

# **INTEGRATING EDUCATION FOR SUSTAINABLE DEVELOPMENT IN THE IMPLEMENTATION OF PRIMARY SCIENCE CURRICULUM**

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## **Abstract**

The purpose of this research is to study the integrating Education for Sustainable Development (ESD) in the implementation of primary science curriculum. The research intends to investigate the ESD knowledge level and teaching practices of Grade 3 teachers. It also investigates the variations of teachers' practices on integrating ESD into science curriculum by primary teachers according to their demographic data. Both quantitative and qualitative research methods were used. Census sampling method was used: 110 Grade 3 teachers were selected as participants in Thabeikkyin Township, Mandalay Region. IPC values, independent sample *t* test, one way ANOVA, post hoc test by Tukey HSD were used for the data analysis. The level of teachers' overall ESD practices was moderate. There were statistically significant differences in integrating ESD in Grade 3 science curriculum grouped by class size. A qualitative follow up study was conducted through interviews and observation. The information obtained from the interviews and observations were complementary to the quantitative findings.

**Keywords:** Education for Sustainable Development (ESD), science curriculum

## **Introduction**

Education for Sustainable Development is 'a vital means of implementation for sustainable development' of all of the Sustainable Development Goals (UN, 2017). ESD aims to transform society towards peace and sustainability through reorienting education and learning. Daw Aung San Suu Kyi (2018) said Myanmar Sustainable Development Plan (MSDP) is the expression of our national development vision that finds resonance in the global sustainable development. The MSDP envisions an education system in Myanmar that will support our country's human resources, our students, to develop their full potential. Thus, the role of the teacher is crucial in fostering students who make informed and conscious decisions for a sustainable future. Teachers can act as key change agents in transforming education and society. By integrating ESD in teacher education, learning methods and content can be reoriented towards sustainability.

## **General Objective**

To study the integrating Education for Sustainable Development (ESD) in the implementation of primary science curriculum

## **Specific Objectives**

1. To investigate the knowledge levels of primary teachers concerning with education for sustainable development
2. To investigate the teachers' practices on integrating Education for Sustainable Development (ESD) in the implementation of primary science curriculum
3. To investigate the variations of teachers' practices on integrating ESD into science curriculum by primary teachers according to their demographic data

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## Research Questions

1. What are the knowledge levels of primary teachers concerning with education for sustainable development?
2. To what extent do the teachers practise to integrate Education for Sustainable Development (ESD) in the implementation of primary science curriculum?
3. Are there any significant variations of teachers' practices on integrating ESD into science curriculum implementation by primary teachers according to their demographic data?

## Limitations of the Study

The following points show the scope of the study.

1. The study is geographically restricted to Thabeikkyin Township, Mandalay Region.
2. Participants of the study are Grade 3 science teachers from Basic Education schools and Monastic schools of Thabeikkyin Township.
3. This study is designed to investigate the integrating Education for Sustainable Development in the implementation of primary science curriculum.

## Theoretical Framework

The theoretical framework was established based on the review of related literature. In this study teachers' ESD knowledge was investigated by (Health and Education Unit of the Commonwealth Secretariat [HEU], 2016) with the 17 SDGs clustered according to three main components of sustainable development: (1) social development, (2) environmental development, and (3) economic development which sit below the overarching theme of peace, justice, equity and gender. This is all underpinned by working in partnership on a global scale.

These dimensions of Education for Sustainable Development are described in details as follows.

**Social Development:** In the Grade 3 science curriculum, SDG 2 and 3 are closely related to social development. According to SDG 2 (end hunger), teachers should contribute food security through several components such as food availability (e.g. through growing produce in school gardens, proper use of food (e.g. sanitation, hygiene, and nutrition education), and as a safety net, as the provision of school meals helps to keep children in school and thus helps families to educate their children and protect their food security in times of crisis. School meals support children's development so that they become healthy and productive adults, breaking cycles of hunger and poverty. Education and food security interact in multiple, mutually reinforcing ways. For instance, food security improves learning outcomes by resulting in better cognitive function and increased school attendance. And then, SDG 3 (good health and well-being), learning environments can foster academic to healthy transitions. Teachers should practices that influence healthy choices such as the availability of healthy foods. Schools and learning environments that promote health can positively influence learners' knowledge of and attitudes towards a range of health and social issues, and improving not only health but also educational outcomes. Therefore, Grade 3 science teachers should integrate these concepts into science curriculum for social develop of the children.

