

# ABILITY > KNOWLEDGE

Can Learning Organizational Qualities be trained in the school system through Supplemental Instruction, and if so, how early?

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An Exploratory Case Study of 7th and 9th Grade Students at Apelgårdsskolan in Rosengård, Malmö, Sweden.



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Technology Management



R.I.P.

**Technology Management**

1997-2015

I hear and I forget ; I see and I remember ; I do and I  
understand.

**Confucius**

# Autobots roll out [1]

It is ironic that while writing a master thesis about Learning Organizations we are experiencing the emergence of our dyadic team as one. We have been our own bosses and constantly challenged each other and our thesis project. It has been a big relief to simultaneously as starting a social venture, tutoring students and writing this thesis, being able to openly discuss ideas and express emotions without prejudices and preconceptions. Yes, we have had our bumpy roads, but always with a goal on the task to conclude this thesis, and go out with a bang.

Finally, it is natural if the reader finds that this thesis is deviating from what the reader is used to. This thesis is of a highly exploratory nature; also, we have taken the chance to add some personal touches through out the document. The latter explains for example why you are reading a horizontal paper. Please keep in mind that these details are just a small proportion of the total number of ideas we didn't put in the paper.

## **Special thanks to:**

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Carina Fredriksson for being an awesome mother

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Lewis Horne @ SOPACT for bunbrushing

TMD for building a better world

[1] This chapter might have been called "Foreword" but nobody reads the foreword and we wanted you to read this. We feel safe admitting this here in this footnote, because nobody reads footnotes either.

# Abstract

**Title:** ABILITY > KNOWLEDGE - Can Learning Organizational Qualities be trained in the school system through Supplemental Instruction, and if so, how early?

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**Issue of Thesis:** The acceleration of the amount of knowledge that an organization in the 21st century needs to process is growing with exponential numbers. In order to survive, the organizations need to transform themselves into Learning Organizations. This thesis examines if Supplemental Instruction, a peer-to-peer based learning method can develop students' qualities to work in a Learning Organization.

**Purpose:** The purpose of this paper is to see if a peer-to-peer based academic support model called SI can develop qualities among individuals at a lower secondary school for an organization that continually learns, a Learning Organization.

**Method:** The method has been explorative, using both a quantitative and qualitative approach. Theory review of both the concept of Learning Organization and Supplemental Instruction has been carried out to define Learning Organization Qualities and to see if Supplemental Instruction has developed these qualities in the past. A case study was established at Apelgårdsskolan, a lower secondary school in Rosengård, Malmö, Sweden. Here, an SI program was established in math for 7<sup>th</sup> and 9<sup>th</sup> graders for a period of 9 SI sessions per group. During the SI program data was collected through in classroom observations, continuous journal by the authors, and post SI program interviews and questionnaires.

**Conclusions:** The results and the SI program indicate that the following qualities most likely developed due to SI: To Reflect on and Question Themselves and their Surrounding Environment, To Collaborate and Prefer Learning Together with Others, and To Share Knowledge With Others. However, it is too early to evaluate to what extent SI is able to develop such qualities. This requires a more exhaustive systematic approach of what SI elements develop LOQs among individuals. This also requires a larger, controlled study, with more validly use of measuring tools.

**Key words:** Learning Organization, Supplemental Instruction, SI, Human Capital, peer-to-peer, learning how to learn

# Cocktail Party Summary

The world is **changing faster** than ever and there is an **inevitable need** of **accelerating learning** for those organizations not wanting to lag behind. **Imagine** if there was a way of as early as among **7th graders** develop **individual qualities** that would **allow accelerating learning**. Believe it or not, this thesis provides reasons to believe that **Supplemental Instruction** is this way.

Twitter Summary:



**didiciconsulting** @didiciconsultin

8s

R u a boss within the industrial sector? Looking for a strategy to induce #HumanCapital for #LearningOrganizations? #SI could be ur answer!

