - the professional respect and admiration the teachers perceive that they earn from colleagues
5. *self efficacy* - teachers' perception that they are equipped with the skills and ability to help students learn, and are competent to develop curricula for students and
6. *impact* - teachers' perception that they can affect and influence school life

Hobbs (2004) also studied how fifteen career science teachers' perceptions of their empowerment, as defined by the above six elements presented by Short (1992) have changed as a result of key events during their careers. Two models emerged. One identifies the two simultaneous processes of empowerment: The personal empowerment process includes self-efficacy and status. The organizational empowerment process includes autonomy, decision-making and impact. Both processes occur simultaneously although individual teacher stories may emphasize one over the other.

Figure 1: Personal and organizational empowerment model
Source: Adapted from Hobbs, M., *et al*., (2010).

The second model shows empowerment as a cycle with three stages of empowerment: The Initiating Phase, The Increasing Phase, and the Sustaining Phase. Although all the dimensions are present during all stages, they become increasingly complex and sophisticated, and reach maturity during the third phase.

Teachers in the study indicated theft need to be respected for their ability to act responsibly and make good decisions. The teachers exhibited remarkable resiliency in maintaining their overall sense of empowerment with professional development providing support for the growth process.

The Hobbs (2004) empowerment model conceptualized the teachers' experiences and their perceived growth in empowerment.

Table 1: The Phases of Empowerment Model

Phase	Years of Teaching Experience	Characteristics
Initiating Empowerment	1-3	• Lack of preparation for entering the classroom and concurrent lack of awareness of professional development opportunities • Early experiences with decision-making • Increasing confidence that accompanied student success
Growth of Empowerment	4-8	• Growing awareness of professional development • Increasing self-efficacy through student success • Challenging contexts- both teaching and personal • Maturing sense of autonomy through involvement in decision-making
Sustaining Empowerment	9^{+}	• Appreciating lifelong learning • Redefining self-efficacy • Valuing relationships with peers • Impacting education through group involvement

Source: Adapted from Hobbs, M., *et al*., (2010).

Tony (2009) highlights the notion that the nature of work worldwide dictates that outcome or output largely depends on the emphasis or attention put onto the input of the organization. Therefore teacher performance (output) will largely depend on the level of teacher empowerment (input) provided.

Science Education

A major goal of science education today is fostering students' intellectual competencies, such as independent learning, problem-solving, decision-making and critical thinking (American Association for the Advancement of Science, 1994; National Research Council, 1996).

According to Russel and Harlen (1990), science is about understanding certain aspects of physical world around us and it involves testing and changing ideas about how natural and made things work.

It is a way of thinking, a way of understanding the world. It is a human endeavor, a personal way of exploring and knowing (Carin & Sund, 1985). Cain and Evans (1990) mentioned the nature of science in four components: (1) content or product, (2) process or method, (3) attitude, and (4) technology.

Science Process Skills

Science process skills are the skills that ensure active student participating, 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).

SAPA grouped process skills into two types- basic and integrated. The basic (simpler) process skills provide a foundation for learning the integrated (more complex) skills. According to Jinks (1997), the integrated science process skills are more appropriate for children at grades four and above.

According to Padilla (1990), ***Basic Process Skills*** are (1) Observing, (2) Inferring, (3) Measuring, (4) Communicating**,** (5) Classifying**,** and (6) Predicting**.** And, ***Integrated Process Skills*** are (1) Controlling variables, (2) Defining operationally,(3) Formulating hypotheses,(4) Interpreting data, (5) Experimenting, and (6) Formulating models**.** Students should be introduced to these skills early in their school experiences because so much of

their success in subsequent guided studies requires a sound understanding and appropriate use of these skills. Therefore, science teachers need to be expert in these process skills, and they also need to be expert in the effective teaching of these science process skills (Ango, 2002).

Methodology

In this study, quantitative and qualitative research methods were used. A set of questionnaire to collect the required data was developed based on **School Participant Empowerment Scale (SPES)** of Short and Rinehart (1992). The reliability coefficient (Cronbach α) was 0.98 for the teacher empowerment questionnaire and 0.87 for science teaching practice questionnaire which was developed based on literature.

Cluster sampling method was used. Three hundred and twenty lower secondary science teachers in Yangon Region participated in this study. The descriptive statistics was used to analyze the collected data. The level of knowledge, empowerment and teaching practice that perceived by teachers were determined as the item percent correct, mean value, standard deviations. Moreover, One-Way ANOVA, Tukey HSD test, the Pearson-product moment correlation coefficient, and Simultaneous multiple regression were utilized.