**Environmental Development:** In the Grade 3 science curriculum, teachers should integrate the SDG 6 and 13 to science lessons for environmental development of children. To enhance environmental development, teachers need to teach about principle of water abundance and water scarcity, potential effects of dirty water, safe handling of drinking water, and responsible and sustainable consumption. Besides, teacher should understand such as the preparedness for natural

disasters (e.g. floods, tsunami, earthquakes), the causes and effects of climate change, and the impacts of human activities and consequences of personal actions to relate with science curriculum.

***Economic Development:*** In the Grade 3 science curriculum, the SDG 11(sustainable cities and community) and 12 (responsible consumption and production) are mainly concern with the children. Therefore, teachers should teach natural cycles through field trips and gardening, and the importance of sustaining the natural environment. Besides, teachers need to teach about sustainable and unsustainable consumption, including resource use, waste generation and disposal, and environmental and health impacts. In the same way, teachers should understand and practice the “4Rs; reduce, reuse, recycle and recover”. They should calculate and compare Ecological Footprints. Furthermore, teachers need to teach distinguishing between and analyzing consumer impacts and risks of different choices (e.g. discovering what products are made of, decomposition times, where waste goes). And then, consumer awareness and commitment to sustainable choices are also important for children. Thus, teachers should relate these concepts into science lessons for economic development.

Moreover, teachers must have thorough knowledge about early childhood development to achieve science curriculum implementation.

According to Jean Piaget’s cognitive theory, grade 3 students are at concrete operational stage (age 7 to 11) of cognitive development. In the concrete operational stage, children are able to think more logically, but only in practical ways. They can now understand that redistributing material does not affect its mass, number, volume or length. If they have items to manipulate and they have the ability to take the perspective of another person.

According to Urie Bronfenbrenner’s sociocultural theories, which emphasis the impact of environment on development. It consists of five systems nested within each other and is represented graphically as concentric circles with the children in the middle circle. These systems are dynamic and interact with each other to shape each unique individual such as personality, values, beliefs, preferences and behavior. The five systems are microsystem, mesosystem, exosystem, macrosystem, and chronosystem. Its implication for teachers of young children include the importance of understanding children within the context of their families and communities, the need to work with families as parents, and the need to advocate for government policies that support families of young children and optimize children’s development.

In implementing grade 3 science curriculum, teachers should know the primary science curriculum well. The grade 3 science curriculum consists of 5 learning areas. They are Living Things, Matter, Energy, and Earth and Space, and Environment.

Moreover, grade 3 science teachers should know and practice the following factors in their teaching to be effective.

In lesson preparation, teachers should prepare to describe key concept, learning objectives and outcomes for ESD. Likewise, they need to prepare teaching methods and learning environment for sustainable development. It is equally important that teachers should create low cost no cost teaching aids from their locality. Moreover, teachers should prepare to integrate ESD concept into science lesson plans of Grade 3 Teachers Training Manual, 2019.

In teaching science, teachers should use ESD pedagogies to integrate ESD concept into science curriculum. Pedagogies associated with ESD stimulate children to ask questions, analyse, think critically and make decisions. Such pedagogies move from teacher-centered to student-centered lessons and from rote memorization to participatory learning.

Moreover, teachers should integrate ESD pedagogies that encourage critical thinking, social critique, and analyses of local contexts in science teaching. Thus, they should use teaching

techniques such as simulations, class discussions, issue analysis, storytelling, problem-base and project-base. Therefore, science teachers should know that in ESD, which differs from the traditional teaching which is one-way knowledge transmission from teachers to children. It promotes not accepting things easily, but rather to see and interpret them from more than one perspective.

Moreover, science teachers should have the ESD competencies, which refer to the amalgam of knowledge, skills, values and attitudes. According to Teacher Educators Training Manual (2019): there are eleven indicative lists of ESD competencies as follow:

- Acquiring knowledge
- Solving issues, problems, conflicts
- Thinking critically
- Communicating and negotiating
- Dealing with systems
- Facing the future
- Reflecting on values
- Participating and collaborating
- Changing perspectives
- Thinking and acting inclusively
- Showing solidarity and responsibility

If science teachers have these ESD competencies, the learners will get acquire knowledge, skills, values and attitudes at the end of the successful learning process.