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# Problem Statement

# 1



# 1 Problem Statement

## Introduction to our study

### 1.1 Background to Problem - Shift Happens

Organizations that want to survive in the intense and dynamic environment of today need to adapt to the reality of a hypercompetitive environment (Richard A. D'Aveni 1995). Organizations aiming to find a sustainable competitive advantage in a hypercompetitive environment expose themselves to a deadly distraction (D'Aveni, 1995). Instead of “shoveling sand against the tide rather than moving on to higher ground” companies need to be proactive in their attitude towards the shifts of the market (D'Aveni, 1995). As if the global, hazardous hypercompetition were not enough, companies of today need to: reorganize, restructure and reengineer for success - not just survival; adapt to the fact that there is a doubling of knowledge every two to three years and to a tremendous amount of breakthroughs in new and advanced technologies (Marquandt, 2011). All shifts unavoidably create a need for learning how to adapt to these new conditions (Marquandt 2011). Organizations that want to tackle these crucial issues will need to continually transform themselves into a Learning Organization (Marquandt, 2011). Learning Organizations are organizations where people continuously increase their capability to continually learn how to learn together (Senge, 2006), to become places in which groups and individuals at all levels continuously engage in new learning processes (Marquandt, 2011). In order to catch up to these new conditions, organizations also need to deal with the fact that there is an increase in lack of skills among individuals, due to schools that do not adequately prepare them for work in the twenty first century (Marquandt, 2011). This is the issue that this thesis is addressing; to find a possible solution that prepare individuals to work in the hypercompetitive twenty first century and more specifically - in a Learning Organization.

### 1.2 Background to Case Study - Shift is Happening in Skåne

#### 1.2.1 Shift is Happening in Skåne

In Sweden, the challenges of a changing world are met as well. All the major urban regions in Sweden are suffering from a mismatch between the demand and supply of available work force with the right education and competence (Region Skåne/Näringsliv Skåne, 2012). Pia Kinhult, president of the self-governing authority Region Skåne (2012), along with several of the region's biggest industry CEO:s, are worried about the supply of technological competence in the region. In a memorandum to the

Swedish minister of education they argue that the supply of engineers and technical work force is essential for the region's future competitiveness (Kinhult et al, 2012). Region Skåne is aware of the overall shifts occurring in the 21st century which is mentioned in their report that addresses the future supply of competence (Region Skåne/Näringsliv Skåne, 2012). The structural shift is transforming the region's industry from a production industry to a service oriented sector. As a consequence, all industries become more and more knowledge intense and there is an increasingly higher knowledge content in the current industry's production, something that unavoidably has an impact on the economic growth (Region Skåne/Näringsliv Skåne, 2012). However, this is not something the region focuses on in the rest of their report, instead the focus is narrated to the differences in supply and demand of educated individuals, the human capital, of the region.

We find that not only the declining work force in some areas is an important issue. What is at least equally important is to adapt to structural shifts and to transform organizations into Learning Organizations. However, if the schools cannot provide the organizations with individuals favorable for Learning Organizations, one question needs to be answered: is there a way that can make the schools able to foster individuals with Learning Organization Qualities (LOQ)?

#### 1.2.2 Supplemental Instruction - Painkiller or Even a Gainpiller?

Region Skåne (Axelsson, 2014) has in fact already showed interest in a peer-to-peer based academic support model Supplemental Instruction (SI), as a possible tool for increasing the supply for the technical work force in the region. This thesis will examine if SI also might be a complementary solution, namely to supply organizations with individuals able to keep pace with the accelerating changing business environment. Or in other words: individuals with LOQ.

SI was developed at the university of Kansas City, Missouri in 1973 as a response to drastic retention drops in the undergraduate body. Today, SI is used at over 1800 institutions in around 30 countries. Essentially, SI integrates learning with learning how to learn, and has widely been proven to increase retention and grades in difficult courses and programs. SI is not only a method, but also an approach to learning where intrinsic motivation and curiosity is the central drivers, and where self-governing and collective learning is emphasized (Olstedt, 2005). A typical SI session consists of an SI-leader, most commonly a student with leadership skills that has passed the course



= Something that is provided in order to develop Learning Organization Qualities of individuals.



= Individual which will go through the "Supply Chain of Knowledge".