Findings

Investigating Science Teachers' Knowledge for Science Process Skills

Teacher's level of knowledge for science process skills was identified according to the range of average score percent as shown in Table 2.

Table 2: Number and Percentages of Participant Teachers Showing the Level of Knowledge for Science Process Skills (N=320)

Scoring Range	No. of Teachers (%)	Remark
<50%	111 (35%)	Below satisfactory level
50%-74%	200 (62%)	Satisfactory level
≥ 75%	9 (3%)	Above satisfactory level

Scoring Range : <50% = below satisfactory 50%-74% = satisfactory level
≥75% = above satisfactory

In science teachers' 20-item knowledge questionnaire, there are three parts: knowledge item (1,2,3,4,8,9, and 12) for basic process skills, item (5,6,7,10,11 and 13) for integrated process skills, and item (14,15,16,17,18,19, and 20) for science teaching methods. Science teachers' knowledge in these three parts was shown in Table 3.

Table 3: Number and Percentages of Participant Teachers in Science Teachers' Knowledge

No.	Parts	No. of items	IPC
1	Basic Process Skills	7	55.2%
2	Integrated Process Skills	6	32.7%
3	Teaching Methods	7	65.6%
Overall Science Teachers' Knowledge		**20**	**52.1%**

Investigating Lower Secondary Science Teachers' Empowerment

The descriptive results of science teacher's perceptions on empowerment were shown in Table 4.

Table4: Mean Values Showing Perceptions of Lower Secondary Science Teachers on Empowerment in Basic Education Schools (N=320)

No.	Elements	Mean (SD)
1.	Desire to Act	3.13 (.50)
2.	Ability to Act	2.94 (.44)
3.	Opportunity to Act	2.82 (.45)
	Empowerment	**2.96 (.42)**

Scoring Direction:

1.00-1.49= no empowerment 1.50-2.49= a little empowerment
2.50-3.49=somewhat empowerment 3.50-4.00= strong empowerment

According to Table 4, mean values for science teacher's empowerment was 2.96. Thus, science teachers' empowerment in this study was somewhat empowerment.

Mean values for perceptions of lower secondary science teachers onempowerment grouped by district were presented in Table 5.

Table 5: Mean Values Showing Perceptions of Lower Secondary Science Teachers on Empowerment Grouped by District (N= 320)

No.	Dimensions	Mean (SD)			
		District A	**District B**	**District C**	**District D**
1.	Desire to Act	3.20 (.40)	2.98 (.49)	3.18 (.55)	3.16 (.53)
2.	Ability to Act	3.01 (.40)	2.86 (.45)	2.92 (.47)	2.96 (.42)
3.	Opportunity to Act	2.87 (.49)	2.78 (.45)	2.82 (.45)	2.82 (.40)
	Empowerment	**3.03 (.38)**	**2.87 (.44)**	**2.97 (.45)**	**2.98 (.40)**

Scoring Direction:

1.00-1.49=no empowerment 1.50-2.49= a little empowerment

2.50-3.49=somewhat empowerment 3.50-4.00= strong empowerment

According to Table 5, all four groups of teachers perceived as having *somewhat empowerment* including desire to act, ability to act, and opportunity to act.

Table 6: One-Way ANOVA Result Showing Significantly Different Elements in Perceptions of Lower Secondary Science Teachers on Empowerment Grouped by District

Dimensions		Sum of Squares	*df*	Mean Square	*F*	*P*
Desire to act	Between Groups	2.59	3	.86	3.52	.015*
	Within Groups	77.41	316	.25		
	Total	79.99	319			

Note: *.The mean difference is significant at the 0.05 level.

n.s = no significance

Table 7: Tukey HSD Result Showing Multiple Comparison for the Perceptions of Lower Secondary Science Teachers on Desire to act Grouped by District

Variable	(I) Group	(J) Group	Mean Difference (I-J)	*p*
Desire to act	District B	District A	-.23*	.020*
		District C	-.20*	.047*
		District D	-.18	n.s

Note: *.The mean difference is significant at the 0.05 level.

n.s = no significance

Table 7 presents the results of Tukey HSD multiple comparison for the perceptions of lower secondary science teachers on desire to act grouped by district. As shown in Table 7, Tukey test shows that District B science teachers were significantly different from District A(p<0.05, d=-0.51)and District C (p<0.05, d=-0.38) science teachers in the perceptions of lower secondary science teachers on desire to act among the science teachers grouped by district.