## **Definition of Key Terms**

### **Education for Sustainable Development (ESD)**

Education for sustainable development is an approach to education that prepares students to make informed decisions and responsible actions to protect the environment for present and future generations. It is also about learning how to protect our culture, promote sustainable economic practices, and build a tolerant society. (UNESCO Yangon, 2017).

### **Operational Definition**

In this study, Integrating Education for Sustainable Development into Grade 3 science curriculum refers to the combination of sustainability issues into science curriculum is an important step to develop the learners' knowledge, skills, values and attitude required to promote a sustainable future.

Teacher practices on integrating ESD into Grade 3 science curriculum were examined by the mean values of teachers' responses from Basic Education Schools and Monastic Schools to questionnaire rated on 51 items. The more the mean values, the higher the extent of teachers' practices on integrating ESD into science curriculum.

## **Methodology**

Both quantitative and qualitative methods were used in this study.

### **(i) Sample**

There are one hundred and ten Grade 3 teachers in ninety-four Basic Education Schools and nine Monastic Schools in Thabeikkyin Township, Mandalay Region. By using census survey method, all Grade 3 teachers were chosen as the participants in this study. Among one hundred and three schools in Thabeikkyin Township, six schools (three highest mean score and three lowest mean score) were selected for classroom observation and interview. From selected schools, six Grade 3 teachers were also selected as interviewers and to observe their teaching practices.

### **(ii) Instrumentation**

In this study, questionnaires were used to collect the data for Education for Sustainable Development (ESD) knowledge and practices levels of Grade 3 teachers in implementing science curriculum. It was divided into three parts. The first one included demographic data concerning gender, age, qualification, external training, teaching service, types of schools and class size. The second part included thirteen true or false items and fourteen multiple choice items for teachers' ESD knowledge about Grade 3 children development based on the review of related literature.

The third one was also developed based on review of related literature. This part was also divided into three parts; lesson preparing, teaching and assessing science curriculum. It consisted of 51 items which were related on five-point Likert scales (1= never, 2= seldom, 3= sometimes, 4= often, 5= always). Observation checklist and interview questions were used in qualitative study.

### **(iii) Procedure**

Firstly, relevant literature was obtained from various valid resources. After that, in order to get the required data, the instrument was constructed under the guidance of the supervisor. Expert validity of the questionnaire was obtained from nine experienced educators from Department of Educational Theory, Yangon University of Education. Pilot testing was conducted on the first week of October. The samples for pilot testing were 50 Grade 3 teachers from Thingangyun Township, Yangon Region. After the pilot study, the reliability analysis of the instrument was done by calculating the internal consistency coefficient. The internal consistency (Cronbach's Alpha) of Grade 3 teachers' integrating ESD in the implementation of science curriculum questionnaire was 0.97.

Secondly, the permission from the Thabeikkyin Township Education Officer was taken to do research. The questionnaires were distributed to Basic Education Schools on the first week of November, 2019. Distributed questionnaires were recollected by the researcher after one week later. The respondent rate was 100%. Classroom observation and interview was conducted with six teachers from six selected schools on second week of January, 2020.

## **Data Analysis**

Descriptive Statistics, Independent Samples *t* test, One-way ANOVA, Post Hoc Tukey HSD and Item Percent Correct (IPC) were used for quantitative data analysis. The qualitative data analysis is based on categorizing and interpreting classroom observation and interview.

## Findings

### Quantitative Findings

Findings for research question (1) are presented in Table 1.

- Q.1 What are the knowledge levels of primary teachers concerning with education for sustainable development?

**Table 1** Number and Percentage of Teachers' Levels of ESD Knowledge Integrating into Grade 3 Science Curriculum (N=110)

Scoring Range	No. of Students	Remark
<50%	23 (21%)	Below Satisfactory Level
50%-74%	86(78%)	Satisfactory Level
≥75%	1 (1%)	Above Satisfactory Level

**Scoring range:** <50%= Below Satisfactory      50%-74% =Satisfactory      ≥75%= Above Satisfactory

Findings for research question (2) are presented in Table 2.

- Q.2 What are the practices levels of primary teachers concerning with education for sustainable development?

