Master's Degree Studies in

International and Comparative Education

Transforming Education towards ESD through ICT-supported Collaborative and Project-based Learning

Multiple-case studies from selected Asian countries

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Abstract

We live in a rapidly changing world. The conditions for human existence have been improving immensely in the past decades. Most people today are healthier, live longer, are more educated and have more access to goods and services. There has been progress not only in improving health and education and raising income, but also in expanding people's power to influence public decisions and share knowledge. Despite the remarkable progress, the world is still facing serious challenges such as financial and economic crises, poverty, climate change, environmental degradation and many countries experience growing inequality. These challenges threaten future progress, limit poverty reduction and may lead to social unrests. We are in the need of knowledge on how to sustain our achievements and create better conditions for current and future generations. Education for Sustainable Development (ESD) can provide the necessary competencies and knowledge. ESD involves not only the change of curricula but also a deeper understanding of teaching and learning and implies also the question of "how" people are being educated. In this context, Project-based Learning (PBL), Collaborative Learning (CL) and the use of Information and Communication Technologies (ICT) have been increasingly recognized as effective approaches for transforming education towards ESD.

The aim of the study is to investigate this transformational process. The underlying question is how and to what extent teachers are able to facilitate transformation of teaching and learning towards ESD through innovative practices. The teachers in this in-depth study provide insight in the processes and challenges that exist in the realization of an international ESD project collaboration.

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CL	Collaborative Learning
DESD	Decade of Education for Sustainable Development
EFA	Education for All
ESD	Education for Sustainable Development
GMID	Graz Model of Integrative Development
HDI	Human Development Index
ICT	Information and Communication Technologies
IDI	Information and Communication Technologies Development Index
ITU	International Telecommunication Union
MDG	Millennium Development Goals
PBL	Project Based Learning
UN	United Nations
UNESCO	United Nations Educational Scientific and Cultural Organization

“The future of all nations is dependent upon their respective capabilities to unlock the human potential of their young people”

Sir Charles Masefield, Qatar Foundation

1. Chapter One: Introduction

1.1 Background

Scientists warn that the current course of economic materialism is leading towards environmental and cultural decline. Collaborative effort is required in order to address the issues such as global financial and economic crises, poverty, inequality, climate change, environmental degradation through education. The greatest challenge is perhaps to find alternative ways of living, thinking, valuing and acting. Education and learning for sustainable development is seen as a facilitator of the change and an accelerator of transition towards alternative and sustainable economic systems, mechanisms and principles (Wals, 2009). These changing contexts require transformative education. Thus in 2005, UNESCO has launched the Decade for Education for Sustainable Development (DESD) with the aim to accelerate the implementation of a new vision in education. When Education for Sustainable Development (ESD) emerged as part of the educational agenda it became associated with significant shifts in the education debate about the purpose and nature of education and with the need to respond to crises caused by the modern idea of progress. The Decade has called for a collaborative approach to re-orient educational policies, programs and practices with the aim to build capacities and work towards a sustainable future. In ESD, teachers are considered to play a particularly important role, as they are the forefront implementers at the actual classroom level, and they teach knowledge, values, principles and skills to their students. Thus, teacher educators and teachers serve as key agents of change in transforming education and society towards sustainable development. ESD challenges the concept of the teacher as a disseminator of knowledge and calls for the engagement of students in questioning social assumptions and dominant ways of thinking.

There is however no general consensus on how to get more sustainable and even within the same country, organizations and other stakeholders may have different understandings. Consequently, ESD is interpreted in many different ways around the world, according to the national and local contexts. The amount of space allowed for participation, self-determination and autonomous thinking influences the type of ESD that is emerging. When there is more space for democratic participation, ESD becomes more interactive, student-centered and transformative. These modes of ESD are emphasizing capacity building, empowerment and behavior change, critical thinking and knowledge co-creation (UNESCO, 2012).

The integration of innovative pedagogies such as Project Based Learning (PBL) and the utilization of Information and Communication Technologies (ICT) for collaborative learning (CL) are seen as important new approaches towards transformative teaching-learning practices towards ESD (Paas & Creech, 2008; Du, Su, & Liu, 2013). The diversity of such collaborative networks is generally regarded as an important source of collaborative learning due to the greater capacity for learning and joint action. In the optimal case networks enable a comprehensive and integrated understanding of the issues

at stake and help to create innovative perspectives and solutions. However, diversity can also become a barrier. As stakeholders might hold different values, interests and goals, combined with the complexity of the national and local contexts it is argued whether the characteristics of diverse networks is the state of learning or rather the state of conflict where individual perspectives divide participants, who stop listening to each other (Sol, Beers, & Wals, 2012).

1.2 Aims and Objectives of the Study

The aim of this multiple-case study is to investigate how and to what extent teachers from a diversity of Asian education institutions are able to facilitate transformation of teaching and learning practices towards ESD, through the implementation of ICT supported collaborative learning (CL) and project based learning. The study will investigate the processes and challenges that exist in the realization of the transformation towards ESD in education institutions and gain insight from teachers across Indonesia, Malaysia and the Philippines. More specifically the research questions are:

- How do teachers collaborate from a diversity of Asian education institutions and facilitate transformation towards ESD through ICT supported collaborative learning and project-based learning?
- To what extent are teachers successful in transforming education towards ESD through ICT supported collaborative and project-based learning?
- What challenges do teachers face when introducing and working on ICT supported collaborative projects for ESD? How are the challenges addressed?
- How and what innovative solutions emerge from ICT supported collaborative projects for ESD in this context?

1.3 Scope and Limitations of the Study

The study is not intended for generalization as the teachers selected for this study are neither representative of all teachers of the respective countries nor their institutions. The scope of the study is limited to four education institutions in Malaysia, Indonesia and the Philippines. If given the resources, a wider array of cases could have been tested and contrasted through the applied model. Moreover, the study focuses on the project processes and the involvement of the stakeholders and does not intend to investigate the content of the teaching.

1.4 Significance of the Study

With DESD coming to end, one of the signicances of the study is the urgency of reorieneting education towards ESD in order to enable students to gain capabilities, skills, values and knowledge to achieve a sustainable future. The research outcomes can contribute to a deeper understanding of how innovative teaching and learning approaches might assist the reorientation of teaching and learning towards ESD in a diverse Asian context. Furthermore, the study will apply and test the recent Graz Model of Integrative Development (GMID). The model has been extensively applied to reflect upon complex

ESD activities at the Regional Centers of Expertise (Regional Centers of Expertise, 2014) around the globe. As the GMID is a generally applicable model to ESD, this study is unique in its approach to apply and test the model in an international educational context in Asia. The data collected from the research will be analyzed and contrasted through the GMID and might result in the redefinition or reshaping of the preexisting model. Such a model could be usefully applied as a self-reflection tool of educational transformation towards ESD in future international collaborative ESD cases.

1.5 Structure of the Thesis Work

The thesis work is structured in seven chapters. Chapter One provides an introduction to the thesis research field. It summarizes the background, objectives, significance of the study and as well as the scope and limitations of the study. Chapter Two elaborates the key concepts and theories relevant for the research. Chapter Three introduces the research methodology as well as the applied theoretical model. Chapter Four provides an insight into the socio-economic and educational contexts as well as sustainability challenges of Indonesia, Malaysia and the Philippines. Chapter Five presents a summary of the project activities and outcomes while Chapter Six analyzes and discusses the project based on the theoretical model introduced in Chapter Three. Finally, Chapter Seven elaborates the findings of the study, reflects about the use of the theoretical model and provides a recommendation for future research.

2. Chapter Two: Key Concepts and Theories

> *"Across the globe, people are uniting in a common struggle: to participate freely in the events and processes that shape their lives."*
>
> Mahbub ul Haq, the Founder of the Human Development Report

2.1 Human Development and Capability Approach

The word "development" has various interpretations. While for some it means material wealth, others think of it as a personnel social or spiritual process. It can be understood as freedom from oppression or as a new term for neo-colonialism. In other circumstances it refers to something unfinished such as the development of children or of a new product. Others see development as enabling people to live lives they value. From this perspective, investment, employment and prosperity are means, among others, of giving people such opportunities; however they are not the ultimate goal. Thus, the term development is ambiguous and value laden. Whatever the normative assumptions are about what development means, they will influence the kinds of policies that are made and the reality of people in which they live (Alkire & Deneulin, 2009 a).

This chapter aims to present a people-centered meaning of development. According to this view, a healthy economy is one that enables people to enjoy a long and lengthy life, good education, meaningful job, physical safety, democratic participation and debate. The

purpose of human development is to expand what people are able to do and be which is called as their "real freedom". The Human Development Paradigm draws attention to what makes life worthwhile; namely the people (Alkire & Deneulin, 2009 b).

The chapter introduces firstly the Human Development Paradigm and the associated Capability Approach as well as the Critical Theory. Following this, the concept of Sustainable Development (SD) and ESD will be elaborated together with innovative pedagogies for ESD and the role of ICT in this context.

2.1.1 The Paradigm of Human Development

The Human Development Paradigm represents a fundamental shift from the notion of neoliberalism. They both have the concern for choice and freedom, although their underlying philosophies are quite different (Deneulin, 2009). Neoliberalism argues that economic systems work best when individuals seek their own personnel interests which in return will result in in superior outcomes to those achieved through government planning. The neoliberal government should not try to intervene in the interest of any social group, rich or poor and it should limit its involvement to enforcing that no one violates upon the rights of others (Lauder, Brown , Dillabough, & Halsey, 2006). Markets should be restricted as little as possible. Thus freedom according to neoliberal views means "free from restrictions". For the Human Development approach freedom is to do or be what one values. Freedom that matters is not the freedom from interference from others but the freedom that one has to live a good and worthwhile life. Expanding this freedom should be the primary goals of public policy. Consequently, economic and social policies become intertwined (Deneulin, 2009). Alkire (2005) formulates that the end or objective of development should be the human beings and their flourishing, rather an increase in economic growth. The enhancement of living conditions is essential and such an enhancement is part of the concept development. However, the status of human beings as goal of development must be restated.

Four important guiding principles can be defined, which have been repeatedly used in human development paradigm (Alkire & Deneulin, 2009 b):

Equity: human development is concerned of equity of those who have unequal opportunities due to various disadvantages and may need preferential treatment. For example deprived parts of population may need special measures to enable them to have the same level of capabilities. Hence, it is different from the concept of equality that entails equality of all people in some place.

Efficiency: from a human development perspective, efficiency is the least costly method of reaching goals through the optimal use of human, material, environmental and institutional resources in order to expand the capabilities for individuals and communities. Thus, in this context, it is necessary to demonstrate, how the chosen initiative offers the highest impact in terms of people´s opportunities.

Participation and Empowerment: it is about the freedom of people to make decisions in matters that affect their lives, to hold others accountable for their promises and to have an impact on development in their communities. This principle implies that people need to be involved at every stage, as agents who are able to pursue and achieve goals that they value and have a reason to value. When people and social groups are recognized as agents, they can determine their priorities as well as choose the best ways to achieve them.

Sustainability: it refers to the durability of development so that progress in all areas – social, political, financial, environmental - endures over time. Environmental sustainability means the accomplishment of developmental results without endangering the natural resource base and biodiversity of the region and without affecting the resource base for future generations. Financial sustainability refers to the way development is financed, for example development should not trap countries into debt. Social sustainability refers to the way in which social groups are involved and support development over time. Cultural respect and freedom are also important values that contribute to socially sustainable development.

Sen (2000) emphasizes that human development involves a systematic examination of a wealth of information about how human beings in each society. It brings a pluralist concept of progress, instead of concentrating only on traditional neoliberal measure of economic growth such as the gross national product per head. It is important that people evaluate explicitly and critically what they want and engage in arguing for –or against – any set of proposed weights. What weights may emerge is ultimately a matter of social choice. Central to this is informed public discussion. Supporting the intellectual basis of well-informed public discourse is of vital importance for human development (Sen A. , 2000).

A vehicle of communication regarding the concept of Human Development is the annual Human Development Report produced by the United Nations Development Program. The first report was published in 1990 and defined human development as the process of widening people´s choices and the level of their achieved well-being (United Nations Development Programme, 1990).

2.1.2 The Capability Approach

The Human Development approach has been inspired by Sen´s extensive works in economics, social choice, poverty, and development economics and his Capability Approach has provided a new paradigm in the social sciences (Alkire & Deneulin, 2009 b). Human Development is often combined with the Capability or Capabilities Approach and to some extent are seen by many people as verbal variants (Nussbaum, 2011). Sen had a major intellectual role in framing it in a number of books and journal articles across disciplines (1980; 1982; 1993). His writings have been synthetized by various authors including Alkire (2002) and Robneys (2002). The key idea of the Capability Approach is that social arrangements should aim to expand people´s capabilities – their freedom to

promote or achieve what they value doing and being. An essential measure of development is whether people have greater freedoms today than they did in the past. A test of inequality is whether people´s capability sets are equal or unequal (Sen, 1992). Another prominent author in the field is Nussbaum who applies the term of Capabilities in order to emphasize that the most important elements of quality of life are plural and qualitatively distinct such as health, bodily integrity, education and other aspects cannot be reduced to a single metric.

The approach is also concerned with social injustice and inequality, especially capability failures that are results of discrimination or marginalization. In its view, the urgent tasks of governments are to improve the quality of life for all people, as defined by their capabilities. These are essential elements of the approach, however Nussbaum´s version also employs a specific list of Central Capabilities (Nussbaum, 2011). Sen insists that the list and weighting of valued capabilities should be defined by individuals themselves (Zheng & Stahl, 2011). Thus, his version of the approach does not propose a specific list of capabilities, although it is clear that he thinks that some capabilities such as for example education and health have a centrality.

Functioning, Capabilities and Agency
The major elements of the Capability Approach are functionings, capabilities and agency (Alkire & Deneulin, 2009 b).

Functionings are being or doing activities that people value and have reason to value. For example being nourished, literate and employed. However, functionings are not limited and apply equally to rich and poor countries and people. Functioning relate to many different dimensions of life, including survival health, work, education, relationships, empowerment, self-expression and culture.

Capabilities
When thinking about capabilities, the central questions is : What is the person is able to do and to be?. In other words, they are what Sen calls “substantial freedoms”, a set of opportunities to choose and to act. In Sen´s formulation a person´s capability refers to the alternative combination of functionings that are feasible for her or him to achieve. Thus, capability is a kind of a freedom, the freedom to achieve alternative functioning combinations (Sen, 1992). In other words it is not just abilities of a person but also freedoms or opportunities created by a combination of personnel abilities and the political, social and economic environment. Nussbaum differentiates between internal capabilities and combined capabilities. Internal capabilities are characteristics of a person (personnel traits, intellectual and emotional capacities, bodily health, internalized learning, skills of perception and movement). These are trained or developed traits and abilities in interaction with the social, economic, familial and political environment. One job of a society that aims to promote human capabilities is to support the development of internal capabilities through education. Combined capabilities are the sum of the opportunities a person has for choice and action in her or his specific political, social and

economic situation (Nussbaum, 2011). Thus, the notion of capabilities means the opportunity to select.

Agency

The third core concept of the Capability Approach is agency. It refers to a person´s ability to pursue and realize goals that she values and has reason to value. An agent is someone who acts and brings about change (Sen, 1999). The opposite of a person with agency is someone who is forced, oppressed or passive (Alkire & Deneulin, 2009 b). The agency is an important aspect in assessing what a person can do in line with his or her conception of good (Sen, 1985). It expands beyond a person´s own well-being to include concerns such as solidarity. From this perspective, people can be creative and active with the ability to act on behalf of their aspirations. Agency is related to approaches that stress self-determination, authentic self-direction, autonomy, self-reliance and empowerment. In this view, development processes should foster participation, public debate and democratic practice. Sen is reluctant to theorize how individual agency is restricted and what it means for the operationalizing of the Capability Approach (Zheng & Stahl, 2011). According to Robneys (2006) this seems to be left intentionally incomplete and extended, enriched and applied by scholars from several disciplines.

2.2 Critical Theory and Critical Pedagogy

While the Human Development and Capability Approach has an implicit concern with power relations and unjust societal structures, it does not provide a theory of societal structures and constraints on personnel choices. Robneys (2008) argues that this is one of the areas where the Capability Approach is open and needs to be complemented. Zheng and Stahl (2011) argue that the critical theory complements this weakness of the Capability Approach, as it focuses on the structural conditions of individual agency and provides a collection of theories regarding the constraints of human agency. There are two central concepts in its vocabulary: ideology and hegemony. Ideologies are particular and dominant worldviews that advantage some and disadvantage others and are accepted by a group or society as correct descriptions of reality (Freeden, 2003; Hawkes, 2003; McLellan, 1995). However, from a critical perspective they can be seen as isolating and partial. These can structure the actions of members which in the end can be oppressive. The concept of hegemony is related to the work of Gramsci who questions why people accepted oppression they were subjected to (Kincheloe & McLaren, 2005). Foucault (1977; 1980) argues that inequalities and power relations are often less visible strategies of normalization. Zheng and Stahl (2011) propose the idea of situated agency. According to them individual agency is not only situated in a certain socio-historical setting, but also in an invisible or taken-for-granted network of ideology and participate in the reproduction of these structures and ideologies. These concepts have important implication for development as they make aware of inherent power structures. Reflexivity is also further point of interest of critical approaches (Kvasny, Ricardson, Robinson 2007; Doling, McLeod 2005). By being open to one´s own assumptions, one is able to recognize

where these assumptions have ideological and alienation qualities and alternative views can be developed (Zheng & Stahl, 2011).