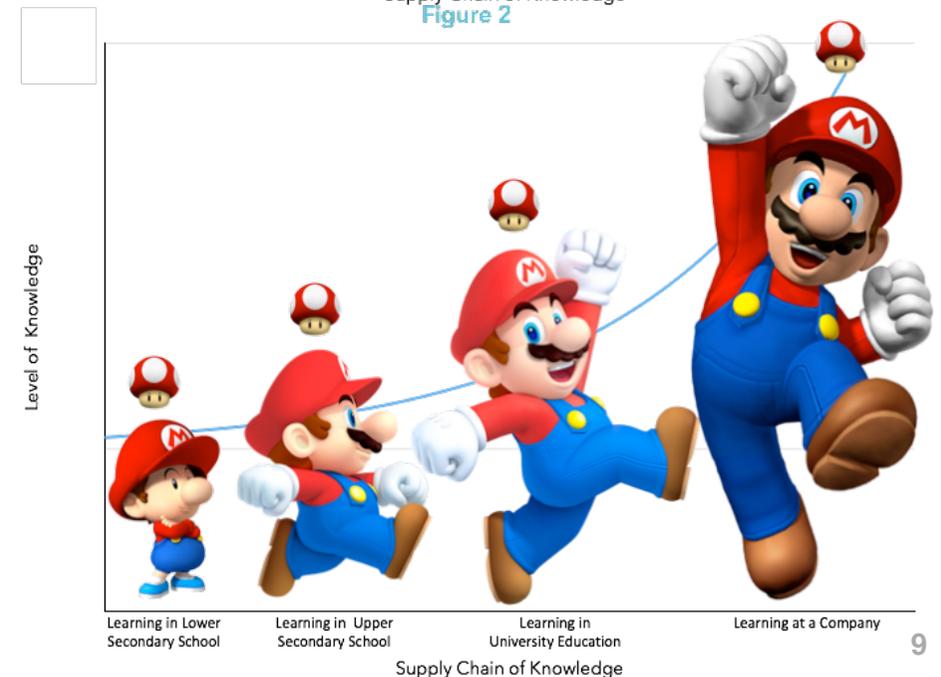
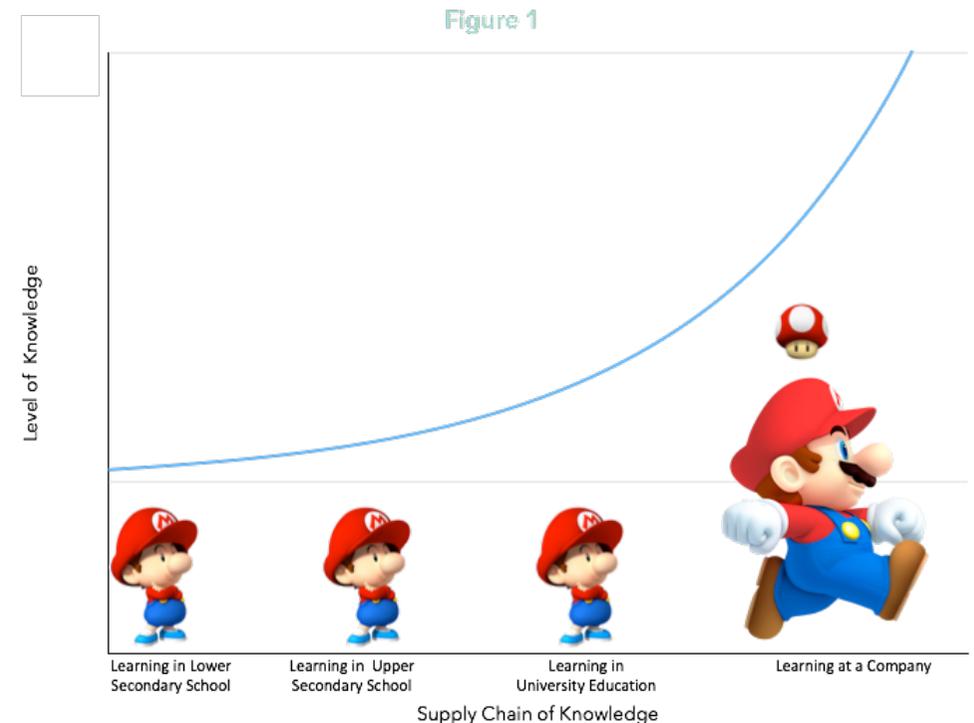
= The amount of Knowledge demanded from the environment surrounding the organizations

before, who helps a group of students canalize their learning through each other. SI uses collaborative techniques as a basis; it also promotes social interaction in an academic environment, which, according to Tinto (2010), is a good way to increase retention. SI's role as a potential tool for developing LOQs for individuals is previously unexplored. We believe that SI might be a potentially suitable tool for stimulating the development of such individuals at large scale, incomparably early in the educational system.

### 1.1.1 Focus on the Individual - not the organization

The Learning Organization seems to imply that the organization enables its individuals to behave in a way that allows the organization to learn what at the time is essential to know for the organization. Hypothetically, individuals possessing qualities that are good for aspects of the Learning Organization will strengthen organizations that want to become a Learning Organization. Such LOQs could be examples of skills or behaviors that strengthen learning, certain ways of collaboration, something that strengthens positive learning cultures etc.