**Table 2** Mean Values and Standard Deviations of Teachers' ESD Practices in the Implementation of Grade 3 Science Curriculum (N=110)

No.	Variable	Mean	SD	Remark	Level
1	Preparing science lessons	3.41	.69	Sometimes	Moderate
2.	Knowledge	3.05	.72	Sometimes	Moderate
	Skills	2.98	.71	Sometimes	Moderate
	Values	3.11	.73	Sometimes	Moderate
	Teaching	3.04	.72	Sometimes	Moderate
3.	Assessing science lessons	3.70	.84	Often	High
	Integrating ESD in science curriculum	3.39	.66	Sometimes	Moderate

- Q.3 Are there any significant variations in science curriculum implementation by primary teachers according to their demographic data?

**Table 3 Mean Values and Standard Deviations of Teachers’ ESD Practices in Grade 3 Science Curriculum Grouped by Class Size (N=110)**

Variable	N	Class Size	Mean	SD	Remark
Preparing science lessons	49	<30	3.41	.10	Sometimes
	26	30-45	3.48	.14	Sometimes
	27	46-60	3.25	.12	Sometimes
	8	>60	3.71	.25	Often
Teaching	49	<30	2.97	.09	Sometimes
	26	30-45	3.22	.15	Sometimes
	27	46-60	2.87	.12	Sometimes
	8	>60	3.53	.13	Often
Assessing science lessons	49	<30	3.60	.13	Often
	26	30-45	4.05	.14	Often
	27	46-60	3.42	.15	Sometimes
	8	>60	4.15	.16	Often
Integrating ESD in science curriculum	49	<30	3.33	.09	Sometimes
	26	30-45	3.58	.11	Often
	27	46-60	3.18	.11	Sometimes
	8	>60	3.80	.16	Often

**Scoring Direction:** 1.00-1.49=Never 1.50-2.49=Seldom 2.50-3.49=Sometimes 3.50-4.49=Often  
4.50-5.00=Always

**Table 4 One-way ANOVA Result Showing Teachers’ Integrating ESD in Grade 3 Science Curriculum Grouped by Class Size (N=110)**

Variable	Class Size	Sum of Squares	df	Mean Square	F	p
Preparing science lessons	Between Groups	1.507	3	.502	1.069	ns
	Within Groups	49.806	106	.470		
	Total	51.313	109			
Teaching	Between Groups	3.785	3	1.262	2.941	.036*
	Within Groups	45.469	106	.429		
	Total	49.254	109			
Assessing science lessons	Between Groups	7.388	3	2.463	3.710	.014*
	Within Groups	70.355	106	.664		
	Total	77.743	109			
Integrating ESD in science curriculum	Between Groups	3.661	3	1.220	2.994	.034*
	Within Groups	43.201	106	.408		
	Total	46.862	109			

**Note:** ns = no significance, \* $p < .05$

According to One-way ANOVA Result from table 4.26, it was significant difference in teachers’ teaching, assessing science lessons and integrating ESD in science curriculum ( $F=2.9$ ,  $p=.03$ ) among groups of teachers classified by their class size.

**Table 5 Tukey HSD Results of Teachers' Integrating ESD in Grade 3 Science Curriculum Grouped by Class Size (N=110)**

Dependent Variable	(I)Class Size	(J)Class Size	Mean Difference	p
Assessing science lessons	30-45	<30	.44	ns
		46-60	.63	.029
		>60	-.09	ns

Note: ns = no significance, \* $p < .05$

According to the table 5, post hoc Tukey HSD results indicate there is a significant difference between class size, 30-45 and 46-60 in the area of assessing science lessons.

### Qualitative Findings

To gather qualitative data, observation checklist and interview questions were used. In order to find out the Integrating Education for Sustainable Development (ESD) in the implementation of Grade 3 science curriculum, six teachers from six selected schools were interviewed and their teaching practices were observed. Findings from observation of each teacher from six schools were presented.

### Results from Classroom Observation

The classroom observation was conducted by using observation checklist. It includes three portions: (1) Lesson Preparation, (2) Teaching for ESD Competencies (Knowledge, Skills, and Values), and (3) Assessing in teaching Grade 3 science curriculum.

#### (i) Lesson Preparation

Researcher observed about the Integrating Education for Sustainable Development (ESD) in the lesson preparation of Grade 3 science teachers. There were differences between teachers (Group A) who had somewhat level of ESD knowledge and practices and teachers (Group B) who had a little level of ESD knowledge and practices. In the observations, all of teachers (n=6, 100%) prepared science lessons according to 5-steps format which was set up from Ministry of Education (MOE), Myanmar. However, teachers (n=2, 33%) from (Group A) prepared and related the environmental, social and economic with the science lessons for sustainable development.