Critical Pedagogy

Critical pedagogy involves a critical engagement with knowledge, institutional change a support for the well-being and agency of the students (Walker, 2009). These insights echo a framework of Freire in "Pedagogy of the Opressed" (1970). Critical pedagogy argues that education is a site of symbolic control where learners´ understanding and the formation of their identities are being influenced by the teaching and learning practices. It is centered on critical thinking, which involves being able to interrogate the assumptions about life and power relations that are taken for granted, to exert more conscious control over one´s lives and to raise questions about the moral relevance of one´s actions. By challenging to recognize and critique undemocratic practices and social relations that produce and sustain them, one is in position to bring about transformation. Walker (2009) argues that the Human Development and Capability Approach to pedagogy ought to be a form of critical pedagogy that connects education to the world beyond the classroom. Therefore pedagogy in this context facilitates reflection on freedom and inequality and pay attention to global processes. This also entails a classroom with a high degree of self-regulation by students. Learners should be active participants and co-constructors of knowledge, learning should be meaningful to learners and learning should have a critical focus. This includes connecting experiences to learning, the process of inquiry, critical dialogue and disagreement. In this context teachers enable students to experience democratic, critical ways of thinking and being. This is strongly connected to the pedagogical rights of students where students are recognized as partners in the pedagogic process. This way, students may develop the capabilities to participate equally and effectively in society and to function well in a democracy (Walker 2006).

Seen from the perspective of the Human Development and Capability Approach and its key concepts of agency and capability have introduced new ways of considering the role of education in development. The Millennium Development Goals (MDGs), Education for All (EFA) and the Decade of Education for Sustainable Development (DESD) have been efforts to integrate such broad ideas into policies that governments and communities can advocate for and act upon (Unterhalter, 2009).

2.3 Sustainable Development

Environment and development has been increasingly in the focus of political debates since the Biosphere Conference in 1968 which was the first international event foreshadowing the present notion of sustainable development. It considered the threats to the biosphere that were being progressively perceived by UN Member States. In 1972, the landmark event of the United Nations Conference on Human Environment in Stockholm recognized that the widespread growth of environmental degradation needed international attention and collaboration rather than individual national solutions. While

some attention was given to the social and economic issues related to the environmental issues the focus was still largely on addressing the ecological impact of increasing unrestricted development. However, within 10 years the world was realizing that treating environmental concerns separated from development needs is impossible, especially given the deep poverty of a large segment of humanity. It was necessary to search for a larger strategy that addressed both the needs of society and the environment (Pavlova, 2013). This shift in the international discourse became apparent in the Rio Declaration on Environment and Development in 1992 (United Nations Environment Program, 1992), where the term Sustainable Development first gained widespread attention and which claimed that development and environmental issues are integral elements of sustainable development. Thus, the initially nature-oriented focus shifted towards an overarching interpretation; economic development was defined as a contribution factor for human development and not the end itself. Hence, SD pursued to reconcile economic and social development with environmental protection and the concern for the human condition became the focal point of the global political SD agenda (Pavlova, 2013).

The stronger emphasis on development and the human condition gave way at least two perspectives of SD (Pavlova, 2012). Cartea (2005) argues the first perspective is that economic growth can be maintained within appropriate ecological limits. In this view an increase in production and capital would allow people to have the necessary resources to repair environmental damage as well as prevent it in the future. SD in this context is associated with the market economy and linked to the faith in science and technology. The second perspective according to Cartea is a model to investigate, identify, and promote alternatives to existing environmental and social problems. In this approach SD is associated with equity, emancipation and social change.

The concept of Sustainable Development has been defined in many different ways. The most widely referred one is given in the Brundtland Commission Report "Our Common Future" in 1987:

> *"…sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs"* (United Nations, 1987).

Sen in his work "The Ends and Means of Sustainability" (2013) argues that the Brundtland Report´s understanding of sustainability is still incomplete. He says that human beings should be seen as agents, who can think and act, not just as patients who have needs that require catering and insists that people should be seen in terms of the importance of their freedom to decide what they want (including what needs to fulfill) to

live the way they would like and do what they have reason to want to do. If these identifications and priorities are to be determined by democratic choice, then there has to be a freedom of discussion as well as freedom of political participation to allow the democratic process to work. He argues that values, including consumption behavior, are formed by public discussion and therefore freedom has some claim to priority over the identification of needs and their relative importance. Another problem with the perspective of needs is that the individuals´ conception of needs might adjust downwards as a result of continued deprivation (Sen, 2013).

In other words the process of sustainable development should be understood as the enhancement of human freedom and capability of present people without compromising capabilities of future generations. The overall effect of this idea of sustainability is the integration of sustainability with the perspective of freedom, so that human being are seen not solely as creatures with needs, but primarily as people whose freedom matters (ibid). Anand and Sen (2000) argue that human development brings to sustainable development as the demand for sustainability is a universal character of human development.

2.4 Education for Sustainable Development (ESD)

Education has become recognized as a key tool for sustainable development in the Agenda 21 in Chapter 36, which called on governments, international agencies, businesses and civil society to integrate sustainable development concepts into all education programs. It identifies education as critical for environmental and ethical awareness, values and attitudes and behavior consistent with sustainable development and for effective public participation in decision making (United Nations Environmental Program, 2002).

When ESD became part of the educational agenda it got associated with significant shifts in the education debate about the purpose and nature of education. The DESD has called for a collaborative process to re-orient educational policies, programs and practices in order to build capacities and work towards a sustainable future (UNESCO, 2003). There is however no general consensus on how to get more sustainable and even within the same country, organizations and other stakeholders may have different understandings. Consequently, ESD is interpreted in various ways according to the national and local contexts.

2.5 Transformative Teaching and Learning for ESD

Teachers play an especially important role in ESD, as they are the forefront implementers at the actual classroom level, and they are teaching knowledge, values, principles and skills to their students. Thus, teachers serve as key change agents in transforming education and society towards sustainable development. ESD challenges the concept of the teacher as a disseminator of knowledge and requires the engagement of students in questioning social assumptions and dominant ways of thinking. Consequently, such a view has fundamental implications on how ESD engages with education systems and

practices. Table 1 summarizes some of the educational shifts as proposed by ESD (Tilbury, 2011).

From	To
Passing on knowledge	Understanding and getting to the root of issues
Teaching attitudes and skills	Encouraging values clarification
Seeing people as the problem	Seeing people as facilitators of change
Sending messages	Dialogue, negotiation and action
Behaving as expert, formal and authoritarian	Acting as a partner, informal and egalitarian
Raising awareness	Changing the mental models which influence decisions and actions
Changing behavior	Focus on structural and institutional change

Table 1: Education shifts as proposed by ESD (Tilbury, 2011)

2.5.1 Project-based Learning (PBL)

ESD is most commonly associated with types of learning such as discovery learning, transmissive learning, participatory and collective learning, problem-based learning, disciplinary learning, interdisciplinary learning, multi-stakeholder social learning, critical thinking-based learning, systems thinking-based learning. Some of these are considered conventional such as transmissive learning and some more cutting-edge. According to the global monitoring and evaluation survey (UNESCO, 2012) participatory and collaborative learning and problem-based learning were the most commonly associated learning forms of ESD (UNESCO, 2012). Project-based learning has become increasingly recognized as an effective and efficient approach to educational innovation because it involves not only a change of curricula but also a deeper understanding of teaching and learning (Graff & Kolmos, 2003). Research has also documented that PBL can be an innovative pedagogy for sustainability education (Lehmann, Du, Christensen, & Thrane, 2008) Thus, the relationship between PBL, innovation, collaboration, interdisciplinarity and sustainability is becoming increasingly recognized (Du, Su, & Liu, 2013).

PBL is an individual or group activity resulting in a product, presentation, or performance. It has a time line and milestones, and other aspects of formative evaluation as the project proceeds. Its strategies are intended to engage students in authentic, “real world” tasks to enhance their learning. Students are given open-ended projects or problems with more than one possible approach or answer, intended to simulate professional situations. I t is a student-centered approach with the teacher in the role of facilitator. Students engaged in PBL generally work in groups for a shorter or longer period of time and are encouraged to seek out multiple sources of information. PBL begins with an end-product in mind, the

production of which requires specific content knowledge or skills. It also raises one or more problems which students need to solve together. First, students define the purpose for creating the end product and identify their audience. They research the project topic, design their product and create a project management plan. Students then begin the project, resolve the problems and issues that arise and finish their product. Students may use or present the product and are also given time to reflect and evaluate their work. The process is meant to be authentic, and utilize students´ own ideas and approaches to accomplish the tasks. Though, the end product is the driving force in collaborative PBL, it is the content knowledge and skills acquired that are important. Collaborative PBL has a multidisciplinary approach. It moves away from transmission teaching to a more student-centered teaching and learning environment. Students must accept responsibility for organizing their own learning and the assessment is more complex because the piece of work resulting from their work will be unique. Advantages with the PBL are that it encourages students´ initiative, inventiveness and independence. However, it also demands the ability to organize the work plan and a high level of self-confidence and motivation. For teachers PBL might present a number of challenges, such as time allocation, extra involvement that emerges from extra workload and extra resource that might be allocated as well as a more complex work of PBL assessment (Donnelli & Fitzmauritze, 2014). PBL can also be implemented in an international setting. In this case, students work with peers from other countries on the research, planning, development and presentation of their project work. Using the Internet and Web 2.0 tools provide connectivity for international PBL that increases the multicultural experience and understanding of the students.

2.5.2 Collaborative Learning

The participatory and collaborative learning forms emphasize working together with others in active participation in the learning process, usually with a focus on resolving a joint task (UNESCO, 2012). Collaborative learning (CL) involves groups of learners working together to solve a problem, complete a task or to create a product. In this setting, learners converse with peers, present and defend ideas and exchange beliefs. CL challenges them both socially and emotionally as they listen to perspectives of others, articulate and defend their ideas. They begin to construct their own conceptual frameworks and question the framework of others (Srinivas, 2011). There is evidence that cooperative teams achieve higher levels of thought and retain information longer than those learning individually (Johnson & Johnson, 1986) Samual Totten (1991) argues that as shared learning engages learners in discussions, they become responsible for their own learning and thus develop into critical thinkers. Gokhale (1995) also claims that active exchange of ideas within small groups not only increases the interests of learners but also promote critical thinking. While the diversity of such collaborative networks is generally regarded as an important source of collaborative learning due to the greater capacity for learning and joint action it can also become a barrier. As stakeholders might have different values, interests and goals, combined with the complexity of the national and local

contexts, it is argued whether the characteristics of diverse networks is the state of learning or rather the state of conflict where the different individual perspectives divide participants, and they cease to listen to each other (Sol, Beers, & Wals, 2012).

2.5.3 Information and Communication Technologies (ICT) for ESD

ICTs can be seen as "[…] tools and processes to access, retrieve, store, organize, manipulate, produce, present and exchange information by electronic or other automated means" (UNESCO, 2003, s. 75). Any kind of technology can be understood as a tool or technique to expand human capacity. Research findings support the idea that many changes called for in ESD can be supported through greater integration of ICTs in the learning environment (Paas & Creech, 2008). ICTs play an important role in increasing access to educational materials about sustainability and help promote new ways of interacting in order to facilitate the learning called for in ESD, that emphasize not just knowledge but choices, values and actions. In this context, ICTs extend human capacity to perceive, understand and communicate. In order to make use of technologies in education, new pedagogies are required. Simply applying ICTs to traditional teaching and learning practices will not work to achieve sustainability (ibid). Any learning situation which aims to enable people to deal effectively with the real world issues, should be problem-based and task-oriented and they should also provide opportunities for interaction, collaboration and connectivity (Visser, 1997). As Freire formulated; a person can only participate actively in society and in the transformation of his reality, if she or he is helped to become aware of reality and his or her own capacity to transform it (Paas & Creech, 2008).

3. Chapter Three: Research Methodology

3.1 Research Design

The researcher takes an interpretivist epistemological and a dialectical constructivist ontological position in this study. This implies that in developing knowledge and thought, social interactions play a critical role. Dialectical constructionism acknowledges the possibility that one must consider multiple meanings when assessing a singular event (Carrie, Boden McGill, Boden, & Sola M., 2012). It implies that social phenomena and categories are not only produced through social interaction, but they are in the state of constant revision. The social world and its categories are not external to us but are built up and constituted in and through interaction (Bryman, 2012).

The researcher has chosen to undertake a multiple-case study design to investigate a ICT-supported collaborative ESD project implemented across four secondary level education institutions in Indonesia, Malaysia and the Philippines. The multiple-case study design entails that by comparing the four cases the researcher is in a better position to test the theoretical model and identify circumstances in which the theoretical model will or will not hold (Bryman, 2012). The data collected from the four cases will be analyzed and

contrasted through the GMID in order to redefine or reshape the preexisting model. The study will utilize a qualitative research approach.

3.2 Sampling Strategy

Selection of the Geographical Region and the Countries

Indonesia, Malaysia and the Philippines have been selected due to their rapid economic growth and the complexity of sustainable development challenges they are facing. The three countries belong to the so called "Tiger Cub" economies due to their significant economic growth in the past decades and future development potentials. In fact, all the three countries are included in HSBC's list of top 50 economies in 2050, while Indonesia and the Philippines are included in Goldman Sachs's Next Eleven list of economies based of their rapid growth (HSBC Global Research, 2012). Despite their fast progress, all the three countries face significant environmental and societal challenges, as further detailed in Chapter Four. Thus, all the three countries have a substantial political focus on sustainable development that makes these countries highly relevant for the researcher´s interest.

Selection of the Project

The selection of the project is based on purposive sampling from ICT-supported collaborative ESD projects implemented in education institutions in Asia in the frame of the "Re-orienting Teacher Education towards ESD" program. More specifically, the researcher has selected a project where education stakeholders from four education institutions across Indonesia, Malaysia and the Philippines have initiated and maintained a collaborative PBL project across borders with aim to reorient education towards ESD.

Selection of the Interviewees

Interviewees were selected from four educational institutions with project leadership roles. These include stakeholders with responsibilities for the project implementation and coordination in their respective institutions as well as in the international collaboration.

3.3 Data Collection Methods

Document analysis

Document analysis was conducted by the researcher with the focus on national documents on ESD, as well as project documents and reports. The researcher has also collected information during self-evaluation and planning activities of the international project team during a project meeting in October 2013. This occured prior to the semi-structured interviews and facilitated the understanding of the specific project contexts.

Semi-structured interviews

In total four project leading teachers were interviewed in semi-structured interviews. The researcher used an interview guide with open ended questions and the interview process had a flexible structure. This means that the researcher used a script to certain extent but questions might follow in different order than indicated in the interview guide. Even questions that are not included in the guide were be asked by the interviewer as she picked

up on information as they came from the interviewee. Nevertheless, the wording used was similar in each case. The interview sessions were no longer than one hour and they were recorded and transcribed. The interviews were conducted in English.

The aim of the researcher in the semi-structured interview was to gain an understanding of the project in each of the participating institutions from individual perspectives of the project leading teachers. Through individual interviews the researcher aimed at gaining information about the involvement and integration of stakeholders in the project network, uncover common and/or unique challenges that hinder transformational development and identify good practices from the perspectives of the interviewees.

After the data collection, the data was analyzed and connections between the data and the theoretical model assessed. The information collected from the research will be applied to test the theoretical model.

3.4 Analytical Framework

As the analytical framework, the researcher applied the Graz Model of Integrative Development (GMID) in her research with the aim to test the model. The model focuses on the transformative stakeholder involvement practices in sustainability processes. GMID is based on five principles that can be recognized in development processes. These include: (1) Leadership and Vision, (2) Social network, (3) Participation, (4) Education and Learning and (5) Research Integration. Each of the five principles has three levels defining how they are reflected in the process of the project. The levels of integration grow more interrelated with each other towards the center of the circle, Figure 1. This interrelation of principles is called integrative development. Consequently, the closer to the center, the more transformative the practices are. The center of the circle therefore represents the most transformative approach regarding actors involved and affected. Principles at this point become more and more intertwined and in the middle it is impossible to describe them singularly.

It is important feature of the GMID that it does not provide a set of ready indicators but assesses the processes of stakeholder involvement from vision to implementation (Mader C. , 2012).