Let us try to visualize the problem and the potential of the solution this thesis aims to examine. First, imagine Region Skåne's issue from the rough point of view as a supply chain of knowledge; from lower secondary school, via upper secondary school and university, to an industry that needs to consist of Learning Organizations in order to be competitive. Such a knowledge supply chain would most definitely benefit the industry if the individuals in the system had more LOQ. What would unleash more LOQ is if they are developed as early as possible. Assumingly, the earlier an individual develop these qualities when entering a stage in the knowledge supply chain, the better prepared the individual will be to develop these qualities further when entering the next stage in the supply chain. The figures below show a comparative overview if an individual's progression of LOQs in: (1) an assumed present state system, where the industry is solely responsible for developing these qualities; and (2) a system that can start develop LOQ as early as in lower secondary school.



**Figure 1** Display of how the individual's level of qualities to work in a Learning Organization is developed without a method that builds the learning throughout educational progression.

**Figure 2** Display of how the individual's level of qualities to work in a Learning Organization is developed with a method that builds the learning throughout educational progression.

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We find that instead of just evaluating if SI can provide the region's organizations with individuals that know the demanded knowledge, Region Skåne should also see if SI can develop individuals able to learn all future knowledge demanded by the region's organizations. In other words; can SI also develop LOQ?

### **1.3 Purpose & Research Questions**

The purpose of this paper is to see if a peer-to-peer based academic support model called SI can develop qualities among individuals at a lower secondary school for an organization that continually learns, a Learning Organization.

In order to fulfill this purpose the following research questions will be evaluated:

- I. What are Learning Organization Qualities (LOQs) of an Individual?
- II. What development of LOQs of an individual can be observed among the participants when conducting the case study's SI-program?
- III. Is there reason to believe that SI can develop LOQs among 7th and 9th grade students?

### **1.4 Purpose & Research Questions Delimitations**

For the avoidance of doubt, it is not expected that the examples of LOQs observed among lower secondary school students will be of the same amplitude as the LOQs of an individual working in company that is considered a Learning Organization. However, it is expected that the study can derive examples of how some of the LOQs can be considered to represent minor versions of these 'real' LOQs. This thesis will not examine whether or not SI makes the school or any other organization become a Learning Organization.

# From Questions To Answers

# 2



## 2. From Questions to Answers

The purpose of this chapter is to guide the reader through the challenges in fulfilling the thesis' purpose and then orienting the reader in how those challenges will be tackled. Initially, the chapter starts with describing the methodology for each of the research questions or where further presentation will be found. This is followed by describing how this thesis responds to the thesis' challenges

### 2.1 Our Methodology for Each Research Question

#### 2.1.1 What are Learning Organization Qualities (LOQs) of an individual?

Figure 3 is showing the different aspects that are considered when being transparent and systematic to fulfill the purpose of this thesis. Fulfilling this thesis purpose can be described as seven tasks labelled in Figure 3, these will be referred to in the text below.

The first aspect of the first research question is to ensure the reader that we defined the LOQs correctly. This is done by (1) a review of the Learning Organization theory. We were searching for a comprehensive book or article that would give us the 'case definition' of the Learning Organization framework. However, we soon found that many, many authors write about the Learning Organization framework. This made us cover several of the most cited authors and also evaluate if an absence of stringency in the typology would cause any problems for the further definition of LOQs. We also needed to (2) define what and why certain behaviors among the students are considered to be indications of these LOQs. A more detailed methodology of how the Learning Organization theory is interpreted into LOQs of an individual are presented in chapter 3.

#### 2.1.2 What development of LOQs of an individual can be observed among the participants when conducting the case study's SI-program?

The first aspect of this research question is to ensure the reader that the method used really is SI. In order to do so, the core compositions of SI (3) need to be presented. This is done in chapter 4. It is also necessary to show that the sessions given to the students can be regarded as SI. By presenting how the SI sessions have been systematically executed (4) the reader can get a sense of how much the SI-sessions correspond to the SI-literature review. This is presented in chapter 5.

The third aspect is to ensure that the measured data correspond to something that we are considering being an expression of LOQs of an individual. This is done by presenting the methodology of the measurements tools (5) in chapter 6. In this chapter failed measurements are also presented. By a triangulating methodology, the results (6) in chapter 7 can become more justifiable to say that different measurement results indicate a presence of the same LOQ.

#### 2.1.3 Is there reason to believe that SI can develop Learning Organization Qualities among 7th and 9th grade students?

To ensure that what we look for is LOQ, that we really use SI, and that the measured data correspond to something we are considering being an expression of LOQ are a matter of evaluation in a methodological discussion and analysis (7) in chapter 8. We are taking a distance to how much the results really correspond to our purpose and if the results of the individuals' development of LOQs really shows something that would be valuable for a company in the future.

Figure 3 is showing the different aspects that are considered when being transparent and systematic to reach the purpose of this thesis.