#### (ii) Teaching for ESD Competencies

Researcher observed the Integrating Education for Sustainable Development (ESD) of teachers in Grade 3 science teaching. The clusters of teaching competences which include the Knowledge, Skills, and Values that children should acquire in relation to each of the 17 SDGs. Moreover, the indicative list of ESD competencies from Teachers Educators Training Manual was used in classroom observation.

The first level of learning outcomes for **Knowledge**, teachers (n=3, 50%) from (Group A) collected data and information from different sources and with the help of various tools; to construct knowledge. Moreover, they (n=2, 33%) from (Group A) used low cost no cost teaching aids (such as water bottle, oil bottle, empty bottle, scale) and real objects (such as banana, orange, egg, rice), teacher (n=1, 17%) ) from (Group A) demonstrated to teach the directions (east, west, south, and north). Teachers (n=3, 50%) from (Group B) introduced with the topic, however, they didn't describe key concept and didn't use low cost no cost teaching aids to construct knowledge.

**Skills**, the second level of learning outcomes, teachers (n=3, 50%) from (Group A) used by taking note on the blackboard, experimental method, group discussion and lecture method. For example, teacher (n=1, 17%) carried out an experiment about "weight and volume", and teacher (n=1, 17%)



related the solving of issues with the problems of local (e.g. causes of soil erosion and deforestation at local), and teacher (n=1, 17%) discussed to analyze “nutritious food types”. Although taking note on the blackboard, group discussion and lecture method were used by teachers (n=3, 50%) from (Group B), there were not observed the ability to contribute to the solving of issues, problems, and conflicts at the local.

The highest level of learning outcomes in **Values and Attitudes**, teachers from Group (A) and (B) conducted the ability to reflect upon diverse perspective and to cooperate with people regardless of their gender, religion, ethnic, cognitive and physical precondition. It was not found that ability to show solidarity for others suffering from inequity and to share the responsibility for ecological risks from teachers (n=6, 100%). Moreover, the competencies such as “facing the future” and “reflecting on values” were not found.

### **(iii) Assessing Science Curriculum**

In assessing science curriculum, all teachers from group (A) and (B) used “Item Type” to assess students’ knowledge and “Rubric Type” to assess student’ practices. It was found that group (A) teachers evaluated students’ achievement by using team building, taking turns and sharing fairly more than group (B) teachers. Student portfolios assessment such as “Rubric Type” was observed, however, it is not enough to cover the curricular objectives (e.g. assignment and practical were not observed about sustainable development).

**Table 6 Results from Observation Checklist of Integrating Education for Sustainable Development (ESD) in the Science Curriculum**

No	Group (A)	Group (B)
1	Teachers from group (A) and (B) prepared science lessons according to 5-steps format.	
2	There were describing key concept, content, learning objectives and outcomes.	There were introducing with the topic and describing learning objectives.
3	There were relating with environmental, economic, social and science lessons for sustainable development.	There were not relating with environmental, social, economic and science lessons for sustainable development.
4	Low cost no cost teaching aids were used.	Taking note on the black board was observed.
5	Group discussion, experimental and lecture method were used.	Group discussion and lecture method were used.
6	System thinking was not observed.	
7	There was the ability to relate the solving of issues with the problems of locality.	There was not the ability to contribute to the solving of issues, problems, and conflicts at the local.
8	There were communicating and negotiating effectively in spoken and written languages.	There were not communicating and negotiating effectively in spoken and written languages.
9	The ability to participate in suitable transformation processes and responsibly collaborate with others was not observed.	
10	The ability to cooperate with people regardless of their gender, religion, ethnic, cognitive, physical and social precondition.	
11	The ability to evaluate multiple future cases and to link innovations with sustainable development goals was not observed.	
12	The ability to reflect upon diverse perspective was observed.	
13	Team building, taking turns and sharing fairly, and understand that groups of students were observed.	Taking turns and sharing was not observed.
14	Assessing students' knowledge by Item Type was observed.	
15	Rubric Type was using to measure students' practices but it is not enough to achieve curricular objectives and sustainable development.	

### The Result of Interview

In order to find out the Integrating Education for Sustainable Development (ESD) in the implementation of Grade 3 science curriculum, six teachers from six selected schools were interviewed. Findings from each teacher from six schools were presented.