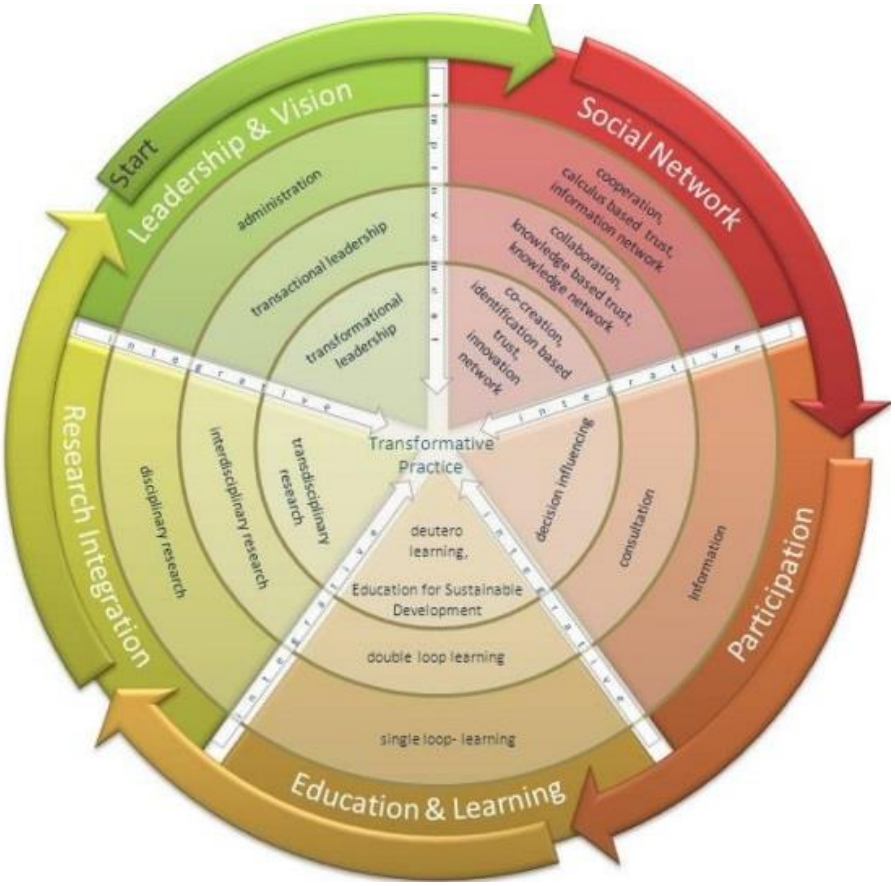

Figure 1 Graz Model of Integrative Development (Mader C. , 2009)

3.4.1 Leadership and Vision

As the first step, GMID analyses the forms of leadership and ways of communicating and sharing the vision. First, it is essential to clarify the vision of the project. According to Ackoff (1998), a vision is a description of a state that is considered to be significantly more desirable than the current stage. It is a state that cannot be reached without an ultimate change of direction and there is always a mobilizing idea is to its core. Then it can be analyzed how this vision is being communicated and/or shared by affected and involved people. A good and well communicated vision is foundational and therefore the basis for successful collaboration in ESD.

The levels of leadership include (1) Administration, (2) Transactional Leadership and (3) Transformational Leadership. The first level is administration-oriented and non-proactive (Ackoff, 1998). In the second level, the vision is being communicated to followers and has a top-down approach where actions are being delegated (Sosik & Dionne, 1997) The motivation of followers to take part in the process may not necessarily be based on a shared vision but rather on personnel motivation; i.e. benefiting from the process (Bass & Avolio, 1994; Burns, 1978). Nonetheless, a win-win situation must be ensured for all both sides so the transactional leader gets support from the stakeholders. In the third level, the transformational leadership, there is a shared vision and leadership. Responsibilities

are being shared among affected and involved stakeholders (Mader C. , 2012), who may take a lead for their own actions according to the shared vision. This leadership form implies individualized and trustful relationships, inspirational motivation through working together on a shared vision as well as a role model behavior of the leader (Ackoff, 1988; Baas, 1997; Burns, 1978; Maak, 2007).

3.4.2 Social Network

For transformative processes it is relevant to consider all kinds of stakeholders, who are or may be involved in the development process, as part of the social network. In innovation networks synergies are being used, innovations and new developments are created and the exchange of knowledge, experiences and support are provided (Mader C. , 2012). According to the relevance and interest of the stakeholders they can become part of (1) Information, (2) Knowledge or (3) Innovation networks. Information networks are the simplest form where there is a one-way information sharing, but there is a lack of interaction. The cooperation between the project stakeholders is based on a win-win situation which is also only the lowest level of trust.

Knowledge networks exchange information and aim at creating knowledge by collaboration (Kogut, Shan, & Walker, 1993; Mader C. , 2012). Collaboration implies consultative participation of the stakeholders in the project´s processes and the development of common ideas. Consultation means that the opinion of stakeholders is gathered in some ways such as during discussions, meetings, surveys, and comments. Stakeholders have some sort of influence as this form of network includes consideration of their feedback and provides the chance to react before taking decisions.

In innovation networks stakeholders exchange information and knowledge with different backgrounds, cultures and from different disciplines. By building teams, following a shared vision, learning and exchanging knowledge together, a co-creative process can be established. At this level a shared vision, and shared leadership with strong trust to each other emerges (Prahalad & Ramaswamy, 2004). Co-creation means the active involvement and participation of stakeholders during all of the project processes. Stakeholders learn from each other and build learning organizations, are collective and problem solving. Identification based trust develops if one identifies with the other's vision and intentions (Lewicki and Bucker, 1996). Transformational processes involve stakeholders actively in the development processes; therefore innovation networks contribute to transformative practices (Mader C. , 2012).

3.4.3 Participation

A core insight of GMID is that transformative processes require the integration of stakeholders, their knowledge and participation in the decision making. In process development it needs to be analyzed how various stakeholders with different interests and backgrounds are involved in decision-making. Three levels of participation (Arbter, Handler, Purker, Tappeiner, & Trattnigg, 2007; Arnstein, 1969) demonstrate the types of

involvement: (1) information-participation (nonparticipation), (2) consultation and (3) decision-influencing. At the information-participation level stakeholders do not get the opportunity to provide feedback. The second level stakeholders are informed and their feedbacks and opinions are considered. Through consultation stakeholders can develop a shared vision while the leaders can adopt their vision according to the feedbacks. Consultation involves the opinion of stakeholders gathered during meetings, discussions, surveys, comments, etc. This stage provides the chance to react before taking further decisions.

The third level is decision-influencing where stakeholders are empowered to influence the processes with their opinions. This level of participation aims at developing innovation networks through co-creation (Mader C. , 2012).

3.4.4 Education and Learning

Education and learning are considered together in this GMID dimension as one principle, since the effect of both is to develop competences and capacities. Learning can be understood as the reflective part of education that incorporates aims, actions and results (Barth & Michelsen, 2012). In this context, three steps of learning can be analyzed; (1) single loop, (2) double loop and (3) generative or deuteron learning. Education can be present at all the three levels. Education and Learning are again strongly integrative with the other principles and they are important to building capacity, knowledge and innovation for the process.

These three steps of learning have been analyzed by Argyris and Schön (1978). In single-loop learning (Figure 2) people rethink their actions, which have results on the actions but not on the initial aims.

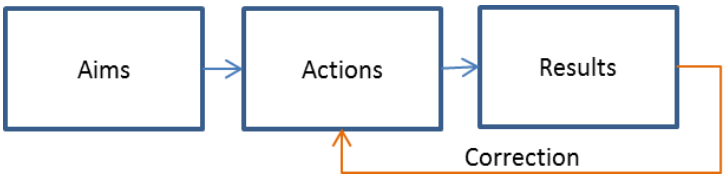

Figure 2: Single-loop Learning (Argyris & Schön, 1978)

Double-loop learning (Figure 3) learners rethink their actions and their aims. Thus, double loop learning contributes to sustainability processes as the project stakeholders are able to react to new circumstances and might change their aims and vision. Routines are being reviewed and new ways to achieve the aims are taken into consideration. This learning level is necessary for transactional leadership and knowledge networks, contributes to consultative participation and supports interdisciplinary research.

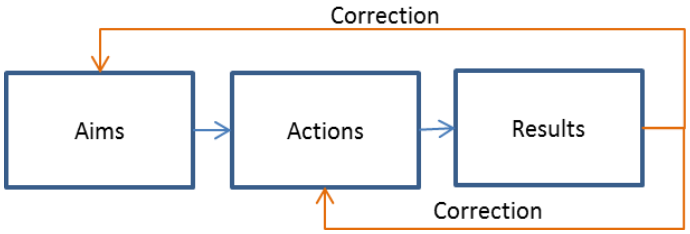

Figure 3: Double-loop Learning (Argyris & Schön, 1978)

Generative or deuteron learning (Figure 4) means learning at the deepest level and describes processes in which people learn how to learn. Learners in such processes not only rethink their actions and aims but also rethink and improve the process itself.

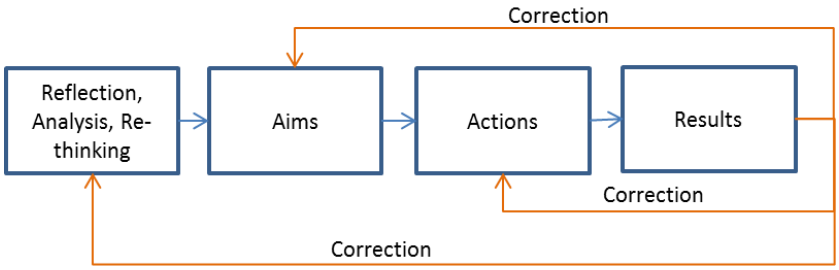

Figure 4: Deuteron Learning (Argyris & Schön, 1978)

3.4.5 Research Integration

Research is the principal that leads towards innovation necessary for sustainable development. In transformative development research is in line with strong participation and knowledge exchange between stakeholders. The research itself can be carried out in (1) disciplinary, (2) interdisciplinary and (3) trans-disciplinary manner. Disciplinary research focuses on a disciplinary aspect and leaves out interrelations with other disciplines. Interdisciplinary research investigates relations between disciplines and leads to a holistic and system understanding. Sustainable development is dependent on the understanding of interrelated causes. Transdisciplinary research can be seen as the most integrative level. It is interdisciplinary and involves people in the research process in order to generate a mutual learning process and to take up socially relevant challenges for the research work. Actors participate in the research process by influencing decisions as the research is driven by societal problems (Mader C. , 2012).

Research can initiate new visions and reveal challenges to building new visions. Therefore, the GMID can be seen as a dynamic circle that is always in fluctuation as all the principles influence each other.

3.5 Ethical Considerations

The research subjects were informed fully about the purpose, methods and intended possible uses of the research results. The confidentiality of information and anonymity of the participants was respected and maintained. This was ensured through informed consent forms that gave the participant the opportunity to be fully informed about the

nature of the research and the implications of their participations. The names of participants are not included on the transcripts and transcripts and copies are kept at a secure place. Data files use identifier codes and the list of participants are kept separately. Research participants were involved in the study entirely voluntary and harm to the participants must be avoided. The researcher was also aware of the differences between the geographical locations and different cultural backgrounds and demonstrated sensitivity within all interactions.

4. Chapter Four: Setting and Context of the Study

4.1 Indonesia

The following chapter introduces the national contexts of the countries where the researched project is situated. It investigates the socio-economic situations, challenges of sustainable development and looks into relevant areas such as Education, ESD and ICT related contexts in the countries.

4.1.1 Socio-Economic and Environmental Context

In Indonesia, sustainable development issues need to be addressed by taking into account the extraordinary socio-cultural and biological diversity, as well as the history of the socio-political system, the geographical location and the size of the country. It is the fourth most populated country in the world with a population of 250 million of which approximately 115 million live on less than $2 a day. It is also the largest archipelago state with over 13,000 islands spreading out over 5000 km from east to west. Its spectacular biological diversity is the second highest in the world after Brazil. The country also represents a large ethnic and social diversity, with over 300 distinctive ethnic groups and 742 languages and dialects. Although it is not an Islamic state, it has the largest Muslim population co-existing with many other religious groups. Indonesia went through a difficult and complex socio-political development, including a colonial past under Dutch administration and dictatorship. In recent years, major natural disasters, such as tsunami and earthquakes have caused enormous problems and damage. Economically, the country has begun to emerge into middle-income status, yet persistent poverty and inequalities affect national development (UNESCO, 2011 d). All these developments bring even greater significance and relevance to ESD integration.

Table 2. reviews Indonesia´s progress in each of the Human Development Index (HDI) indicators. Between 1980 and 2012 the life expectancy at birth has increased 12.2 years. The mean years of schooling increased by 2.7 years and expected years of schooling increased by 4.6 years. The GNI per capita increased about 225 per cent between 1980 and 2012. Currently, the country is in the medium human development category, in the position of 121 out of 187 countries. Between 1980 and 2012 Indonesia´s HDI value increased from 0.422 to 0.629, an increase of 49 percent or an average increase of about 1.3 percent annually (United Nations Development Programme, 2013).

	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP$)	HDI value
1980	57.6	8.3	3.1	1,278	0.422
1985	60	9.3	3.5	1,478	0.456
1990	62.1	9.9	3.3	1,911	0.479
1995	64	9.9	4.2	2,630	0.525
2000	65.7	10.3	4.8	2,390	0.540
2005	67.1	11.2	5.3	2,950	0.575
2010	68.9	12.9	5.8	3,775	0.620
2011	69.4	12.9	5.8	3,973	0.624
2012	69.8	12.9	5.8	4,154	0.629

Table 2: Indonesia HDI Trends 1980-2012 (United Nations Development Programme, 2013)

According to the ICT Development Index of the International Telecommunication Union (ITU), Indonesia is ranked 97. on the global scale and 17. in the Asia-Pacific region in terms of its level of ICT development. The index measures a variety of information such as (1) ICT infrastructure and access including fixed and mobile phone subscriptions, internet bandwidth, (2) ICT usage indicators such as percentage of internet users, fixed and mobile broadband subscriptions, as well as (3) ICT capability and skills indicators such as adult literacy, gross secondary enrolment and gross tertiary enrolment (International Telecommunication Union, 2013).

4.1.2 Education in Indonesia

For decades, the Indonesian education system was firmly centralized. This came to an end when the country was severely hit by the Asian crises at the end of the 1990s, which forced the government to initiate large-scale education reforms. In 1999, two decentralization laws had large impact on education. These made possible that the central government reduced its expenditure and gave more responsibility to local governments and households. The country was also subject of policy prescriptions of the Washington Consensus. The World Bank and the International Monetary Fund tied a “post-crisis rescue package” to the implementation of market deregulation and privatization. As a result, a new vision of education is being promoted in Indonesia that emphasizes democracy, autonomy, decentralization and public accountability (Broekman, 2013).

4.1.3 Education for Sustainable Development

The launch of DESD took place in 2005 in Indonesia when the Ministry of Education and the Ministry of Environment jointly signed an agreement to work together and promote ESD. The national implementation strategy has been focusing on increased access to quality basic education especially in poor and disadvantaged areas, the quality improvement of basic education, improved capacity building at local and community levels and the improvement of the professionalism and accountability of educational institutions. The National Curriculum Institution has been working on integrating ESD in formal, non-formal and informal education. The national curriculum has been reviewed and several improvements were proposed for the integration of ESD topics. However, the lack of qualified education personnel, teacher trainers, in-service teachers made the implementation process difficult. In order to address the challenges, curriculum teams were set up, consisting of teachers, headmasters, disctrict heads of education and quality

assurance representatives. These groups have been trained to embed ESD in teaching and curriculum. The ESD integration in the country has been focusing on justice, democratization, gender and disaster mitigation as well as teacher quality, school building and community participation. There are several programs for primary and secondary education that promote the integration of ESD. One of these is the Adiwiyata green schools that encourage responsibility for the protection of the natural environment through participatory approaches and community involvement. Another program that promotes ESD is the network of the ASPnet schools (UNESCO Associated Schools). This network comprises of 200 schools and involves teachers and students in ESD (UNESCO, 2011 d).

The so called "adjectival education" about peace, values or international understanding is still practiced by Indonesian governmental and non-governmental organizations. While these types of education are certainly needed, they are also responsible of compartmentalizing education initiatives and represent an obstacle to more interlinked and coherent education system under the umbrella term of ESD. Indonesia made a clear commitment towards ESD and tries to connect the different initiatives and activities under ESD. Challenges however are still numerous. ESD is still perceived as a low priority issue, especially for schools in remote areas, where they have local challenges such as poverty, health and nutrition issues. There is also a lack of time in schools to cover basic educational obligations, thus it is important that ESD is integrated in the curricula and does not stand as an extra-curricular activity. It is also reported that the different competing educational projects and programs hinder the implementation of ESD. There is a need to create coherence and synergies among these programs. Therefore it is necessary that ESD is viewed as an umbrella theme that enables these connections. The lack of capacity building for teacher trainers, teachers and curriculum developers continues to be a major challenge to overcome (UNESCO, 2011 d).

4.1.4 ICT in Education

Students in Indonesian schools are introduced to ICT in the primary stage of their education but access varies and is decided by individual schools. The primary focus relating to the Internet in Indonesian schools is that of connecting them in the first place, followed by the training of teachers to use ICT in general (Family Online Safety Institute, 2014).