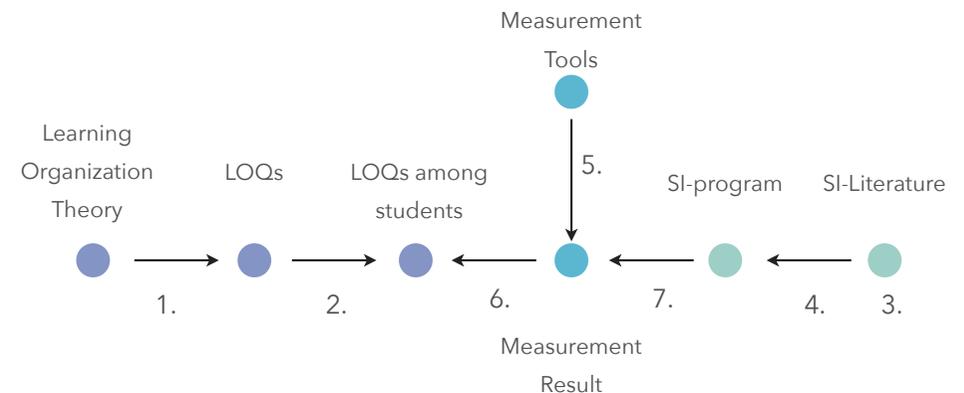


Figure 3 - A road map to our answers.

**Table 1** showing an overview of the different aspects and chapters:

Step	Research Question	Aspect	Resolved by	Presented in
1	RQ1	Is the LOQs Correctly Defined?	Review of the Learning Organization theory	Chapter 3
2	RQ1	Is the LOQs Correctly Defined?	Transparent discussion of when we consider LOQs to appear among students	Chapter 3
3	RQ2	Is what we are doing SI?	Literature Review of SI research	Chapter 4
4	RQ2	Is what we are doing SI?	Being structured and persistence use typical SI tools	Chapter 5
5	RQ2	Is what we are observing LOQs?	Using different measurement tools.	Chapter 6
6	RQ2	Is what we are measuring LOQs?	Triangulating the results from different measurements	Chapter 7
7	RQ3	Are the LOQs we we are measuring a consequence of something that is SI?	Methodological discussion and Analysis of results.	Chapter 8

## 2.2 Other Challenges With Fulfilling the Thesis' Purpose

Remember our purpose: "...to see if a peer-to-peer based academic support model called SI can develop qualities among individuals at a lower secondary school for an organization that continually learns, a Learning Organization." In fulfilling this thesis' purpose we identify three main challenges: (1) the exploratory nature of this study; (2) scarcity of recourses; and (3) linking SI to LOQs.

### 2.2.1 The Exploratory Nature of this Study

When choosing what level of ambition to aim for and what type of study that will be conducted, the existing material of the research object is important (Wallén, 1996). An overview of when different types of study and levels of ambition should be used is described in Table 2.

Level of ambition	Description
Exploratory	When there is little knowledge in the field and when trying to find basic understanding an explorative study is conducted (Wallén, 1996).
Descriptive	When basic knowledge and understanding of the area is recognized and the goal is to describe but not explain existing relationship, a descriptive study is conducted (Wallén, 1996).
Explanatory	When looking for deeper knowledge and understanding and when both a description and an explanation of a field is required, an explanatory study is conducted (Wallén, 1996).
Improving/ normative	When there is existing knowledge and understanding about the research object and the goal is to provide guidance and actions for improvement, a normative study is conducted (Wallén, 1996).

Since there is no, to the authors' awareness, previous research trying to map the cause and effect between Supplemental Instruction as a tool to develop LOQ among individuals, no previous methodological framework is given. This challenge is denoted exploratory nature. Another exploratory aspect is that the case study was conducted at Apelgårdsskolan who had never heard of SI beforehand, resulting in a highly unknown context for the study. A final exploratory aspect, is that SI is a university based method with almost no information about how well it might work in junior high school, such as

Apelgårdsskolan. It shall be noted that there is some previous research from the SI literature that reports development of attitudes to learning and skills as a consequence of SI. These findings and how they can be linked to LOQs will be presented in chapter 4.

### 2.2.2 Scarcity of Resources

Secondly, the thesis is budgeted with a limited amount of resources, a challenge that we denote scarcity of resources. The scope of the thesis corresponds to a half year of full time studies at Master's level. For several reasons, the amount of time that is given from start of the semester to deadline is 16 weeks from course start to hand-in, and the case study is conducted with only 9 sessions of SI per student group. As a consequence of few SI leaders, the amount of students participating in the study is limited to a 7th grade and one 9th grade class.