#### Question (1) How do you integrate ESD in preparing science curriculum?

Researcher investigated about teachers' integrating ESD in preparing grade 3 science curriculum. All teachers (n=6, 100%) said there were no difficulties in lesson planning because lesson plans were presented in Grade 3 teacher's guide. Therefore, they teach according to teacher's guide and they did not need to prepare lesson plans. However, they (n=6, 100%) did not prepare to integrate ESD into science curriculum.

**Question (2) Which ESD concept should be integrated in teaching science lessons?**

Researcher investigated about teachers' integrating ESD in teaching Grade 3 science lessons. In chapter 1, teachers (n=2, 33%) said that nutrition education was needed to integrate ESD in three types of food group. Teachers (n=4, 67%) said that chapter 1 would relate social dimension of ESD and teachers (n=2, 33%) related with environmental education.

In chapter 2, teacher (n=3, 50%) said that deforestation would affect weather and climate change. Teachers (n=6, 100%) said chapter 2 would relate with environmental dimension of ESD. Teacher (n=1, 17%) said this chapter would relate with environmental, social and economic.

In chapter 3, noise pollution was integrated in this chapter by teacher (n=1, 17%), the chapter about "light and shadow" and "formation of sound" was difficult to integrate ESD. Teacher (n=1, 17%) said that children were difficulties to understand that 'sound cannot travel in vacuum'. All teachers said that this chapter would relate with social dimension of ESD.

In chapter 4, teacher (n=5, 83%) said to experiment "three types of soil" was difficult. It was not observed all three types of soil in their environment. Teacher (n=1, 17%) said causes of soil erosion and its affect was conducted in this chapter. Teachers (n=6, 100%) said "types of soil" would relate with environmental dimension of ESD.

In chapter 5, "teaching directions: east, west, south and north" by the sun and compass was not easy to integrate ESD. All teachers (n=6, 100%) confused to integrate ESD. They could not make decision to relate this chapter with environmental, social and economic. Teachers (n=5, 83%) were having difficulties because of teaching aids such as magnet bars and compass.

In chapter 6, all teachers (n=6, 100%) conducted "Properties of Matter: floating and sinking" and "Weight and Volume" by doing experiment. This chapter included many science process skills but less ESD concept. Teachers (n= 4, 67%) said to integrate ESD they would relate this chapter with social and teachers (n=2, 33%) relate with economic dimension.

**Question (3) What types of assessment are used to integrate ESD?**

Researcher investigated about teachers' integrating ESD in assessing Grade 3 science lessons. All teachers (n=6, 100%) used "Item Type" to assess students' knowledge and "Rubric Type" to assess student' practices. However, all teachers' Rubric Type was same with each other. They did not relate students' assignment with local problems such as environmental, social and economic.

**Question (4) Are there any difficulty in implementing new science curriculum?**

Researcher investigated about teachers' difficulties in implementing new science curriculum. Teachers (n=3, 50%) said that the class size is too large to do activities for science lesson. So, they found that in larger classroom, students were less engaged. Teachers (n=2, 33%) their schools do not have sufficient numbers of teachers. Hence, the teacher shortage affects poor-quality teaching. Moreover, the local Parent Teacher Association is weak to promote the welfare of children and school. Teacher (n=1, 17%) said that she less attention in teaching-learning activities because of her young daughter.

**Question (5) What is your opinion about grade 3 science curriculum?**

Researcher investigated about teachers' opinion on Grade 3 science curriculum. All teachers (n=6, 100%) said that the content of Grade 3 new science curriculum is very interesting. However, teachers (n=2, 33%) said that some lessons were not engagement in their locality and it

was difficult to get teaching aids (e.g. types of soil). In Grade 3 science lessons, some contents were difficult to understand by the students (e.g. sound cannot travel in vacuum). Teacher (n=1, 17%) stated that taking shadow pictures was a difficult activity. Moreover, teacher (n=1, 17%) discussed that “3Rs: Reduce, Reuse, and Recycle” should be included in Grade 3 science curriculum. Besides, consumer rights and nutrition education activities were also essential for Grade 3 children and should be integrated in the curriculum, teacher (n=1, 17%).