4.2 Malaysia

4.2.1 Socio-Economic and Environmental Context

The country stretches over two regions in South-East Asia, the southern part of the Malay Peninsula and the island of Borneo. Malaysia has a population of over 27 million that consist of many different ethnic groups, such as Malay, Chinese, indigenous, Indian and others. The country has experienced phenomenal economic development based on the export of natural resources and has undergone a major structural transformation, moving

from an agricultural to a manufacturing-based economy, with significant social changes. This has helped the country to reach a high human development level and a low poverty rate, with around 2% of the population below the poverty line. However, the rapid development has also brought great impacts to the natural environment. Recent studies show an increasing average temperature and rising sea levels at the southern coastal areas, which might indicate growing environmental challenges in the near future. Sustainable development is critical in South-East Asia as the region has been identified as highly vulnerable to climate change. Malaysia is particularly vulnerable as the majority of its population and economic activities are located within 100 km of the coast, thus exposed to extreme weather events and sea- level rise. Natural resources such as water, food crops, forestry and fisheries are at risk from warming, changes in precipitation patterns, flooding and ocean acidification. Extreme temperatures could also have serious health impacts on urban populations (Government of United Kingdom, 2014). Thus, when talking about development in Malaysia, environmental considerations and the protection of ecosystems as an integral part of development must be taken into account. Malaysia is most of all committed to address global environmental issues related to the atmosphere, wetlands, surrounding oceans and seas, climate, human health, the health of flora and fauna, and the protection of the bio-diversity. The Malaysian policy framework recognizes that education development plays and ever increasing role in building a sustainable, resilient and competitive society (UNESCO, 2011 b). Malaysia is a rapidly developing middle-income country with ambitions to become a high-income nation by 2020. Such rapid development plans pose a challenge to Malaysia's long-term sustainable development goals. Table 3. reviews Malaysia´s progress in each of the HDI indicators. Between 1980 and 2012 the life expectancy at birth increased by 7.1 years, mean years of schooling increased by 5.1 years and expected years of schooling increased by 3.6 years. The GNI per capita increased by about 191 percent between 1980 and 2012 (United Nations Development Programme, 2013).

	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP$)	HDI value
1980	67.4	9	4.4	4,692	0.563
1985	68.8	9.8	5.6	5,099	0.603
1990	70.1	9.7	6.5	6,328	0.635
1995	71.1	10.2	7.6	8,702	0.678
2000	72.1	11.9	8.2	9,378	0.712
2005	72.9	12.6	8.9	11,020	0.742
2010	74	12.6	9.5	12,758	0.763
2011	74.2	12.6	9.5	13,322	0.766
2012	74.5	12.6	9.5	13,676	0.769

Table 3: Malaysia HDI Trends 1980-2012 (United Nations Development Programme, 2013)

In terms of the country´s ICT development, the IDI ranks Malaysia 59. on the global scale and 9. in the Asia-Pacific region in 2012. With this result the country is well ahead of Indonesia and the Philippines and above the average level if ICT development in the region (International Telecommunication Union, 2013).

4.2.2 Education in Malaysia

The government spends approximately 25 % of its public expenditure on education, which is one of the highest in South-East Asia. The country has nearly full enrolment in primary education, around 70% in secondary education and 30% in tertiary education. In general, education is seen as a motor of change in relation to creating awareness on sustainable development issues. In this context, TEIs play an important role as they can bring change to the education system that will shape the knowledge and skills of the next generations. The Ministry of Education in Malaysia and TEIs in Malaysia are aware of the role of teachers in promoting awareness on climate change issues, natural disasters and means to reduce destructions by natural disasters and a roadmap has been designed by the MOE with the required actions to radically transform teacher education. The reform will take place over 13 years, from 2013 to 2025 during three implementation phases (Ministry of Education, 2012).

4.2.3 Education for Sustainable Development

ESD in Malaysia is perceived as the vehicle to achieve the Millennium Development Goals, the EFA goals, adress key issues, such as poverty reduction, climate change, gender equality, corporate social responsibility and protection of indigenous cultures.

The National Policy on the Environment by the Ministry of Science, Technology and Innovation is one of the plans addressing sustainable development in Malaysia and calls for its promotion through education. In 2001, the MOE launched the Education Development Plan (2001-2010) that provided a substantial call for ESD implementation based on four thrusts: 1) increase access to education, 2) increase equity in education, 3) improve the quality of education and 4) improve efficiency and effectiveness of educational management. ESD implementation in Malaysia is jointly managed by the Curriculum Development Division of the MOE and the Department of Environment of the Ministry of Natural Resources and Environment. However, there is no specific budget allocated to ESD implementation. The strongest policy mandate for ESD is closely linked to environmental education and the National Policy on the Environment. The Green Strategy in the aforementioned National Policy seek to integrate environmental considerations in five key areas. One of the key areas is Education and Awareness for a better and deeper understanding of the concepts of sustainable development and a caring attitude towards nature (UNESCO, 2011 c).

4.2.4 ICT in Education

Malaysia was among the first few countries in the world to have introduced a strategic ICT plan for its education system. Policies and plans were developed since 1990, including the Smart School Roadmap and the Policy on ICT in Education 2010. The Ministry of Education also seeks to leverage ICT to improve the efficient delivery of quality education to under-served groups such as rural and under-enrolled schools. Accordingly, one of the most capital-intensive investments the Ministry has made in the past two decades has been in the ICT infrastructure for schools. From 1999 to 2010, the

Ministry has invested approximately RM 6 billion on ICT in education initiatives. A study conducted by the Ministry in 2010 found, however, that ICT usage was relatively limited. Approximately 80% of teachers spend less than one hour a week using ICT. Only a third of students perceive their teachers to be using ICT regularly. Even when ICT is used in teaching, in most cases it has not gone much beyond the use of PowerPoint as an instructional tool. There was no evidence that ICT is being used to foster students' creativity, problem solving, and critical thinking and communication skills. One reason usage still appears to be limited is that hardware was rolled out without sufficient training and support services to schools, such as technicians to maintain the equipment. Even in cases where training and support were provided, it was often not sustainable. Teachers were ill-prepared in terms of how to actually use the computers in their work. Another issue is the lack of a long-term strategy for sustaining and scaling up key policy implementation elements, such as ICT infrastructure and teacher competencies. There is no explicit guaranteed period of computer renewal, and schools that received equipment in the early 2000s are now in need of renewal (Ministry of Education, 2012).

4.3 Philippines

4.3.1 Socio-economic and Environmental Context

The Republic of the Philippines is the world's 13th most populous country and consists of 7000 islands. The Philippine islands became a Spanish colony during the 16th century; they were ceded to the US in 1898 following the Spanish-American War. In 1935 the Philippines became a self-governing commonwealth. In 1942, during the World War II, the islands fell under Japanese occupation and US forces and Filipinos fought together during 1944-45 to regain control. On 4 July 1946 the Republic of the Philippines attained its independence. The country has estimated 100 million people, whereof 34% are children (UNESCO, 2011 b), and more than 10 million living abroad. Of the population, 22% are living below the poverty line.

The country´s HDI value for 2012 is 0.65 and the country has reached a medium human development ranking positioning and ranks the country at 114 out of 187 countries. The table reviews Philippines´ progress in each of the HDI indicators. Between 1980 and 2012 the life expectancy at birth increased by 5.8 years, mean years of schooling by 2.8 years and expected schooling increased by 1.3 years. The GNI per capita increased by about 35 percent between 1980 and 2012 (United Nations Development Programme, 2013).

	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP$)	HDI value
1980	63.2	10.4	6.1	2,786	0.561
1985	64.2	10.5	6.7	2,208	0.563
1990	65.2	10.7	7.1	2,506	0.581
1995	66	10.8	7.5	2,606	0.594
2000	66.8	11.4	8	2,694	0.610
2005	67.4	11.6	8.6	3,040	0.630
2010	68.5	11.7	8.9	3,568	0.649
2011	68.7	11.7	8.9	3,649	0.651
2012	69.0	11.7	8.9	3,752	0.654

Table 4: Philippines HDI Trends 1980-2012 (United Nations Development Programme, 2013)

The two official languages of the country are Filipino and English. There are eight major dialects - Tagalog, Cebuano, Ilocano, Hiligaynon or Ilonggo, Bicol, Waray, Pampango, and Pangasinan.

The Philippines covers a restless part of the world. Most of the mountainous islands are volcanic, and the country also lies within the typhoon belt of the Western Pacific. It also experiences frequent seismic and volcanic activities. Major environmental challenges are uncontrolled deforestation especially in watershed areas; soil erosion; air and water pollution in major urban centers; coral reef degradation; increasing pollution of coastal mangrove swamps that are important fish breeding grounds. The national priorities of sustainable development are enshrined in the Philippine Agenda 21.

IDI ranks the ICT development in the country 98 in the global rank and 18 in the regional rank which places the country last, when compared to Malaysia and Indonesia (International Telecommunication Union, 2013).

4.3.2 Education in the Philippines

The government expenditure on education is 16% of their total expenditure. The enrolment ratio in primary education is 92% while enrolment in secondary education is 61%, and in higher education is 28.5%. The student to teacher ratio at both primary and secondary level shows a declining tendency, but it is still high with 33.7% in primary and 35,1% in secondary education (UNESCO, 2011 b). The Philippine education system has been heavily influenced by its colonial history, which has included periods of Spanish, American and Japanese rule and occupation. During the period of American colonization, beginning in 1898, English was instituted as the language of instruction and a public school system was established, administered by the Department of Instruction, and modeled on the US system. Philippine state is meant to prioritize education. Taking into account the high ethnical diversity and the very young age of the population, education is considered as an important part of the Philippine nation building. Therefore, a reform of the educational system is one of the major political topics discussed in public: As most public schools are suffering low paid educational personnel and a lack of necessary books and facilities, the improvement of the school situation and manpower development is high on the agenda.

4.3.3 Education for Sustainable Development

The Philippine government has adopted the National Environmental Awareness and Education Act (NEEA) in 2008 that integrates environmental education in school curricula at all levels. NEEA envisions an environmentally literate and proactive citizenship with a responsibility to care, protect and enhance environmental quality that promotes the well-being, supports the economic development of the nation and pursues peace, social justice ad equity in the use of natural resources. There have been several actions to support the reorientation of the curriculum and the integration of ESD, but the

lack of funds for printing modules, lesson samples, materials, teacher training and monitoring hurdled the process. The priority focus of ESD in the country is climate change and disaster risk reduction (UNESCO, 2011 b).

4.3.4. ICT in Education

ICT is introduced at the elementary level as a subject called Home Economics and Livelihood Education and in the secondary level as Technology and Home Economics. In the majority of cases, ICT materials such as software and multimedia, are used to supplement instruction. The Philippine Ministry of Education has policies on the use of ICT. These are: (1) technology must be studied first as a separate subject, then applied in other learning areas as a tool for learning how to learn; (2) the application of computer skills to the other learning areas is a curriculum policy that comes from the principle that teaching-learning must not be textbook-driven, and educational processes should take advantage of technological developments, including the application of ICTs; (3) an education modernization program will equip schools with facilities, equipment, materials and skills and introduce new learning and delivery systems necessary to capitalize on recent technological developments. More than 70% of schools have no access to the Internet, particularly the public schools. The schools in Manila, have the greatest access to the Internet, but the connectivity decreases as one goes northwards and southwards throughout the archipelago (Bonifacio, 2013).

It is under these national circumstances that the ICT-supported collaborative PBL project with the title "Plastic Usage Reduction: a School Campaign" was implemented with the participation of four secondary schools in the three countries. The following chapter will introduce the project more in detail.

5. Chapter Five: Introduction of the Case Studies

The study explores the project "Plastic Usage Reduction: a School Campaign", which has been implemented in four secondary schools across three Asian countries: Indonesia, Malaysia and the Philippines. The following section reviews the project context, aims and objectives as well as further important details.

5.1 The Project Context

The "Plastic Usage Reduction: a School Campaign" project has been carried out in the framework of the UNESCO initiated program on "Re-orienting Teacher Education towards ESD". The objective of this Asia-wide program has been to assist teacher educators and teachers to integrate ESD concepts and contents into their curriculum and teaching materials and to recognize the potential of ICT in enhancing the quality and reach of education. Within the framework of the program two training workshops were organized in November 2012 and October 2013. Encouraged to incorporate technology-enhanced pedagogies into their teaching practices, teachers designed, developed and implemented group projects. Trained teachers further trained peer-teachers in their

schools, thus served as "multiplicators" in their respective schools. After receiving the first training, the teachers were asked to form project groups and implement a project to utilize the gained skills and knowledge. They became project leaders with the role to implement and coordinate the project in their schools and among their international group members. While a number of pilot projects emerged from this the initiative, it was the "Plastic Usage Reduction: a School Campaign" project that managed to implement collaborative PBL with the largest sustained international collaboration network across three Asian countries. The first phase of project started in November 2012 and ended in second half of 2013. The second phase is currently under implantation and will finish by mid-2014. This study aims at investigating and analyzing the first Phase of the project.

5.2 Aims and Objectives of the Project

The objectives of the project has been the implementation of PBL and ICT-supported collaboration among the four schools, to create an online campaign that promotes the reduction of plastic usage, foster awareness among students on the dangerous effects of plastics and inspire them to reduce the use of plastics. The implementation was driven by four project leaders in the participating schools.

5.2.1 Implementation of Project Based Learning (PBL)

The project aimed at integrating the concepts of environmental protection in multiple subject areas such as English Language, Arts, Science and Social studies through applying PBL. The interdisciplinary learning objectives and the subject-specific learning objectives have been formulated as follows:

Interdisciplinary Learning Objectives

- Creating an online campaign on plastic usage reduction,
- Creating a video presentation on the reduction of plastic usage based on the data gathered from the participating countries

Subject-specific Learning Objectives

- Social Studies: students should understand the effects of plastics in the society, create brochures and other printed information for dissemination of the information and conduct exhibitions to showcase the detrimental effects of plastic.
- Science: Students should understand the implications of using plastic and its effect on the environment, determine how plastic usage can be reduced and what are the possible alternatives as well as investigate the status of usage and awareness of school regarding harmful effects of plastic and create a report of the survey.
- Language: Students should produce essays, articles, quotations and slogans regarding plastic reduction.
- Arts: Students produce creative printed and online materials such as cards, brochures, pamphlets, posters on the topic of plastic reduction.

5.2.2 ICT-supported Collaboration

The project leading teachers were also planning to conduct ICT-supported collaboration among the countries in order to secure the collective actions and strengthen the accomplishment of the project objectives. The outcome of the collaboration should be a video presentation based on data and information gathered from the participating countries. The planned ICT tools to be used in the project included: PowerPoint, Dropbox, Blogs, Google applications, YouTube, Vimeo and Facebook.

5.3. Project Participating Schools

The involved schools are detailed below with their pseudonyms (Table 5).

Location	School	Type
Indonesia	School A	Senior High School, Private
Indonesia	School B	Junior High School, Public
Malaysia	School C	Residential Science High School, Public
Philippines	School D	Science High School, Public

Table 5: Participating Schools in the Plastic Usage Reduction Project

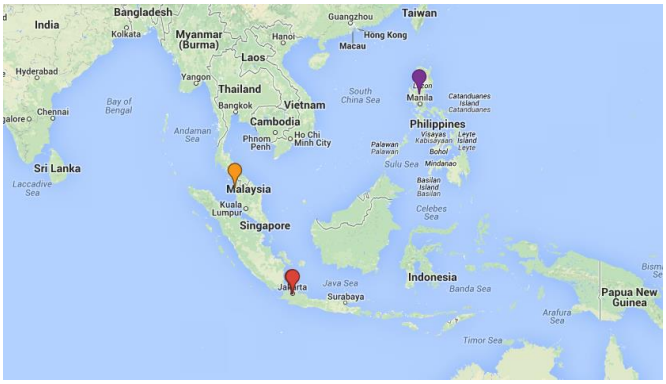

Table 6: Participating Countries: Indonesia, Malaysia and Philippines

The interviews were conducted with the four project leading teachers who were responsible for the project implementation and co-ordination in the schools.

Pseudonym	Position	School
Teacher A	Teacher, Project Leader	School A
Teacher B	Teacher, Project Leader	School B
Teacher C	Teacher, Project Leader	School C
Teacher D	Dean, Project Leader	School D

Table 7: List of the Project Leader Respondents

In terms of the project beneficiaries, the project leading teachers agreed that the target student participants should be students ranging from grade 7 to 10, from age 12 to 17.

5.4 Project Implementation

Due to the differences in the local contexts, the Plastic Usage Reduction project was implemented in the participating school with a varying start and end date as well as different durations. These start-end dates are shown in the Table 8 together with the age of the participating students.

School	Project Duration	Beneficiaries (Age)
School A	Feb. 2013-July 2013	Students 15-16 years old
School B	Jan. 2013-May 2013	Students 12-13 years old
School C	Jan. 2013–August 2013	Students 13-17 years old
School D	Dec. 2012–April 2013	Students 12-15 years old

Table 8: Project Duration and Beneficiaries

The following section aims to give an overview and summary on the project activities and outcomes in each of the participating schools.

5.4.1 Project Activities in School A

Project Title: Plastic Usage Reduction: a School Campaign

Subject Areas: English Language, Arts (partially)

Type: Curriculum embedded

Number of Students: 25

Age of Students: 15-16 years

Implementation: February 2013 – July 2013

Project Summary: Students have implemented an environmental protection campaign with focus on plastics and were engaged in various, curriculum embedded activities in the English class and in Arts class. They have also maintained a blog, where they published their outputs, such as a survey, videos, slogans and posters, printed T-shirts with the slogans and initiated an event called "Peace One Day", a day without using any kind of plastic.