### 2.2.3 Validity, Reliability and Replicability

The nature of this thesis' purpose, to identify causality from SI to LOQ among individuals, involves a social context with numerous factors separate from SI affecting the students. These factors are by us referred to as noise, see Figure 4. One type of noise is that the SI-program that we conduct includes other factors than just the influence of SI, such as our gender, age, attitude, nationality, interests, and the way we talk to the students inside and outside of the classroom. Another type of noise is that the students participating in our SI-program are exposed to other effects than just SI during the course of our case study, e.g. other classes, spare-time activities, or even the emergence of spring. Notably, this noise can be both positive and negative, meaning that the effects of the noise can both encourage and discourage LOQ of individuals.

Figure 4



Figure 4 An overview of what different types of factors that will influence the development of LOQ for individuals. Notably is that all types of factors, referred to as noise, can potentially either have a positive or a negative effect. Furthermore, note the authors' hypothesis of that SI has an effect that encourages LOQ of individuals.

The consequence of the noise is that the study's validity, reliability and replicability will be compromised. The case study is not replicable, and all the noise decreases the reliability. External validity regards the question if the study's result can be generalized into other contexts than just the particular research context in which the study was conducted (Bryman & Bell, 2005). If the external validity measuring LOQ of individuals in the case study would be high, then we also would be able to claim that the result would be generalizable to other schools. We expect a low external validity in this regard. This is mainly due to the explorative nature, the absence of a controlled environment and the overall lack of reliability and replicability of this study. In other words, it would be very hard for us to ever do the exact same study again, due to the highly specific nature of not only the type of SI and measuring of LOQ but also the very execution of the SI and measuring of LOQ. Therefore, this specific study cannot be used to predict results at another school. The low external validity could have been resolved with a larger sample of SI-participants and a variation of SI-leaders. We could also conduct a controlled study, where we facilitated half of the student groups in SI with a particular set of principles and half of the groups in some other type of pedagogy with another set of principles. But then we would probably not have had a school accepting us to conduct this study, since the SI-program combined with one of the author's experience and reputation was the reason we got accepted to the school. A pessimistic reader would argue that this study totally lacks value when not being reliable at all. The only notable external validity point, is that if we can implement conventional SI that works in the seemingly tough environment of Apelgårdsskolan, then we would be able to at least claim that we are able to have conventional SI with schools that have equal or better conditions. Conclusively, we are able to make a similar study at other schools, but reliability and external validity makes it hard to compare the results of the studies.

Internal validity reflects the extent to which a causal conclusion between two or more variables is correct and valid (Bryman & Bell, 2005). In this study internal validity regards if our definition of LOQs of individuals and SI are correct according to the thesis' purpose. Internal validity also regards if the LOQs are measured among the individuals as a consequence of SI and not of any other factor, in a valid way. We need to provide reinforcing arguments of that the observations in our case study are connected to LOQs as a consequence of SI. The methodology for increasing the internal validity is undoubtedly considered to be the biggest weakness of this thesis. The next sections describe each methodology for each research question.

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## 2.3 Dealing With These Challenges

Then how will the authors try to overcome these challenge? Essentially, the authors will try to shoot down these challenges with five types of bullet; (1) setting the bar of expectations of the thesis' outcomes to a level of basic understanding; (2) being aware of our pre-conceptions; (3) counter attacking with purposely designing a difficult case study; triangulation; (4); and (5) Transparency & Systematic Approach When Deriving LOQ to SI

### 2.3.1 *Setting the Expectation Bar on a Level of Basic Understanding*

As a consequence to the scarcity of resources and the exploratory nature of this thesis, the authors have chosen to set the bar of expectation on the thesis' outcome to a level of finding basic understanding of the relationship between SI and developing LOQs among individuals. This means that the relationship will not be tried to be explained or even described, but rather merely recognize an existence of the relationship.

### 2.3.2 *Being Aware of our Pre-conceptions*

The authors are not able to rely on previous findings when tackling the thesis' purpose, instead they are mostly relying on their own pre-conceptions when exploring their way to the answers. These pre-conceptions and their consequences are hence important to relate to when interpreting the thesis results. One way of further emphasizing the importance of this section is the following quote:

*"The frame of conception limits what you see, how you think and how you act." (translated from: Lundahl, Skärvad, 1992, s 57 ).*

This thesis is the degree project of the M.Sc. program in Technology Management (TM) at Lund University. This education has rewarded the students with extensive insights related to strategic management, project management, leadership, teamwork, etc. What is more, the program consists of 50 % engineering students from varying disciplines and 50 % business students, and this degree project has to be carried out with at least one student from each discipline. The consequences of bringing these two separate capabilities together allow for a higher degree of flexibility to "pic and choose" from different methodological structures when conducting this explorative study.