Table 8: Summary of One-Way ANOVA Result Showing Degree of Perceptions of Lower Secondary Science Teachers on Desire to act Grouped by District

No.	Dimensions	Mean (SD)				*F*	*P*
		District A	District B	District C	District D		
1.	Decision Making	3.05 (.51)	2.87 (.58)	3.08 (.58)	3.08 (.54)	2.76	.042*
2.	Professional Development	3.21 (.43)	2.96 (.52)	3.21 (.63)	3.18 (.57)	4.00	.008**
3.	Self-Efficacy	3.30 (.51)	3.02(.52)	3.25 (.59)	3.22 (.60)	3.85	.010**
4.	Autonomy	3.24 (.49)	2.96 (.55)	3.20 (.63)	3.12 (.65)	3.67	.013**

Note: *.The mean difference is significant at the 0.05 level.
**.The mean difference is significant at the 0.01 level.

Investigating Lower Secondary Science Teachers' Teaching Practice

Mean values for perceptions of lower secondary science teachers on teaching practice grouped by district were presented in Table 9.

Table 9: Mean Values Showing Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by District (N= 320)

No.	Variable	Mean (SD)			
		District A	District B	District C	District D
1.	Science Teachers' Teaching Practice	3.97 (.57)	3.82 (.56)	3.89 (.52)	3.81 (.51)

Scoring Direction:
1.00-1.49=Low 1.50-2.49=Moderately Low 2.50-3.49= Satisfactory
3.50-4.49= Moderately High 4.50-5.00= High

According to Table 9, all four groups of teachers perceived as having moderately high level *teaching practice* mentioned in this study.

Table 10: One-Way ANOVA Result Showing Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Knowledge

Variable		Sum of Squares	*df*	Mean Square	*F*	*P*
Science Teachers' Teaching Practice	Between Groups	2.72	2	1.36	4.74	.009**
	Within Groups	90.80	317	.29		
	Total	**93.51**	**319**			

Note:.**The mean difference is significant at the 0.01 level.

Table 10 shows the ANOVA result for the perceptions of lower secondary science teachers on teaching practice in their subject. According to table 10, there was significant variation on the perceptions of lower secondary science teachers on teaching practice among the teachers grouped by level of knowledge (df= 2, F= 4.74, P<.01).

Table11: Tukey HSD Result Showing Multiple Comparison for the Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Knowledge

Variable	(I) Knowledge Level	(J) Knowledge Level	Mean Difference (I-J)	*p*
Science Teachers' Teaching Practice	Group A	Group B	-.18*	.011**
		Group C	-.31	n.s

Note: **.The mean difference is significant at the 0.01 level.

n.s = no significance Group A=Below satisfactory level Group B= Satisfactory level Group C = Above satisfactory level

Table 11 presents the results of Tukey HSD multiple comparison for the perceptions of lower secondary science teachers on teaching practice grouped by level of knowledge. As shown in Table 11, Tukey test shows that group A was significantly different from group B (p<0.01, d=-0.33) in the perceptions of lower secondary science teachers on teaching practice among the science teachers grouped by level of knowledge.

Table 12: Summary of One-Way ANOVA Result Showing Degree of Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Knowledge

No.	Variable	Mean (SD)			*F*	*P*
		Group A	Group B	Group C		
1.	Science Teachers' Teaching Practice	3.75(.59)	3.93(.51)	4.06(.44)	4.74	.009**

Note: **.The mean difference is significant at the 0.01 level.

Table 13: One-Way ANOVA Result Showing Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Empowerment

Variable		Sum of Squares	*df*	Mean Square	*F*	*P*
Science Teachers' Teaching Practice	Between Groups	10.04	3	3.35	12.67	.000***
	Within Groups	83.47	316	.27		
	Total	93.51	319			

Note: ***.The mean difference is significant at the 0.001 level.

Table 13 shows the ANOVA result for the perceptions of lower secondary science teachers on teaching practice in their subject. According to the table 13, there was significant variation on the perceptions of lower secondary science teachers on teaching practice among the teachers grouped by the level of empowerment (df=3, F=12.67, P<.001).

Table 14: Tukey HSD Result Showing Multiple Comparison for the Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Empowerment

Variable	(I) Empowerment Level	(J) Empowerment Level	Mean Difference (I-J)	*p*
Science Teachers' Teaching Practice	Group B	Group A	-.73	n.s
		Group C	-.61*	.000***
		Group D	-.80*	.000***

Note: ***.The mean difference is significant at the 0.001 level.

n.s = no significance

Group A= no empowerment Group B= a little empowerment

Group C= Somewhat empowerment Group D= strong empowerment

Table 14 presents the results of Tukey HSD multiple comparison for the perceptions of lower secondary science teachers on teaching practice grouped by level of empowerment. As shown in Table 14, Tukey test shows that group B was significantly different from group C (p<0.001, d=-1.1) and group D (p<0.001, d=-1.48) in the perceptions of lower secondary science teachers on teaching practice among the science teachers grouped by level of empowerment.