Teacher Ethos: *"They will become students and persons who will care for the environment, collaborate with others and they will be global citizens."*

Project Activities and Outputs:

English Language
*Survey on the Usage of Plastics :*Students interviewed 15 school personnel (teachers, food vendors, school personnel) about their usage of plastics, the frequency and type of plastic they use, the level of awareness on dangerous effects of the plastic and their willingness to participate in in the plastic reduction school initiative. The result of the survey has been concluded and published on the project blog site. They have used the feedbacks to collect ideas for creating awareness raising slogans and posters.

Video production: Students created a video on how to reduce plastic. They have also included interviews conducted with two community members via telephone. The video has been uploaded on the project blog and on YouTube. They used the feedbacks to generate ideas for awareness raising slogans and posters which they also showcased in the video.

Students have also created a video about their opinions of plastic and why plastic reduction is necessary. The video with the student voices have been uploaded on the project blog site and on YouTube.

Peace One Day: Students have initiated a day when they did not use any plastic products and showcased their outputs created in Arts class. Instead of eating from plastic plates they ate from banana leaves. A Peace One Day video has been created by the students and uploaded on the project blog site and on YouTube as well.

Creating Slogans and Posters: Using the results for the surveys and interviews students created awareness raising slogans and posters in English and published them on the project blog site.

Arts
T-Shirt printing: Students designed and printed T-shirts with awareness raising slogans by using computer printing technique.

5.4.2 Project Activities in School B

Project Title: Plastic Usage Reduction: a School Campaign
Go Green!

Subject Areas: English Language, Arts, Social Studies, Science

Type: Curriculum-based

Number of Students: 39

Age of Students: 12-13 years

Date of Implementation: January 2013 – May 2013

Project Summary: Students have implemented an environmental protection campaign with focus on plastics and were engaged in various, curriculum embedded activities across the four disciplines. The outputs are published on their website in each of the disciplines.

Teacher Ethos: *"Students learn to communicate, to understand each other and learn how to use technology"*

Project Activities and Outputs:

Science
Plastic in the Environment Clippings: Students formed research groups and collected information material about the effect of plastic usage through printed and online media. The findings were presented to the class and were used for creating the slogans and they were also uploaded on the project website.

Survey: Students conducted a survey with 135 people including100 students, 25 teachers and 10 canteen food sellers on the usage and awareness on effects of plastic. The survey results were electronically documented, evaluated and presented.

Social Studies
Videotaping interviews: Students conducted three interviews with school personnel such as the genitor, food sellers in persons on their views on the environment and effects of global warming. The interviews were taped and the best ones were published on the project website.

English Language
Creating and printing campaign slogan: Students have designed and printed campaign slogans.

Creating Infomercial: Two short awareness videos have been produced by the students. One infomercial explained how to separate the garbage in the school, how to save water, use paper efficiently, save electricity and dispose plastic bottles properly. The other one

raised students´ awareness to have a caring attitude towards their environment and dispose their garbage.

Arts
Poster making: The campaign slogans were used to create and print posters.

T-shirt Designing and Painting: Students painted T-shirt by hand in groups. The slogans that were created in the English class were used for the of T-shirt designs. The process of the painting has been filmed and published on the project website.

5.4.3 Project Activities in School C

Project Title: Plastic Usage Reduction: a School Campaign

Subject Areas: English Language, Arts

Type: Mostly extra-curricular, after teaching hours (boarding school)

Number of Students: 7

Age of Students: 13-17 years

Project Summary: Students worked on environmental protection campaign in various, mostly extra-curricular activities across the two disciplines, such as essay writing, awareness raising photo campaign, poster and decorative element designs. Their outputs are published on their website.

Teacher´s Ethos: *"Team work is great! How to relate to other students and to the teachers, this is very important for them"*

Project Activities and Outputs:

English Language (extra-curricular activity)
Essay writing: Students wrote essays on "Saying NO to plastic bags" and "Reducing the use of plastic bags". Some of them were published on the school´s project website. The essays produced during extra-curricular activity time were corrected in collaboration with the English teacher.

Reduce Plastic Awareness Campaign: Students created an awareness raising photo material on how they can contribute to decreasing the usage of plastics in their daily life and published these on their website. These focused on how students can replace their plastic food containers, plastic cutlery, plates and glasses with other environmentally friendly materials.

Arts

Design of decorative elements: Students learned, documented and published the process on how plastic bags can be re-used to create decorative plastic flowers for the other schools to learn.

Posters design: Students have also been drawing awareness raising posters with slogans about plastic usage reduction. The posters were published on the project website.

5.2.4 Project Activities in School D

Project Title: Plastic Usage Reduction: a School Campaign

Subject Areas: Language, Arts, Social Studies, Science

Type: Curriculum-based

Number of Students: 120

Age of Students: 12-15 years

Implementation: December 2012 - April 2013

Project Summary: Students worked on environmental protection campaign in various, curriculum-based activities across the four disciplines. They created posters, designed shirts, conducted surveys and interviews and created short informericals. Moreover, they organized an exhibition to showcase the project and a fashion show of t-shirts with the campaign slogans. Students published the outputs on the project website.

Teacher´s Ethos: *"Students work together, not only within but also outside the class. They become authentic"*

Project Activities and Outputs:

Arts

Poster making: Students were asked to individually make posters for their class in Arts about the effects of plastic. The 10 best posters were chosen during the culminating activity held on March 19, 2013. Posters were judged using the criteria relevant to the theme, originality, required elements, and attractiveness.

Shirt Designing and Printing: Taking inspiration from the output of the Language class (tag line output/campaign slogan), another group of students designed their own t-shirts. The best printed t-shirts were as well chosen and uploaded in this site.

Social Studies

Students were introduced to the topic through the lesson "Industrial Revolution Precursor to Environment Degradation"

*Videotaped interviews***:** Serving as a supplementary activity to the lesson, students conducted scheduled interviews with administrators, teachers and personnel, secondary

school students, school vendors. Edited interviews in video format were submitted and presented.

Science
Plastics in the environment clippings: Articles and information about issues around plastics were collected and presented in the class

Survey on the usage and awareness on the Effects of Plastics: Students conducted a survey with 125 people, such as teachers and school personnel, students and school vendors and summarized the survey results. They have created a narrated PowerPoint presentation with the survey result of each of the interview.

Communicating to the World: Another group of students made a narrated slideshow presentations showing the information/data gathered from the surveys.

Language
Campaign slogans: Students created printed campaign slogans inspired by the output of Social Studies and Science classes. Students came up with their taglines, conceptualized and shot photographs that matched with their lines.

Infomercial: The same group of students also produced three-minute video infomercials that promoted their campaign slogans.

6. Chapter Six: Analysis and Discussion

The following chapter will apply the GMID to analyze the "Plastic Usage Reduction: a School Campaign" project processes in the presented four cases through the five dimensions of the model; (1) Vision and Leadership, (2) Social Network, (3) Participation, (4) Education and Learning, (5) Research Integration.

6.1 Vision and Leadership

The first dimension of the GMID is the Vision and Leadership. As the first step, it analyses forms of leadership and the ways of sharing the vision. According to the model, good leadership is dependent on a vision and objectives that can be communicated to others. The following section investigates how the project vision has been designed, formulated and communicated by and among the project stakeholders.

6.1.1 Creating the Project Vision

The core idea of PBL is to look to real-world issues and challenge and to choose a topic that is relevant and interesting for the students. Moreover if the PBL has an international reach, it is also important to consider that an interesting project is where the class interests and community challenges overlap with those in the other countries. The research has revealed that the Plastic Usage Reduction project group aimed at addressing problems

and challenges that the project coordinating teachers saw common in their countries, namely the negative consequences of using plastic products.

> ***Teacher B:*** *We focus on the main problem that we face in our place and I was concerned with plastic because I see in my school that we waste so much plastic products. The students use so many plastic bottles and even the school canteen. I also see that in Jakarta trash and garbage are not quite well managed, like by households and house wives. So I am concerned with this.[..] My target is actually how I could make my school to manage plastic very well*

> ***Teacher A: [..]*** *we went with the plastic because it is everywhere and it is very dangerous. We saw videos and the effects of plastic. And then after that we came up with the design of the project and then we promised to implement the project in our school.*

> ***Teacher C:*** *The vision is that students should be aware of (the disadvantages) using plastic*.

It was also envisioned that the project would help students to acquire practical skills and gain international experience:

> ***Teacher A:*** *There is one thing that the students will have; not only knowledge at the classroom and something theoretical but they do projects, they do video conferencing and they can telecollaborate. It means they will know other students in another country.*

This teacher also envisioned that the project would help her school to improve its image, as it is a private school and dependent on funds.

> ***Teacher A:*** *I imagine, if our school can do it, then it would be one of the selling points. Because we are a private school, we are not public and we as a private school should be funded by ourselves. So, if this project succeeded, that would be great for us. it will be a selling point for the school. Not for me, but for the school. Because I am concerned with its future.*

After the project group identified the common issue relevant to their local contexts they agreed and formulated the objective of the project:

The project is an environmental protection campaign focusing on the reduction of the use of plastic products in the schools. The ultimate goal is to create an online campaign material on the means and ways of promoting the reduction of plastic usage in the schools and subsequently to inspire students and other individuals around the world of the significant and valuable contributions they can do to reduce the use of plastics.

More specifically, they identified that the project should integrate the concepts of environmental protection into specific topics of various subject areas by specifically focusing on the plastic usage reduction and the dangerous effects of the plastics. It has also aimed at fostering awareness of students and promoted the significant contributions students can do to reduce the use of plastics. Moreover, the project aimed to plan and scaffold tangible outputs necessary to create an online campaign material and conduct collaboration with the countries involved. This is to secure collective action among project leaders, and strengthen the accomplishment of the goal namely creating the online campaign material.

Considering Curriculum Content and Objectives

Among the first steps of developing a vision for the project was to reflect and relate to the existing objectives, national curriculum and standards. As the curriculums differ in the participating schools, it was important to focus on key concepts and skills from the national educational standards and try to find common goals. This curriculum integration issue was a key discussion point at the project start. Teachers first discussed in what subject matters they can infuse the project idea in their respective schools. In some cases the participants saw that the ideas can be infused in Grade 8 curriculum while for another school it was grade 7 and so on. After the group agreed on their initial project goals and objectives, members have individually investigated where in their respective curricula they can embrace and integrate the project idea. Due to the differences in national curricula, it was impossible to standardize the grade in which the project should be implemented. The project group has finally agreed to implement the project in four subject areas: Language, Arts, Science and Social Studies. While the teacher project leaders in two schools have managed to integrate the project in these subject areas, in school C it has been implemented only with limited teacher collaboration and mostly as an extra-curricular activity. In school A it has been infused only in language education and with no cross-disciplinary approach.

The project leading teacher team has also decided to create a final collaborative product. According to the initial project action plan the concluding collaborative activity of the students was a video/movie presentation that used selected student outputs and which was to be jointly created by the participating schools.

After the group of the project leading teachers has jointly agreed on the vision and larger objectives of the project “Plastic Usage Reduction: a School Campaign” one of them volunteered to draft the design of the initial project plan. She circulated it among the project team members through email. The team has commented the draft and gave suggestions. The project design was then revised and distributed again until it the final agreement was reached by all the project leading teachers.

Through the conducted interviews with the teachers it has become apparent, that the formulation of the project vision has involved the project leading teachers in the first place. Other affected stakeholders such as the local school management, subject teachers,

students, local communities were not directly involved in the formulation of the vision and objectives from the initial stage but only later. However, their feedbacks and involvement proved to be crucial as they had major influence on the actual project implementation. Some issue related to the initial project design are reflected in the following statement:

> ***Teacher D:*** *After that we adapted the design. So the design was okey. And then after maybe a week or two I received some problems from them (the international project members). Because for example in case of School C it was only the language teacher who adapted the design. Although it is explicitly written here (project plan) that all the subjects, arts, language, science etc… but when they are implementing, they do modifications. For example they do not adapt arts, others adapt arts, others don´t adapt social studies.*

Such issues arose in School A and C. School B and school D. has not changed the project plan and both schools intended to implement the project across all the planned subject areas with the support of the management.

It is apparent that the project leading teachers have created the project vision through a collaborative process on the international level. However, other school stakeholders on the national levels, who also had major influence on the implementation, were consulted at a later stage. How does this affect the implementation of the project? The next part will investigate this question through analyzing the types of leaderships that emerged and related challenges that were experienced by the project leading teachers. It is also important to note, that the project leadership had two levels: international and the school level. In both cases the project leading teachers were the drivers of the project processes, thus their role as leaders were doublefold. Figure 5 depicts the leadership roles of the project leaders both on the international and on the school level.

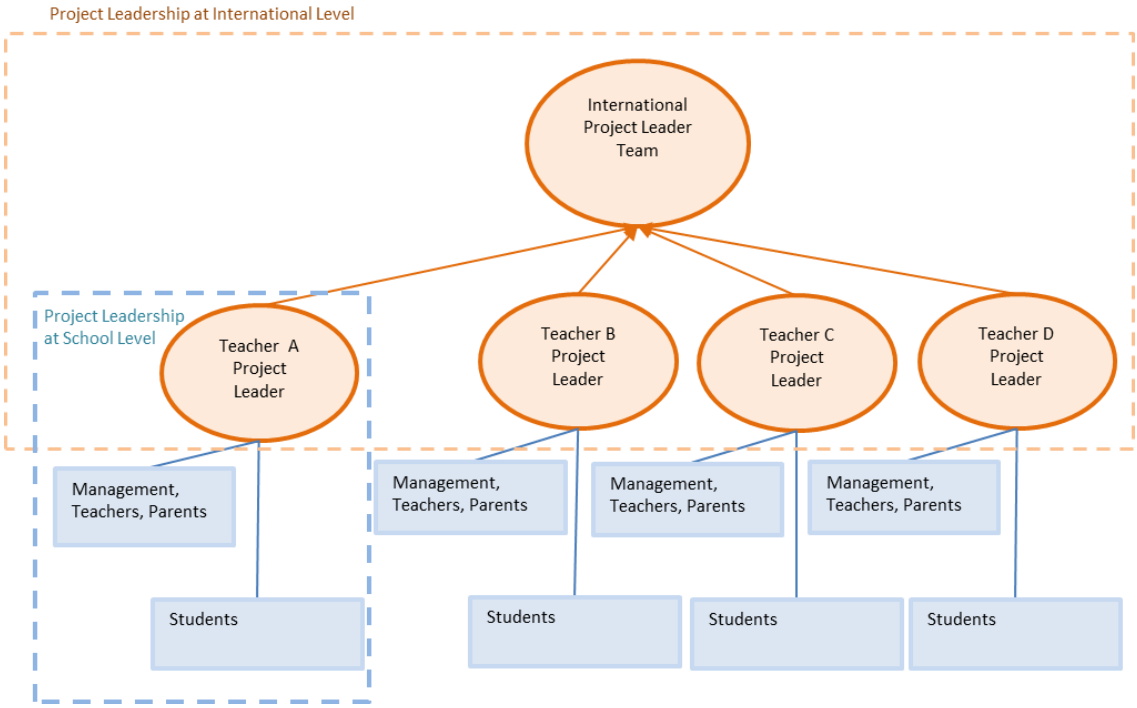

Figure 5: Project Leadership Structure

The levels of leadership according to the GMID include (1) Administration, (2) Transactional Leadership and (3) Transformational Leadership.

6.1.2 Administration

An administration oriented leadership only reacts in response to the challenge and is therefore not proactive as this would be required to reinforce the change to realize a vision (Bass & Avolio, 1994; Ackoff, 1998). Leadership at this level would not enable the initiation of development process that fully integrates the stakeholders.

The project leading teachers have had certain administrative responsibilities such preparing project documents, preparing regular reports, organizing meetings and maintaining contact.

6.1.3 Transactional Leadership

At this stage the processes become integrative as they require approaching followers through participation in order to build up a social network.

On the school level, it can be argued that the project leadership in School A is an example of transactional leadership. This is due to the fact that the project leading teacher reached out to the school stakeholders and built up a network of followers. This process has not been without any complication, as she did not manage to build the project on shared vision with the management and subject teachers. They did not support the project implementation full heartedly. Thus, a truly transformative leadership that builds on shared vision and joint responsibilities of the affected stakeholders was not possible. Although the management and subject teachers were not fully supportive to the project,

the project leading teacher had the opportunity to implement the project on a smaller scale, within her own lessons. This has resulted in an integration of the project with limited inter-disciplinary collaboration between subject teachers. These experiences are reflected in the following statements:

> ***Teacher A:*** *I tried to convince the more senior teachers and the principal. You know, it is really hard for me. Because the senior teachers say, this (project) does not fit in our country, this does not fit in our school. The School B in Indonesia is one of the great schools and students inputs are the smartest. But it is different in our school, you can find the smartest, the then you know the disabilities, the poorest, the richest. So we get varied students. Sometimes the senior teachers said that it (the project) does not fit in our school, it only really fits in the elite school. It is really hard for me to convince them. It is not really for the elite or the rich person or the smartest one, but it is for all. That is the point.*
>
> *My principal thought "Is this [project] really significant, Miss?" I said, yes Mam, for the future. My principal at that time wanted that in a short time it should be like that. "But I cannot do it in a short time, Mam". It is for the long term, for a long period, the results can be seen in a long term. My principal said "Miss, I don´t think so. Because we have a lot of school activities and school programs, why don´t you try it in your classroom?" Then I got really tired after a time. Where are the supporters?*

She has also reported the lack of support from other subject teachers in realizing the vision.