## **Conclusion**

### **Discussion**

In this study, the level of teachers’ Education for Sustainable Development (ESD) knowledge concerning with Grade 3 children development, the participant teachers had different levels of knowledge. One teacher was above satisfactory level, eighty-six teachers at satisfactory level and twenty-three teachers at below satisfactory level. Among the three dimensions of ESD knowledge, environmental knowledge was the lowest for teachers. They had difficulties in understanding environmental knowledge such as cause and effect of climate changes, sources of water pollution and air pollution. Most teachers had ESD knowledge of Grade 3 children development. Besides, according to qualitative findings, teachers need to study ESD knowledge because of their locality. Thabeikkyin Township is a gold mining region. In this region, there are various impacts of gold mining on environment such as soil pollution, water pollution, air pollution and noise pollution were observed. So, teachers need ESD knowledge to teach their children about their environment, social and economic for sustainability.

In implementing science curriculum, Grade 3 teachers sometimes practiced in planning for integration of Education for Sustainable Development (ESD) in science lessons. They had sometimes practiced in studying science magazine, books, e-books, and watching educational videos for extended knowledge. In the observations, all of teachers (n=6) prepared science lessons according to 5-steps format which was set up from Ministry of Education (MOE), Myanmar. However, teachers needed to prepare and relate the environmental, social and economic with the science lessons for sustainable development.

In teaching science curriculum, Grade 3 teachers sometimes practiced in teaching for integration of Education for Sustainable Development (ESD) in science lessons.

The clusters of teaching competences which include the Knowledge, Skills, and Values that children should acquire in relation to each of the 17 SDGs. Teachers had sometimes practiced to achieve the learning outcomes of knowledge, skills and value level. They seldom practiced in distinguishing between consumer impacts and risks of different choices, teaching with photos and real objects about recyclable and reusable materials, and the ability to read labels and buying recycle materials. Besides, they also seldom practiced in celebrating science fair and experiment for science activities. To be effective teaching-learning situation, there should be celebrating activities and using low cost no cost teaching aids, and student-center teaching methods should be used in the classroom.

In assessing science curriculum, all teachers used “Item Type” to assess students’ knowledge and “Rubric Type” to assess students’ practices. It was found that teachers seldom evaluated students’ achievement by taking turns and sharing fairly, and understanding that groups of students. Student portfolios assessment such as “Rubric Type” was observed, however, it is not enough to cover the curricular objectives and sustainable development.

According to the results based on grouped by class size, the mean values of above sixty were higher than that of class sizes. Results of One-way ANOVA showed that there were

significant differences in Grade 3 science teaching and assessing science lessons. The largest class size was the highest mean value. It was certain that the large class size of teachers' integrating ESD into science curriculum were higher than that of teachers. This might account for why the effects of class size on teaching are not obviously affecting student achievements (Blatchford et al. 2004). Moreover, the previous research (Evertson & Randolph, 1989), teachers do not always adapt their teaching to take advantage of small classes.

The findings showed that Grade 3 science teachers' ESD knowledge level was satisfactory and then teaching practices was also moderate level. It is certain that teachers could integrate ESD concept into science lessons although they had nothing ESD training. San Aye (2018), indicated that teachers could integrate ESD concepts in the science lessons. The result of the research showed that in order to address ESD, the teachers need to be fully prepared. This will be more easily achieved by teachers if, in addition to having positive attitude towards ESD, they fully understand various aspects of ESD concept and possess teaching skills in integrating ESD concept in their teaching subjects. Therefore, people need basic knowledge from the natural sciences, social sciences, and humanities to understand the principles of sustainable development.

### **Recommendations**

- It is essentially important that preparing science lessons to relate with environmental, economic, and social for sustainable development by teachers.
- It is important that teachers should create low cost no cost teaching aids for ESD lesson plan.
- It is necessary to provide workshops or training for teachers to develop ESD concept.
- There is a need to study such as Self-Study of Teacher Education Practices (S-STEP) for ESD.
- It is crucial that teacher competency framework should be implemented in the professional universities.
- ESD is indispensable for integrating into all levels and types of education and across the curriculum by policy makers.
- It is unavoidable important that to review, develop and strengthen the curriculum to ensure ESD feature at all levels of the education system by Ministries of Education and curriculum developers.
- Government is absolutely vital to support non-formal education opportunities provided by communities, civil society and the media to convey information about ESD.

### **Needs for Further Research**

The study contributed to investigate integrating ESD in the implementation of Grade 3 science curriculum in Thabeikkyin Township, Mandalay Region. Therefore, the result cannot be generalized to any wider population. It is necessary to investigate integrating ESD concept into other subjects and another State and Region of Myanmar.

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