Table 15: Summary of One-Way ANOVA Result Showing Degree of Perceptions of Lower Secondary Science Teachers on Teaching Practice Grouped by Level of Empowerment

No.	Items	Mean (SD)				*F*	*P*
		Group A	Group B	Group C	Group D		
1.	Science Teachers' Teaching Practice	4.03 (.21)	3.30(.59)	3.91(.51)	4.10 (.49)	12.67	.000***

Note: ***.The mean difference is significant at the 0.001 level.
n.s = no significance

Relationship between Perceived Science Teachers' Empowerment and Their Teaching Practice

Table 16 shows that the correlation between science teachers' empowerment and their teaching practice was statistically significant because the 'sig' is less than 0.01. There is an association between science teachers' empowerment and their teaching practice (r=.430, p<.01).

Table 16: Correlations between Perceived Science Teachers' Empowerment and Their Teaching Practice

Two Groups	Science Teachers' Empowerment	Science Teachers' Teaching Practices
Science Teachers' Empowerment	1	.430**
Science Teachers' Teaching Practice	.430**	1

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

The Potential Factors Affecting Teachers' Empowerment

Five variables were identified as predictors of science teachers' teaching practices: Decision Making (DM), Professional Development (PD),

Status (S), Self-Efficacy (SE), and Autonomy (A). Simultaneous multiple regression was conducted to investigate the best predictors of teaching practice. The means, standard deviations, and inter correlations are shown in Table 17. The combination of variables to predict teaching practice included Decision Making (DM), Professional Development (PD), Status (S), Self-Efficacy (SE), and Autonomy (A), F (5,314)= 17.653, p<.01.

Table 17: Means, Standard Deviations, and Inter-correlations for Teaching practice and Predictors Variables (N=320)

Variables	**Mean**	**SD**	**DM**	**PD**	**S**	**SE**	**A**
Teaching Practice	3.87	.54	.34**	.44**	.30**	.38**	.42**
Predictor Variables							
DM	2.86	.49	--	.75**	.55**	.64**	.61**
PD	2.95	.46		--	.68**	.77**	.73**
S	3.07	.50			--	.73**	.71**
SE	3.00	.46				--	.83**
A	2.95	.51					--
**P<.01	*P<.05						

According to Table 17, it was found that science teachers' teaching practice was positively and significantly correlated with Decision Making (r=.34, p<.01), Professional Development (r=.44, p<.01), Status (r=.30, p<.01), Self-Efficacy (r=.38, p<.01), and Autonomy (r=.42, p<.01).

Table 18: Simultaneous Multiple Regression Analysis for Teacher Empowerment Dimensions Predicting Teaching Practice

Dimensions	**B**	**SEB**	**β**	***P***
Decision Making	-.01	.09	-.01	n.s
Professional Development	.39	.11	.32**	.001
Status	-.10	.08	-.09	n.s
Self-Efficacy	-.05	.12	-.04	n.s
Autonomy	.31	.10	.29**	.002
Constant	2.30	.20		.000

Note: R=.47, R^2=.22, F(5,314)= 17.65,
*P< .05, **P< .01, *** P< .001, n.s=no significance

The Regression Equation is :

Science Teaching Practice = 2.30 - .01DM + .39 PD - .10S - .05SE + .31A

The beta coefficients were presented in Table 18. Professional Development and Autonomy significantly predicted teaching practice when all five variables were included. The adjusted R squared value was .22 (R=.47). This indicates that 22% of the variance in teaching practices was explained by the model, and this is a large effect according to Cohen (1988).

According to the β weights, Professional Development variable (β=.32, p<.01) appears to be the best predictor of science teachers' teaching practice. Autonomy variable (β=.29, p<.01) appears to be the second predictor of science teachers' teaching practice. Moreover, decision making, status, and self-efficacy appear to be important for science teachers' teaching practice.