> *I face some problems because some teachers are reluctant: "I don´t think it is really appropriate with my activity in the classroom". I tried to talk to them and they are still reluctant or fifty percent.*
>
> *In my school it did not work well because teachers said: "Miss, I don´t think we can do this because I haven´t planned this one."*

Another example of transactional leadership is to be observed in School C. The project leading teacher has managed to win the support of the management and share the project vision with some subject teachers, the English and Arts teachers, who helped him in some of the tasks. However, the project was not fully infused into all the planned subject areas, it was mostly extra-curricular and the subject teachers´ support was limited to certain tasks, not the entire project.

School D is another example for transactional leadership. In this case, subject teachers from all the four areas were involved in the project. The project leading teacher was in fact the dean herself. A top-down leadership approach of promoting the vision and involving the school stakeholders was apparent. Thus, the project implementation was

initially not necessarily based on shared vision and values but rather on a win-win situation and subject teachers had no room to form the initial project vision.

> ***Teacher D:*** *I use high school teachers and I asked them to implement, to integrate this (project) in their subjects. Maybe because I am their dean, they have not got any choice. […] We oriented them (subject teachers) with the project, with the requirements, with everything. And asked: "Are you willing to join?*

6.1.4 Transformative Leadership

This level is the third and most integrative level as it builds on a shared vision. In effect, followers become leaders and contribute to the process themselves.

An example for transformative leadership is the School B is an example where the project leading teacher could successfully share the vision with other stakeholders such as the management and other subject teachers. As the school is an ASPnet school it runs international programs and both the management and subject teachers were supportive and collaborative. This is well reflected in the fact that teachers worked together across all the four disciplines and as the project leader stated: "we really did collaborate". Thus, the subject teachers became also drivers of the project vision and aims. So did the management:

> ***Teacher B:*** *Especially for the international program we got support from our principal, because it gives good chance for the students to develop themselves.*

Finally, the group of the project leading teachers itself is an example of transformative leadership. After the teachers took part in the capacity building training, they have jointly created a shared project vision, took charge of implementation in their respective schools, built up social networks to support the process and contributed to the international collaboration. This GMID dimension also assumes trustful relationships and inspirational motivation among the member who work together on a shared vision. During the conducted interviews and project meeting observations, it was apparent that the project team members shared a trustful relationship, even if challenges arose in the course of communication due to technical difficulties or lack of resources.

> ***Teacher D:*** *[..] they (project members) are so supportive. Even up to now, we are so familiar with one another, we belong one another.*
>
> *The schools did a great job for the cooperation. "Okey, I will do this and how about you?" How far are you? Something wrong? They supported. It is not a great telecollaboration but we did support one another if we face some difficulties.*

The following table provides an overview on the integrative levels of the project leadership:

Vision and Leadership		
Administration	**Transactional Leadership**	**Transformative Leadership**
• Preparation of project related documentation, regular reports, organization of meetings and maintaining contact	• Coordination of stakeholders (management, subject teachers, students) in School A, C, D towards common aims.	• Shared leadership among the project leaders on the international project level. • School B: shared vision with the management and shared leadership among the subject teachers

Table 9: Levels of the Vision and Leadership Dimension

6.2 Social Network

The second dimension of GMID is the Social Network. Social network in this case refers to the people who are connected with each other through relational ties in the project. This project is built upon an international network of four participating schools, where the project leading teachers have built up a smaller or larger network of supporters. The involved or affected project stakeholders include; the school management, subject teachers, school personnel, school vendors, parents and community.

This dimension investigates specifically how the communication between the project stakeholders functions, what the members have in common and what motivation they have to participate and contribute. The stability of the network is depending on whether the members contribute to the common aim and maintain their relationship. Social networks have three levels according to GMID; information, knowledge and innovation networks.

6.2.1 Information Network

Information network is the first level and the simplest form of networks that offers information to the project stakeholders but without any collaboration.

When analyzing the stakeholders involvement in the project, it is apparent that parents have been part of an information network in Schools A, B, C and D. They received information about the project through the students but they were no further involved neither did they provide any feedback on the project outcomes. This is well reflected in one of the project leaders statement on parental involvement:

> ***Teacher D**: Indirectly maybe the parents are (involved) because, you know, they do the project. Definitely the support from the parents is important. That is also why some of our collaborating schools tell me that the support of the parents is important. You have to, if necessary, speak to them, orient them. The students should be properly oriented also, so when they go back home and (parents ask) "Why is your class like this? " So they can speak to their mothers and explain it*.

Similarly, the world-wide and local community was also part of an information network through the blogs, websites, and YouTube videos that students have created and uploaded to various digital spaces. Feedback from these stakeholders was not apparent.

In case of School A, the management and subject teachers were also part of an information network. Due to lack of interest and capacity on their side they were not involved in the project, but only received information through the project blogs and from the project leading teacher. There has only been limited involvement with the Arts teacher in one of the tasks.

In School C the school personnel, and other secondary students were only part of an information network, as they got information through the website and were not consulted for their opinion.

6.2.2 Knowledge Network

Knowledge network is a more integrated type of networks in GMID. In the knowledge network stakeholders not only exchange information but also seek collaboration (Kogut et al., 1993).

In the case of School A, B and D the project participating students, some local community members such as school and street vendors, school teachers, school personnel and secondary school students have been part of knowledge networks. Project participating students conducted videotaped interviews and surveys with these stakeholders. The surveys were to find out people´s feedback on their use of plastics and whether they are aware of the effect of plastics on the environment. The results were summarized and presented to the class and also communicated to the school community for their feedbacks while they also served as input for the school campaign design.

The subject teachers have also become part of knowledge networks in School D where the project has been successfully infused in different subject areas with an active collaboration of the subject teachers. In School C some subject teachers were involved in some collaboration such as the English teacher, the Arts teacher and project leading teacher for the extra-curricular activities, however, the collaboration was limited to certain tasks. The project participating students in School C were involved in a knowledge network as well. Their feedback and input were built in the project, for example the idea of awareness-raising in the canteen originated from them.

6.2.3 Innovation Network

Finally, an innovation network is based on co-creation and identification based trust. It is based on the participation of a wide range of stakeholders and the involvement of their expertise, ideas and contributions.

The network of the project leading teachers on the international level can be regarded as on the way towards an innovation network. Transformative leadership as well as decision influencing participation have been present among the project leading teachers from various countries and backgrounds. However, there was still much space left to build a more integrative innovation network; the schools should have worked on co-creating one final product and jointly found an answer on how the extensive usage of plastic products could be reduced. This could have meant the active participation of a wider range of stakeholders in the international collaboration, for example among students and subject teachers across countries. This initial aim was however not achieved due to a number of factors that will be detailed in the following Participation dimension section.

In School B the management and subject teachers became part of an innovation network, as they shared the project vision and developed an intense interdisciplinary collaboration with community involvement. Table 10 provides a summary of the levels of the social networks. Figure 5-8 give an overview of the social networks broken down to schools. The figures include the types of participation as well, which is the next dimension of the GMID. Participation will be detailed more comprehensively in chapter 6.3. The reason that they are shown together is that the Social Network and the Participation dimensions of the GMID are strongly interrelated.

Social Networks		
Information Network	**Knowledge Network**	**Innovation Network**
• Parents are informed through the students about project in School A, B,C, and D. • World-wide and local community informed through project websites and blogs in Schools A, B, C, and D • School Management in School A receives information, but	• Project Participating Students in School A, B, C and D share responsibilities and collaborate. • Management in School C collaborates but project is mainly extra-curricular. • Subject teachers in School C collaborate in	• Project leaders in School A, B, C and D create shared project vision among themselves, take charge of the school level implantation and coordination, maintain their relationship through digital means and build a network of supporters.

there is lack of collaboration • Subject teachers in School A receive project information. No collaboration. • School personnel and secondary students in School C only receive information but there is no collaboration.	certain project tasks. • School personnel, school vendors in School A, B, and D involved through interviews and surveys. Their input is regarded.	• Management in A and B and subject teachers in School B infuse the project across all the four disciplines.

Table 10: Levels of the Social Network Dimension

Social Network and Participation in School A:

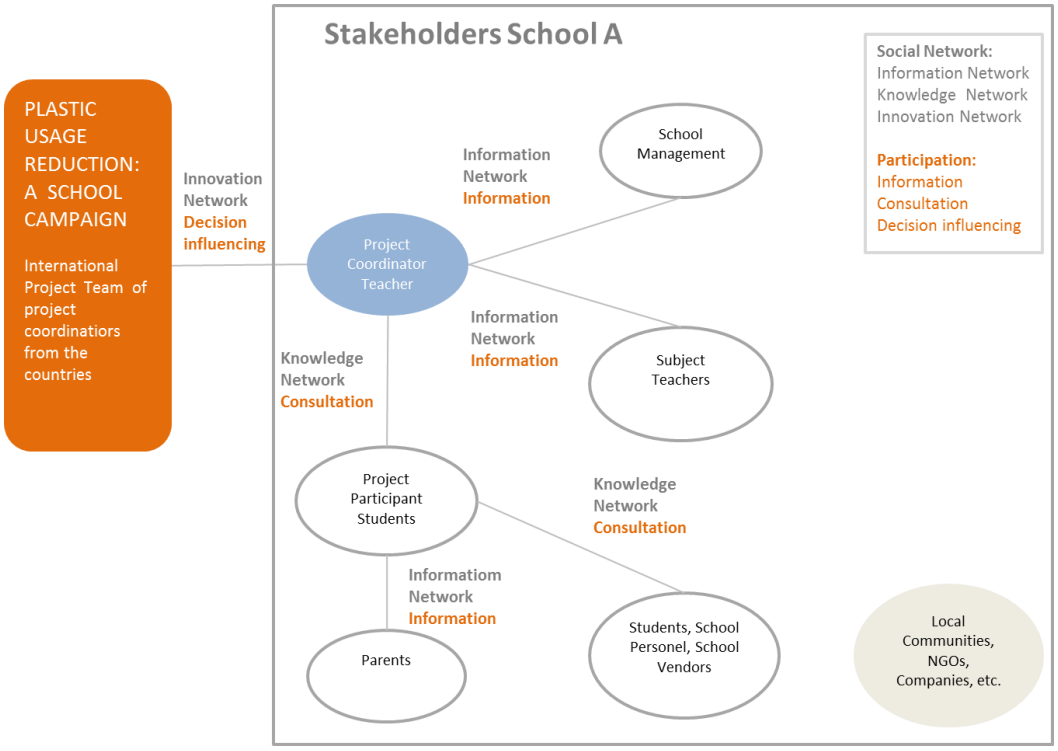

Figure 5: Levels of Social Network and Participation in School A

Social Network and Participation in School B:

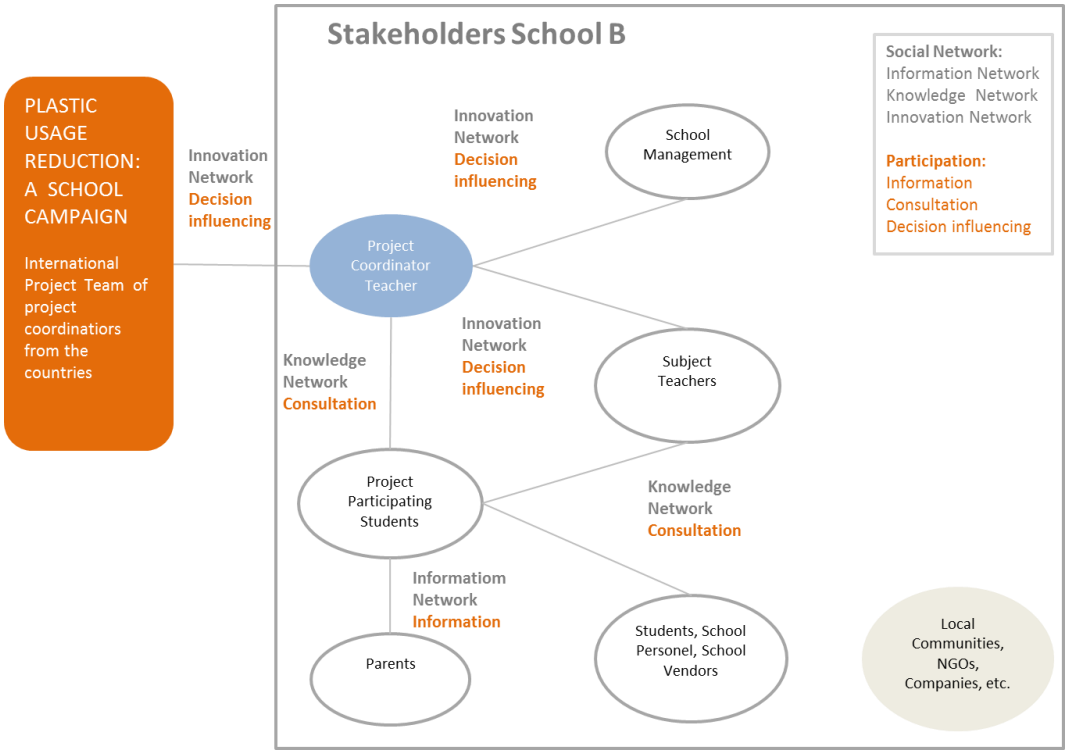

Figure 6: Levels of Social Network and Participation in School B

Social Network and Participation in School C:

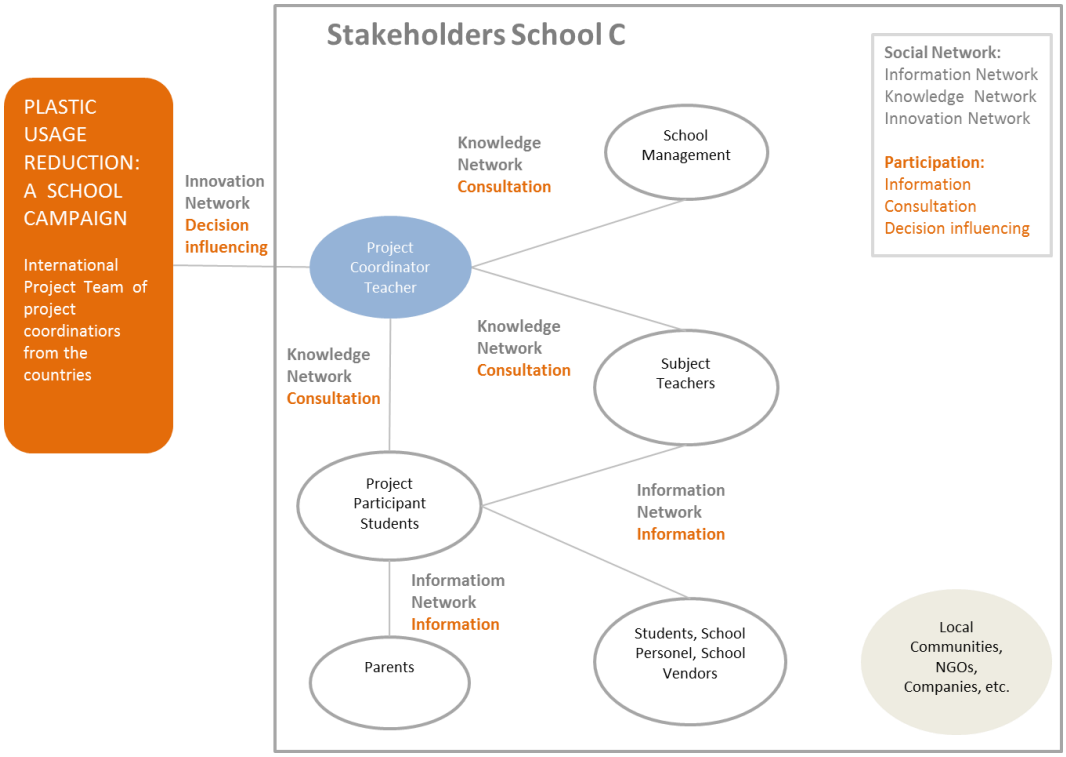

Figure 7: Levels of Social Network and Participation in School C

Social Network and Participation in School D:

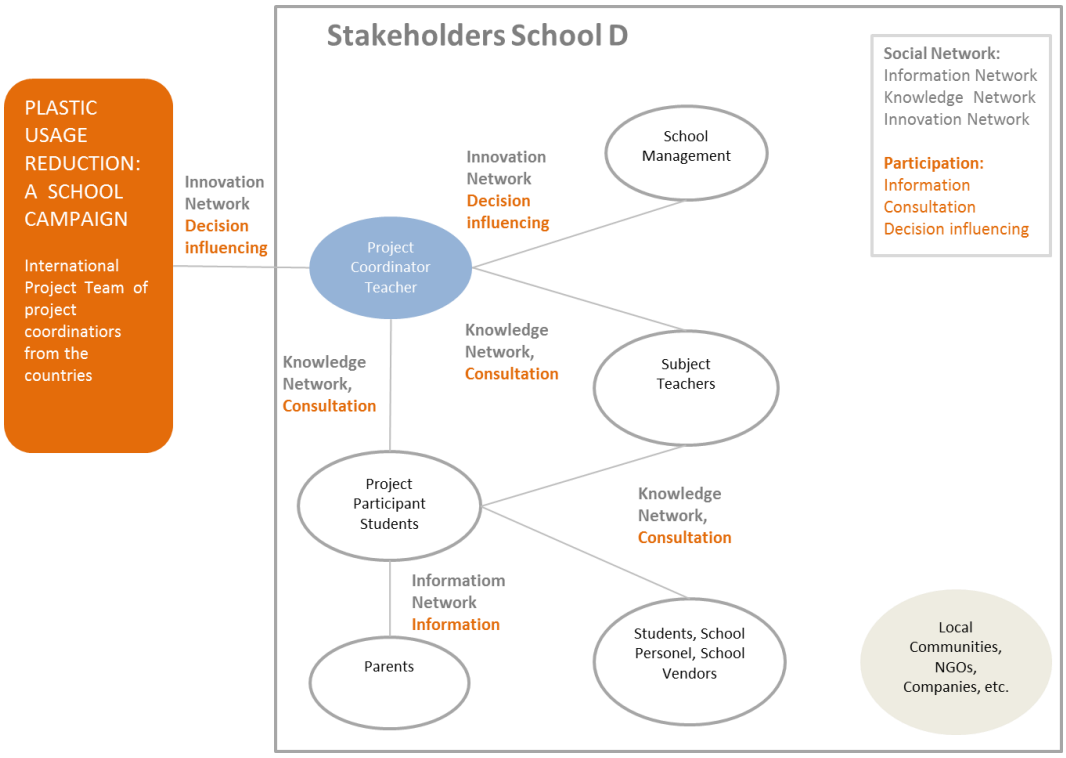

Figure 8: Levels of Social Network and Participation in School D

6.3 Participation

Participation refers to the relationships, communication and interaction between the drivers of the processes and those affected by the processes. Thus, the question raised in this chapter is what levels of involvement in the sense of participation do exist and what role does participation play in the project processes. Participation is strongly integrative with the other four dimensions.