Both authors are born and raised in the same city, as the school is located, Malmö. This gives the authors better pre-knowledge about the neighborhood and the school than SI-leaders with another background. Additionally, the reader should be aware of is that Fredriksson's professional experience have the experience from an extensive engagement in Supplemental Instruction in over four years, as an SI-leader, SI-coach and supervisor of the SI-method. Making him very experienced when acting as a SI-leader. Lindberg's experience of Supplemental Instruction was more limited. Before the topic of the thesis was determined, Lindberg had no previous knowledge about SI's core compositions. However, in order to get a basic understanding he went through Lund University's SI training program.

### 2.3.3 *Difficult Case study*

The case study is not only carried out in a school system differing in student age. While traditional SI is taking place at universities with relatively strong academic performers, this thesis tries to show the impact at a school in Rosengård. The school is located in a socially challenged environment in Sweden that is characterized by alienation with socio-economic challenges. In short, the students at the school, and hence in this study, are generally at a larger risk of not succeeding in school. Three examples of the challenges that the school has are: to graduate the students with eligibility for further studies, weak native language or knowledge related language, and motivating the students to attend lessons, according to the school's principal (Skoog, 2014).

Also, the case study is very brief in order to induce individual traits that are favorable for Learning Organizations. The participating students will maximally go through nine hours of SI spread out over two and a half months. Assumingly, if effects are detectable, then the less exposure of SI, the stronger the effect.

### 2.3.4 *Triangulation To Increase Validation*

As earlier mentioned, this study is uncontrolled which is lowering the validity. Furthermore, because of the scarcity of resources of conducting this study, the size of the case study and the literature reviews are limited, which decrease the probability of detecting any effects of SI. Therefore, this thesis is tackling the purpose of this thesis from several points of view, namely by; conducting a literature review of the linkages between SI and LOQs among individuals, sending out questionnaires of personally experienced development of growth as a consequence of SI, interviewing students about SI and how it might have induced

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LOQs, interviewing school staff about SI, in classroom observations of SI, and continuous evaluations on how “learning” the groups were in each SI-session. This usage of more than one method or source of data when studying social phenomena is called triangulation and can be used to increase validity of results (Bryman, Bell & Nilsson, 2005). Furthermore, ethnographers usually use interview questions to verify their observations in order to be certain of not misunderstanding what they have seen or what they have heard (Bryman, Bell & Nilsson, 2005).

### *2.3.5 Transparency & Systematic Approach When Deriving LOQ to SI*

When conducting a study this explorative it involves a large extent of exploring new methods. Therefore, there is a great need of clearly communicating and motivating the reasons behind why the thesis has been carried out the way it has been, i.e. choice of methods and choice of outline. What is even more, to study development of LOQs among students is as earlier mentioned much uncontrolled. This heavily reduces reliability and validity, especially regarding SI’s role in any potentially observed LOQs among students. Hence, when trying to derive LOQs among students to SI it is crucial to understand and be transparent about to what degree is SI the reason behind any emergence of LOQs among students.

# Learning Organization Qualities

3



## 3. Learning Organization Qualities

This chapter presents an overview of the Learning Organizational typology and what “building blocks” constitute a Learning Organization. These “building blocks” of a Learning Organization are then translated into “building blocks” of a Learning Organization individual - Learning Organization Qualities of individuals.

### 3.1 Senge And Beyond - A Literature Review of The Learning Organizational Typology

#### 3.1.1 The Wide Meaning of the Term Learning Organization - Confusion or Flexibility?

Peter M. Senge, considered as “Mr. Learning Organization” (Marquandt, 1999) and even the “guru” of the Learning Organization (Jackson, 2000), has by far the most cited work on Learning Organization theory in his book “The Fifth Discipline”. Senge (1990a) himself, defined the Learning Organization as:

“organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together”.