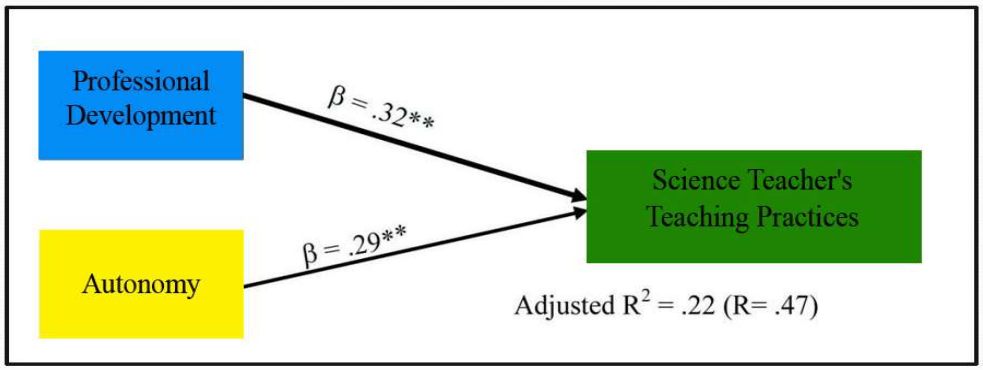

Figure 2: Potential Factors Affecting Science Teachers' Teaching Practice

Based on the quantitative and qualitative findings, the review of relevant literature, and validation by 24 expert educators, the developed teacher empowerment model for improving teaching practices of lower secondary science teachers in Yangon Region was illustrated (see Figure 3).

In addition, the following suggestions and recommendation were drawn to improve the lower secondary teachers' science teaching practice in Yangon region.

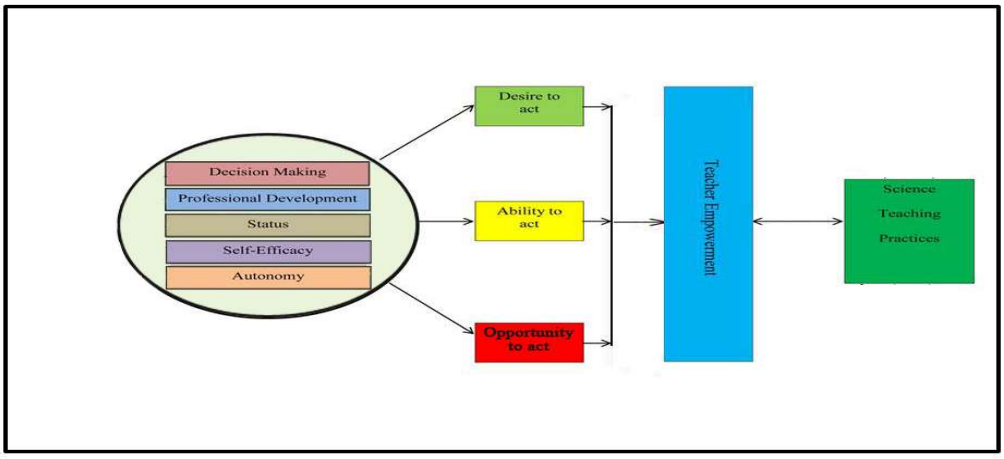

Figure 3: Developed Teacher Empowerment Model for Improving Teaching Practice of Lower Secondary Science Teachers

↔ Inter-relationship between two variables

→ Relationship between two variables

Recommendation

The following recommendations are based on the analyses of the research findings.

- School principals should create an environment that fostered establishing and maintaining school participative decision–making in the schools.
- School principals should provide opportunities the teachers to become powerful enough to engage in, share control of, and influence events and organization affecting their lives.
- School Principals should frequently use praise to recognize the contributions of teachers, the difficulties and challenges associated with the work of teachers, and recognize special successes in the schools.
- School principals should make efforts in supporting teaching aids and instructional materials, and monitoring teachers to use them in teaching science.

- Teachers should be supported professional development activities, programs, trainings and allowances to develop their science knowledge, skills and attitude in order to improve teaching science. And then, as self-directed teacher professional development, teachers should involve in initiating and designing their own professional development and share materials and ideas as well as discuss challenges and solutions.
- Teachers should be empowered and given the freedom or autonomy to determine the best possible treatment for their students learning problems in the schools.
- Teachers should be provided workshops or training to develop the knowledge of science process skills, especially integrated process skills.
- Teachers should be supported science materials, facilities, and resources to well-implement teaching science.
- Teachers should use available resources as teaching aids in teaching science lesson effectively.
- A classroom should be used as a storage space for science materials and teaching aids, and teachers should use and maintain them with a logbook.
- Non-instructional workloads of teachers should be eliminated to have more time in teaching science.
- Not only teacher-pupil ratio but also teacher-classroom ratio should be considered in order to provide students inquiry learning opportunities.
- Text books should be reviewed to correct the spelling errors and to modify figures to be clear and colorful.
- Formative and diagnosis assessment should be emphasized in teaching science in order to be continuous reflection on learning science and to identify students' weakness and misconceptions in teaching science.
- Activity-based assessment system for science achievement should be used to match with how science should be taught.

Need for Further Research

The studies in all subject areas need to be conducted to investigate how to give empowerment for different subject teachers to improve their teaching practice.

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