6.3.1 Information

At the lowest level is the distribution of information as a form of participation. It makes processes transparent and is used to inform stakeholders about the project developments. It does not allow any feedback, thus it can also be called non-participation. At this level project decision makers inform affected stakeholders via blogs, websites, meetings and through providing the opportunity to view documents, videos and other project materials. The project decision makers decide what is to be made public and can thus steer the transparency.

The Plastic Usage Reduction project websites and blogs have information distribution function. These are aimed to inform the school stakeholders, local and world-wide audiences about the projects and poster the output of the students.

Similarly, parents in Schools A, B, C and D, received information about the project through the students. Thus, students needed to be carefully oriented and prepared, in order to ensure that they can explain the project to their parents. This was especially important because parents´ financial support was necessary for some of the project tasks, such as T-shirt printing.

However, it has become clear throughout the project that a more integrative parental participation would be necessary, especially because the schools have planned to reach out to local communities as well in a later stage of the project.

> ***Teacher B:*** *We did not get any feedback from the parents and local communities, because we did not involve them last year. But this year we have the parents association. We will include the parents this year and the local community and we are planning in the end to ask their feedback, how they think about this project, whether they learned something or not.*
>
> *This year [..]we might need schools permission and the support from the parents as we let their children go out of school and it will be busy and (we will) probably bring the students to the local community and use their time.*

In School A, the project leader initiated communication with the school management and subject teachers and provided them information about the project. However, most of them were reluctant to further engage in the project. Thus, they did not participate on a more integrative level.

6.3.2 Consultation

The next level of participation is the consultation. It goes one step further as it not only about informing people and affected stakeholders, but also incorporating their feedbacks and opinions in the project, thus they begin to have some degree of influence. Using their feedback can improve the project´s processes.

Project participating students have been involved in the project process through consultation in School A, B, C and D. After they have received an orientation from the project leader and subject teachers on respective targets of the project they have been working on the various activities in the involved subject areas. Students were asked and encouraged to provide feedback. In School D the students have in some cases provided online comments as well. In case of school A the teacher reported that students´ feedback was positive and students were excited about the project. They have told about the project to the junior students and as a result the teacher has found that the number of applicants to the English club has nearly doubled. In school B students inquired the teacher about the international collaboration and were eagerly expecting to see the students from the other the countries. Although this has not been achieved, they were enthusiastic about the school level project and provided feedback on the tasks and group work through self- and group evaluations.

Secondary students, school personnel, teachers, school and street vendors were consulted through surveys and videotaped interviews about their views on using plastics as well as global warming issues in School A, B and D. In case of School A, 15 surveys were conducted with school personnel and teachers. In School B 3 interviews were conducted with food sellers and school personnel, and School D conducted 125 surveys and 16 interviews with students, teachers, school personnel and school vendors in the Science and Social classes. The videos and survey results were published on the project websites.

School C did not conduct surveys or interviews with these stakeholders. The school management was collaborative and supportive towards the project and there are actually 15 teachers involved in PBL at the school. However, the Plastic Usage Reduction project was rather limited in scope, with only 7 involved students mostly extra-curricular. Subject teacher participation was rather limited and focused only on a limited number of tasks.

6.3.3 Decision Influencing

At the third and highest stage is the decision influencing participation. In this stage, stakeholders have the right to influence the decision according to their opinion. Project leaders´ participation in the project is at the decision influencing stage. They have together negotiated the project vision and aims and continuously collaborated on its achievement in the international project team as well as in their respective schools. On the school level, the project leaders in School B, and D sought consensus with management and subject teachers, thus these groups had a decision influencing role as well.

Challenges in the Participation

The project leading teachers have reported a number of challenges that affected the students´ integrative participation in the project. These are collected and explored here.

Connectivity and Facilities

In case of School B, the connectivity was an issue that affected the international collaboration among the project leading teachers.

> ***Teacher B:*** *It is problem with the bandwidth. Just like when we do the telephone conference the connection is sometimes down. The problem in my school is that we have two units, junior high and senior high and so we have to share (the internet line). So when we want to have better connection, we have to cut the line to the senior high. Especially at midday, quite much traffic, right.*
>
> *[…] In principal it is about internet connection. So with no better connection it will not work very well, right?*

Time Management

The main issue the project leading teachers have reported that they had difficulties to find time for the international collaboration because of differences in the length of school years in the participating countries, partially because of a not properly planned time schedule and due to lack of time as well.

> ***Teacher D:*** *The goal was to come up with an online campaign material, beside the blogs. The intention of the group was this objective: conduct collaboration with the countries involved to secure collective action among project leaders. We intended that good students, certain students would meet online, communicate, exchange mails, talk online through video conferencing and finally come up with a video on how to reduce plastic. The intention was that this should be our goal:, the students do one project. But we didn´t reach such points because my project ended up in April, others in August and in July.*
>
> ***Teacher A:*** *We missed that (the collaboration). Because last year we promised to have a video conference for the telecollaboration and the project report. We missed that because of time limitations [..].*
>
> ***Teacher B:*** *Each of us got very busy and we missed to communicate regularly and then suddenly, oh my god, we have to finish this and then we tried to keep doing it. Yeah, well, we did not prepare quite well the timeline. We also should have decided a head of the project, a student head I mean, from each school. I think that would have been better.*

[..] that is why we will make some improvements this year, well, related to the timeline. It should be well set.

Multidisciplinarity

The project leading teachers in School B and D have also reported that the high number of the involved subjects, such as Arts, Language, Science and Social studies was difficult to manage even in the school projects. Thus, coordinating and collaborating across countries among subject teachers and students and creating a common final product was not achieved.

> ***Teacher B**: We did too many (subject areas) and that is why we are going to shorten. So this year we will focus on two.*
>
> *My team did so many tasks with the four subjects. But there is no problem with the collaboration itself, because it has good impacts for the students and teachers. But we just gave too much… it was too much.*
>
> ***Teacher D:** Let me add, that we found out, based on what we had, it is quite difficult to have so many subject areas to maintain. So now we trim down. [...] Maybe social studies and language next time.*

Project Leadership

One teacher has also raised the issue that the international collaborative PBL would be more successful if students got more responsibility and had student heads assigned who would have been responsible to coordinate the communication with peer student heads in the partnering countries. She also emphasized that teachers should rather be facilitating the students´ interactions, but the activities should be carried out by the students themselves.

> ***Teacher B:** We should have had a student head of project in the Philippines, Malaysia and Indonesia. And these heads should have collaborated with each other and the teachers should have made sure whether they communicate or not. We were supposed to have a timeline and then ask them: have you collaborated with the head of Indonesia and Malaysia? That would have been better if we did that. So that is why we plan this for the next year program. We will set the timeline for doing the collaboration like when they (students) should communicate to each other. So we teachers just take charge for observing and facilitating. Teachers can collaborate to teachers, but it is supposed to be the students who are acting, right? Last year we really did control (the activities) but it is about the problem solving. Now we got more insight and hopefully it will be much better.*

Table 11 summarizes the levels of Participation among the project stakeholders.

Participation

Information	Consultation	Decision influencing
• Kick-off meetings and orientation sessions for project participant students organized in the schools. • Websites, blogs, YouTube videos, information materials and awareness raising materials published online to inform the international community, the project participating schools and local school stakeholders.	• Project participating students work on PBL tasks and provide feedback through evaluations in School A, B, C, D. • Subject teachers consulted about the project in School C. • School personnel, management, secondary students in School A, B and D. consulted through surveys and interviews.	• Project leaders co-create the project vision, design and communicate online. Consensus with management and subject teachers in school B, and D is sought.

Table 11: Levels of the Participation Dimension

6.4 Education and Learning

According to the model, there are three levels of learning that can be achieved in integrative development processes: single loop learning, double-loop learning, and deuteron learning. Education can be present at all levels at the same time. This principle does not analyze the conditions of learning and the education in the schools and in the classes itself, but focuses on the process of learning in the whole project and its development from the beginning.

6.4.1 Single-loop Learning

In single loop learning (Figure 2) people only rethink their actions after gaining results. The aims stay the same. Changes may be achieved in process development and their results but not in the values, vision and aims of the process.

The project participant student learning can be categorized as single loop learning in this case. The project participant students provided feedback at the end of the respective project activities about their experiences and learning.

6.4.2 Double-loop Learning

Double loop learning (Figure 3) the project stakeholders not only rethink their actions but also the project aims.

According the project participants, one vital lesson learned from the project was to implement bigger and bolder activities and include other members of the community such as local governmental units, non-governmental organizations. This is also to assure that

the project is based on real-life issues and problem solving approach. This thought is well reflected in the following statement:

> ***Teacher D:*** *Because we only focused on the school, and now we realized that we have to expand it. I mean to include the local government unit in the campaign. So we are thinking of raising the awareness of the following people: the households, the fishermen, the farmers, the store owners and the street vendors and we will ask our science class to consolidate the reports and collaborate with the social studies. The social studies will organize a public campaign and community seminars regarding the effect of plastics and the proper plastic management that they will get from the survey of the science group. So some examples of activities are and we are not hundred percent sure yet, if these are possible, but just list up: community visits; the students will conduct simple community visit and collaborate with local governmental officials. School campaign: we asked our students how do we campaign with the results and they said to do some demonstrations. We want also the social studies to collaborate with the business establishments and probably encourage them that one day they should not be using plastic straws. For example we will be asking the business owners to declare one day when there will be now straws in the restaurant. So we are thinking that the social studies could do this. As we have reported, we want to stick with our project and extend the campaign.*

Education is done at the subject teacher level. They received orientation training about collaborative PBL in the schools from the project leaders prior to project implementation. It was reported, that an extra effort was necessary in order to persuade the subject area teachers. Their unwillingness as well as insufficient comprehension of the concepts of ESD became a concern. The team has identified the need that project leaders need to organize orientation sessions that are persuasive and encouraging to the subject teachers.

6.4.3 Deuteron Learning

Deuteron learning (Figure 3) is the most integrated level of Learning according to the GMID. It arises when people "learn how to learn". Learning processes of this level focus on the improvement of the learning process itself and ensure that the lessons learned can be adapted to new learning processes. Deuteron learning can be supported by self-assessment and evaluation as well as research.

The project group of the project leading teachers reflected about their actions and conducted a self-assessment at the end of their projects in the 1st Phase. The following learning experiences arose from the evaluations and interviews:

Improving Time Management

The main issue identified was that the group failed to implement the collaborative activities among the students in the participating schools thus the initially planned

common website and awareness raising video was not created. According to the teachers account, this was the effect of the lack of time to organize the activities. Thus they identified that for the project continuation an improved time management is necessary and setting up a time schedule is important. This was also important, because some of the project leaders were also entrusted with additional work and school responsibilities by their respective school officials.

Sharing Project Responsibilities

The team has also reflected about the necessity of re-organizing their approach to the international collaboration, as the school year is different in each of the participating countries. Thus, it is necessary to share the project tasks among the schools instead of each school working on the same ones.

> ***Teacher D:*** *We really wanted to have one single output, you know, so that students can really work collaboratively. So if we are looking back what we experienced, that point, if we had a common time. My students graduated in April, when they (the others) are starting the calendar. But as said, when we did our discussion, perhaps we don´t have to wait for each other. Perhaps one work on this one, one will work on another one (project task). So this is a good feedback for our next project what we are doing now.*

Setting Realistic Goals

Parallel to the this issue the project team realized that the initially identified subject areas need Social Studies, Science, Language and Arts to be reduced due to the difficulty and complexity of coordinating activities across four subject areas. Thus they formulated that at the next stage the project will be limited to two subject areas.

Motivating Students

The project leader from School B reported that sometime students got tired of the extra workload originating from the project. She expressed the importance of student motivation and more patience from the teachers.

> ***Teacher B:*** *Well, I learned a lot. I see how students collaborate and should have given more motivation because sometimes you know they were too tired and I had to motivate them and got to be more patient. That´s what I learned, actually.*

Increasing Parental Involvement

Parents support to the project became valuable since the project entailed student outputs that required materials and financial support. Some activities that were agreed upon with the project team were in fact modified to suit the specific conditions of their target students. For example in School A students used old T-shirts for the printing, as the parents were not ready to buy new shirts. The project leader team formulated the necessity

to orient parents at the initial stage of the project and explain the interdisciplinary project approach to them.

Ensuring Management Support
The project leader team identified that school management has a great impact on the easy project implementation, thus their understanding and involvement in the project is crucial. In case of limited resources and facilities, management should have the role to set priorities in order to sustain the international collaboration. The following table summarizes the levels of the Education and Learning dimension.

Education and Learning		
Single-loop	**Double-loop**	**Deuteron learning**
• Students provide feedback about the tasks during classes.	• Moving the project out of the schools and increase community involvement, such as local governments, businesses, households, fishermen, farmers, store owners and street vendors.	• Self-assessment and proposed improvements: • Implementation of a strict time management plan and sharing the responsibilities among the participating schools. • Motivation, timely orientation of students and subject teachers • Decreasing the number of subject areas in the project • Parental orientation on the PBL • School facilities to be prioritized by the management.

Table 12: Level of the Education and Learning Dimension

6.5 Research Integration

Research integration is the fifth and last principle of GMID. Research can be the initiator of new visions or reveal challenges in building new visions. As the other principles, research integration has three levels ranging from disciplinary, interdisciplinary to trans-disciplinary research.

The research in this project is represented on the student level. Students in School B and D have conducted research prior to the project implementation in various ways that in

turn shaped the project outputs. In School A students conducted a survey with some school stakeholders. In School B and D students conducted both surveys and interviews with school stakeholders. The most extensive research was done in School D, where over 125 people were involved. While research on the student level is present, there was no evidence of research conducted by other stakeholders in the project such as the project leaders and other involved teachers. Thus, this section will review the levels of research conducted by students.

6.5.1 Disciplinary Research

This is the lowest level. Project processes involving disciplinary research in their development only involve single disciplines which are not dealt with in an interconnected and interrelated way.

An example of this are the students in School B and D who were forming research groups and investigated the effects of plastics in the environment in the science class. They conducted the research from printed and online media and reported their findings in the class.

In School A students surveyed 15 school stakeholders about their awareness about the disadvantages of plastics and their interest in joining a school campaign. The research was conducted in Language education.

6.5.2 Interdisciplinary Research

Interdisciplinary research combining aspects and interrelations of different disciplines and it is relevant for sustainable development as it opens up a wider range of viewpoints and knowledge to the stakeholders.

An example of the interdisciplinary research approach are students in School B and D who conducted surveys about plastics in the Science Class and also interviewed stakeholders in Social Studies about plastics. The outcomes of the surveys and interviews were then evaluated and used to create an informercial in Arts class.

6.5.3 Transdisciplinary Research

This level can be seen as the most integrative level of research. Besides its interdisciplinary approach, transdisciplinarity involves people in the research process in order to generate a mutual learning process and investigates societally relevant challenges for the research work. Using community members and resources outside the classroom provides students with an opportunity to learn additional perspectives and increase their knowledge about an issue. At the beginning of the project community resources can help students to conduct research, gather information through interviews and develop a plan for their project. This ensures that their final product makes a meaningful contribution to the community.

Students in School B and D conducted research from printed and online media, surveys and interviews with school personnel, students, teachers, school vendors and some street

vendors about the use of plastic materials in social sciences and sciences classes. They presented their findings to the students and school community and used the results as an input to design and create a school based awareness raising campaign. The intention to involve a wider segment of community members in the research was expressed by the project leading teachers as a future objective of the project. Table 13 summarizes the levels of research integration in the project processes.

Research / Innovation		
Disciplinary	**Interdisciplinary**	**Transdisciplinary**
• Students investigate the effects of plastics in science class by conducting a research in printed and online media and report their findings in the class in School B and D. • Students conduct surveys in English Club with 15 school stakeholders in School A	• Students in School B and D conduct research about plastics in social and science class and based on the outcomes they create an informercial in language class.	• Students in School B and D conduct research, surveys and interviews community members in Social Sciences and Sciences classes. They evaluate and present their findings to the students and school community and use the results to design and create a school based awareness raising campaign.

Table 13: Levels of the Research Integration Dimension

The following table (Table 14) gives an overview of the levels of GMID for the assessed case of the “Plastic Usage Reducation: a School Campaign” project.

Leadership and Vision	**Administration** Preparation of **project related documentation, regular reports**, organization of meetings and maintaining contact	**Transactional Leadership** • Coordination of stakeholders **(management, subject teachers, students) by project leaders in School A, C, D towards common aims**	**Transformational Leadership** • Shared vision **and** leadership **among the project leaders on the international project level** • **Shared vision and leadership with the management the subject teachers in School B**
Social Network	**Information Network** • **Parents** are informed through the students about project in School A, B,C and D. • **World-wide and local community** informed through project websites and blogs • **School Management** in School A receives information, but there is lack of collaboration • **Subject teachers** in School A receive project information. No collaboration. • **School personnel,** and **secondary students** in School C only receive information but there is no further collaboration.	**Knowledge Network** • **Project Participant Students** in School A, B, C and D share responsibilities and collaborate in the project activities. • **School Management** in School C supports project implementation but project is mainly extra-curricular. • **Subject teachers** in School C collaborate in certain project tasks. • **School personnel, school vendors** in School A, B, and D involved through interviews and surveys. Their input is regarded for the project design.	**Innovation Network** • **Project Leaders** in School A, B, C and D co-create project vision, take charge of the school level implantation and coordination, maintain their relationship through digital means and build a network of supporters. • **Management and subject teachers** in School B and D infuse the project across all the four disciplines.

Participation	**Information**	**Consultation**	**Decision Influencing**
	• **Kick-off meetings** and **orientation** sessions for project participant students organized in the schools. • **Websites, blogs, YouTube videos, information materials** and awareness raising materials published online to inform the international community, the project participant schools and local school stakeholders.	• **Project participant students jointly work** on PBL tasks and provide feedback in School A, B, C and D. • **Subject teachers consulted** about the project in School C. • School personnel, management, secondary students and school vendors in School A, B and D. were consulted through **surveys and videotaped interviews**.	• **Project leaders co-create** the project vision, design and communicate online. Consensus with management and subject teachers in school B, and D is sought.
Education and Learning	**Single-loop Learning**	**Double-loop Learning**	**Deuteron Learning**
	• **Students´ feedback** about the tasks and activities	• Expanding the project and move it out of the schools through **increased community involvement**, such as local governments, businesses, households, fishermen, farmers, store owners and street vendors.	• **Self-assessment** and proposed improvements: • Implementation of a strict **time management plan**. • **Motivation, timely orientation** of students and subject teachers • **Decreasing the number of subject areas** in the project • **Parental orientation** on the interdisciplinary PBL • **School facilities to be prioritized** by the management.

Research Integration	**Disciplinary Research**	**Interdisciplinary Research**	**Transdisciplinary Research**
	• Students investigate the effects of plastics in **science class** by conducting a research in printed and online media • Students conduct **surveys in English Language** with 15 school stakeholders in School A	• Students in School B and D conduct **research inSsocial and Science class** and based on the outcomes they create an informercial in Language class.	• Students in School B and D conduct **research, surveys and interviews across disciplines with school community members** and use the results to design and create a school based awareness raising campaign.

Table 14: Summary of the GMID Dimensions

7. Chapter Seven: Summary of the Findings

The following chapter will summarize the findings of the research study by keeping a focus on the initial research questions and provide a conclusion about the applied analytical framework.

7.1 Collaboration for Transforming Education towards ESD

The analysis of the four project cases "Plastic Usage Reduction: a School Campaign" investigated how educators across Asian education institutions work together on transforming teaching and learning towards ESD through ICT-supported collaborative PBL. The transformational level of the project processes have been analyzed through the GMID, which was instrumental for reflection about how educators work together and how intensive their level of collaboration is.

7.1.1 Project Leadership and School Management

The project leaders have been facilitating and driving the project processes both on the international and the school levels. The analysis revealed that the integrative levels of leadership are quite different according to the local contexts and consequently influence the implementation on the international level.

The role of the school management proved to be crucial in all the cases as the enabler of the project processes. In School A, there has been a lack of support from the management and subject teachers. Thus, the implementation was limited and only disciplinary. The project leaders´ personnel characteristics and entrepreneurial spirit have been extremely important in this case, as she has been ambitiously driving the project despite the unfavorable conditions. Given more support and capacity development of the other stakeholders, a more integrative project leadership could have been developed. The project leader has envisioned that her down-top approach would expand to other subject areas and reach other teachers when the project gets more visibility and demonstrates success.

In case of School B, the project leading teacher has successfully shared the project vision and received support from both the management and subject teachers. This enabled a smoother and inter-disciplinary implementation of the project as there has already been a shared understanding on the importance of international collaboration and the implementation of new teaching-learning approaches. In case of School C despite the management´s positive response, the implementation was still limited and mostly extra-curricular due to other competing programs. Collaboration among the subject teachers and the project leading teacher was limited. In case of School D the project leader was also the institutional leader in one person, thus sharing the initial project vision with the other school stakeholders seemed to happen based on her authority in a top-down approach. It also resulted in a comprehensive and interdisciplinary implementation.

Thus, the role of management as an enabler of the processes has been very important. The more institutional support the project leaders got, the more effectively they could integrate other stakeholders in the project, thus ensure an interdisciplinary learning experience for their students.

On the international level the project leaders were designing and shaping the project vision together and have managed to build trustful relationships. The leadership on the international level could have been more transformative if other stakeholders such as subject teachers were involved in the creation of the initial project vision and design especially in the case of School A and School C where the subject teacher involvement was very limited. This would require also capacity building prior to the project planning, so that management and subject teachers have a good understanding of ESD and collaborative PBL.

7.1.2 Involving and Engaging Stakeholders

Due to the changing local contexts, there were differences in each of the participating schools in terms of the stakeholder involvement. It seems that the social network participants in School B and D are the most integrated in the project development processes. It is important to note, that in both schools there has been a strong support from the management side that made the integration possible. The analysis has also revealed that some stakeholder groups, such as parents and the local communities were integrated in the projects in all of the schools only at the lowest level. As the project progressed, it became apparent that the role of parents is important and they should have been consulted at the project start. The lack of consultations in some cases led to the fact that teachers had to modify the activities to some extent, due to lack of financial support from the parents. In case of the local community, the project participants came to the joint conclusion that for a more authentic and real-life learning experience and problem-solving approach for SD, students will have to go out of the schools and approach the local communities, NGOs and companies in the future. Thus, expansion of the project network has been placed high on the agenda. This also entails a more integrated parental involvement, since community work means that students need to leave the school premises, and perhaps take extra time, which requires parental consensus.

Similarly to the previous dimensions, the participation of the stakeholders in the project processes varies in the different schools. In School B and D where the management was supportive, stakeholders could participate in the processes more intensely.

However, in the international collaboration participation was limited to the project leading teachers. Students did not take part in the international collaboration, as it was the initial aim of the project. This is the result of several challenges that the project leaders experienced, including time management issues, differences in the school year start and end date, connectivity issues and the work overload due to the multidisciplinary approach in some of the schools. In terms of participation, School A was the least integrated.

However, the project leading teacher expressed her hope that the project could start as a grass-root movement in one class and eventually would have spill-over effects into other areas and reach other teachers and students.

> ***Teacher A:*** *You can go with a little or the smallest thing you can do, but still it can give great impact. So start with your English club members and then after that, when your English club members did a great job, I think it will spread out. As my student said, he will be the "virus" of his friends.*

7.1.3 Identifying the Lessons Learned

Important conclusions arise from the analysis of the project stakeholders reflections on their experiences and own learning.

The teachers´ accounts on lessons learned emphasize the necessity of an increasing community and parental involvement in the project. Also, regarding the project processes a number of issues were identified. The research has shown that collaborative PBL on the school levels has been implemented to a varying extent with varying intensity. However, the international collaborative PBL, that was supposed to involve students in the project work across countries, was not realized. Thus, the vision of the project has only been partially achieved. Project leaders have coordinated among themselves, but their work was also challenged due to a number of factors. It is important to investigate the reasons why and how the implementation was hindered and why there was no final product created.

By reflecting on the challenges, project processes can be improved in the future. This learning is especially important, because the project stakeholders expressed their intention to continue the project and implement the second phase of the project with an increased focus on community involvement during the first half of 2014.

Time management

Time management was identified by all the project leaders as the main reason why the international PBL did not manage to involve the students. This was due to the fact that the school year in the countries had different start and end dates and the projects were implemented with varying start and end dates as well with different durations. Also, teachers work overload with other school and administrative responsibilities left little time for coordinating activities. Thus, the team identified the need to create a strict time management plan that should be planned ahead and consequently followed through. In order to manage student communication, student heads could help the coordination so that students get more responsibility in managing the communication across countries as well.

Re-thinking the Project Design

Time management issues can also be solved with a different project design in the future. In the first phase of the project the countries have been working on similar tasks more or less simultaneously with each of them creating their own outputs. There has been no horizontal links between the institutions. However, schools can share responsibilities and jointly work on assigned tasks. This would require collaboration across countries and would ensure that students are engaged both in a local and international learning contexts. Sequencing the project tasks could also be useful to bridge the differences in the school years.

Orientation and Motivation of Stakeholders

The subject teachers´ lack of understanding of ESD and collaborative PBL principles was a concern for the project implementation. Consequently, project leaders became responsible for the local capacity development. Thus, the project leading teachers saw the necessity of organizing orientations for the other teachers. It is important that subject teachers are involved in persuasive orientation sessions prior to the project implementation, both about the underlying concepts and the project objectives. Similarly, it is also necessary to carefully orient students about the project objectives in order to fully engage them. Motivation of both subject teachers and students was highlighted by some project leaders. Inspirational and motivating leadership as well as patience are cornerstones in engaging stakeholders in the project. Likewise, as already mentioned before, the proper orientation and involvement of parents is important for the successful implementation.

Setting Reasonable Objectives

There was a general consensus that ESD should be embedded in the curricula in order to avoid extra workload and ensure a truly interdisciplinary approach. The project objective was to infuse the project in four subject areas such as Arts, Language, Science and Social Studies. ICT was infused in all of these areas, thus it did not count as a separate subject but still it was of key importance. Those schools that implemented the project across all the intended subjects reported that the complexity of embedding the project in the different curricula was overwhelming for teachers and was difficult to maintain. The lesson identified was to start first with a smaller number of subjects, thus they intend to limit the subject to two, instead of four. The complexity of implementation on the school level can limit the opportunities for the international collaboration, as teachers are already overloaded with their local school projects. Therefore, the reduction of the subject areas might prove to be also helpful for an improved international collaboration.

Connectivity and Facilities

At last but not at least, the connectivity and availability of facilities for international collaboration is crucial. Some of the project leaders experienced low quality internet connection that made cross-border communication difficult. If stakeholders do not have access, there is no chance for interaction with their foreign counterparts. Therefore, if such problems occur and resources are scarce, it is important to seek out support from the

management in order to secure access. They can help to prioritize access to facilities and resources.

7.1.4 Identifying Future Directions

Identifying the lessons learned throughout the projects´ progressing and modifying the vision accordingly are important contributes for a sustained and improved project.

In parallel, research can be helpful to identify new future directions and innovation of the project. Research activities have been present in the project, however only at the student level in School B and D. While students were conducting simple, interdisciplinary research and involved school community members, research opportunities can be increased by expanding the project outside of the schools. All the project leading teachers expressed their joint intention to widen the research involvement of the students in the future and possibly involve a larger and more diverse segment of local communities that helps student to identify further real-life issues around environmental protection. Local communities, NGOs, companies and households can be included in the research activities and local community resources can be used to conduct data and information collection. This would ensure that students learn about real-life issues and propose solutions that are relevant and innovative for the local and global communities. However, research could be also conducted by teachers and teacher educators themselves in order to identify future improvement possibilities of the project, teaching and learning with collaborative PBL. Again, research contributes to transformation as it can influence the vision, thus the transformational process is in a constant flux.

In summary, this study has examined and contrasted four cases from the perspective of transformative development through the GMID. The basic assumption of the model is that transformation is a continuous process that should be constantly negotiated among the affected stakeholders. The space and opportunities given to stakeholders to influence this process are essential, as also implied in the Human Development and Capability Approach as well as in ESD. Both of these concepts entail that affected stakeholders need to be involved in development processes at every stage. The more integrated and involved people are in the processes, the more influence they have to shape them. Thus, participation and democratic practices, as proposed by the concept of Agency in the Capability Approach as well as in ESD and Critical Pedagogy, need to be fostered. Shared vision, participation, joint action, continuous discussion and critical reflection are prerequisite for transformative processes, which are also the cornerstones of the applied GMID.

7.2 GMID as Analytical Framework

The GMID model has proven to be useful for the intended analysis as it provided an approach that aided the researcher in reflecting upon various aspects of the complex network, the level and intensity of involvement of the stakeholders, their joint learning

processes and future inspirations. It has also provided a systematic tool to reveal the weaknesses and challenges that occurred during the journey towards their aims. The researcher believes that the module can be useful as a self-reflection tool in ESD related projects that have an international focus. While the GMID is useful to reflect about the processes, it does not have a sharp focus on outputs. Thus, the process-oriented view of the module can be complemented with an output oriented analysis for a more detailed picture.

7.3 Research Recommendations

The research has analyzed the first phase of the project and provided a snap-shot of the transformation processes from the vision to implementation. By applying the GMID and analyzing the project after the second phase (currently in implementation), further conclusions could be made. The results can be compared which would enable stakeholders to follow their journey of transformation with a longer time perspective.

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Appendix 1: Interview Guide

Project data

Project title:

Project duration:

The interviewee

What is your role in the project?

How did you get involved in the project? What is your personnel background (interests, motivation)?

Vision, Leadership

How did the project start up? Did you have any difficulties during the start-up? If so, what?

What is the main aim of the project?

How does the project aim to achieve its goals?

Network / Participation

What/Who are the main actors involved in the project?

Through what channels do you communicate with the main actors? Face to face, email, telephone, etc…?

How? (informing, consulting involving in the design, involving them in the decision making?)

Have you experienced ay stumbling blocks / challenges in the communication?

What do you think about the communication / cooperation between the participating institutions?

Education and Learning

What has changed since the start-up of the project?

Where do you see the added value of collaborative project based learning for ESD?

Has there been any feedback from the institution / students / teachers / local community/ schools/ partner institution / organization regarding the project?

Is there anything that should be changed in the project?

Research

Are any new innovative solutions developed / invented / resulting from the project? How?

Are multiple disciplines reflected in the project? (disciplinary, interdisciplinary or transdisciplinary?) Please elaborate.

Additional

What are the particularly positive experiences of the project?

What are the particularly negative experiences of the project?

Is there anything you would like to add?

Thank your very much for your participation!

Appendix 2: Consent Form

Consent Form

Research topic:

Project Based Learning and Collaboration for ESD in Education

Contact:

Melinda Mathe, Stockholm University, Sweden, Institute of International Education, Master's Program of International and Comparative Education

Tel.:+46 70 415 8770

Email: mema0676@student.su.se

Information and Purpose: The interview for which you are being asked to participate in, is a part of a master thesis research study. The purpose of the study is to gain insight whether project based learning (PBL) with tele-collaboration facilitates the collaboration of teachers for ESD and if so, to what extent.

Your Participation: Your participation in this study will consist of an interview lasting approximately 40 minutes. You will be asked a series of questions about the specific project you have participated in as part of the "Reorienting Teacher Education towards ESD" program as well as your experiences. You are not required to answer the questions. You may pass on any question that makes you feel uncomfortable. At any time you may notify the researcher that you would like to stop the interview and your participation in the study.

Benefits: The benefits of the research will be to better understand how teacher trainers can effectively engage in collaborative Project Based Learning for ESD in a diverse Asian context.

Confidentiality: The interview will be recorded, but your name will not be recorded on the tape. Though direct quotes from you may be used in the paper, your name and other identifying information will be kept anonymous.

If you have any questions or concerns, please contact the researcher at the above mentioned contacts.

By signing below I acknowledge that I _____ have read and understand the above information. I am aware that I can discontinue my participation in the study at any time.

Signature_____
Date_____