However, Senge is not the only author that has tried to cover the aspects of the Learning Organization (Örtenblad, 2002). Örtenblad reviewed several different perspectives on the Learning Organization terminology with the purpose to clarify the typology of the Learning Organization. In order to do so, he tried to categorize the authors’ typologies in different types of understandings of the Learning Organization. These categories are: Old Organizational Learning; Learning at Work; Learning Climate; and Learning Structure. Old Organizational Learning addresses the situation where the individuals have learnt as agents for the organization and that the knowledge has been stored in the organization’s memory. Learning at Work simply means that learning can occur at work and not on courses. Learning Climate is a term that describes the situation where an organization facilitates the learning of all its employees. Finally, Learning Structure includes the perspective where the Learning Organization is considered an organic and flexible structure that can

adapt to a changing world (Örtenblad, 2002). The fact that there is a variation in the Learning Organization typology seems to be the opinion by the other Learning Organization authors as well. Marsick et al (2000) means that Senge (1990) named a phenomenon that several researches had been struggling to name. Watkins and Marsick (1993), defined the Learning Organization as an organization characterized by continuous learning in order to have continuous improvement, and that the organization has the capacity to transform itself. Örtenblad (2002) concluded that Watkins & Marsick’s (1993) approach was the only one that had a primary focus on all four, by Örtenblad defined, understandings of the idea of Learning Organization, while he found that Senge’s (1990) original work of the Fifth discipline just covered two; Learning climate; and Learning structure. Later, Örtenblad (2007) also problematized Senge’s typology and found that while different authors referred to Senge’s Learning Organization perspective they actually wrote different interpretations of what Senge meant. Finally, it shall be emphasized that Örtenblad (2002) found that the differences in the Learning Organization typology is not necessarily causing confusing but also flexibility. It gives organizations the opportunity to “choose a version suitable for their specific situation”. This flexibility will be used when we define learning organizational qualities of individuals.

#### 3.1.2 The Paradigm Shift of the Learning Organizations

Marquandt (1999), a third frequently referred author, means that a Learning Organization is a company that has the capacity to gather, store, and transfer knowledge and thereby continuously transform itself to be successful. Marquandt also present seven key paradigm shifts that distinguish a Learning Organization from the traditional organization.

The overall shift is that the learning takes place as an ongoing by-product of people carrying out their work, which stands in contrast to the previous conception of that knowledge should be obtained before performing a task (Marquandt, 1999). Marquandt also writes that the need for individuals and organizations to obtain more knowledge will be increased over time. The big shift is that what organizations know comes second to the ability how quickly they can learn.

### 3.1.3 Final remarks About the Learning Organization Typology

<b>Traditional Focus</b>	<b>Learning Organization Focus</b>
Productivity	Performance
Workplace	Learning environment
Predictability	System and patterns
Training and staff development	Self-directed learning
Worker	Continuous learner
Supervisor/manager	Coach and learner
Engagement activity	Learning opportunity

#### *for the Scope of this Thesis*

In conclusion, for the scope of this thesis different typologies of the Learning Organization share the following aspects: an organization that is able to canalize the learning among the organization's individuals for the account of the organization; and by that enabling the organization to adapt to shifts in its surrounding environment. An important take away from Örtenblad's (2002) research is that even though there are differences between different authors definition of the typology, it does not only create confusion. Örtenblad means that the differences also create flexibility for organizations that aspire to be Learning Organizations to choose a definition that suits the organizations' needs best. Hence, organizations can become a Learning Organization in numerous ways. Therefore, we find it necessary to also describe a wide range of qualities for an individual, instead of just going with one author's description. While describing those qualities from a wider range of authors we also increase the likelihood to measure the development of Learning Organization Qualities (LOQ) among individuals according to at least one author's definition.

### **3.2 Learning Organization Qualities of an Individual are:**

In order to see if Supplemental Instruction can develop LOQ among individuals, it is necessary to explore how such an individual would be

described in the Learning Organizational literature. However, since the nature of the theoretical framework primarily directly describe organizational characteristics and not individual, it is necessary to make some sort of translation of LOQ among organizations to LOQ among individuals. The translation of LOQ of organizations to LOQ among individuals is carried out and presented in three steps:

1. First, qualities of the Learning Organization from different authors are categorized into different themes, describing different LOQs that share commonalities.
2. Each theme of LOQ of the organization is then converted into LOQ of an individual.
3. Finally, we will provide a couple of examples of how developing LOQ among students as a consequence of SI could come to expression.

#### *3.2.1 To Understand Systems and How Actions Influence Each other*

Senge (2006) means that businesses as well as other social activities are linked in different systems. Some of links take years in order to fulfill their effect on other systems and the interrelated connections between the systems are not always visible (Senge, 2006). Organizations and the people in them tend to focus on certain isolated pieces, subsystems, of a bigger system, without taking the relationships between the subsystems into account when taking action. Senge's (2006) System Thinking provides a conceptual framework to deal with the issue when focus on subsystems fails to solve the core issues for the bigger system. System Thinking also clarifies full patterns of our issues and shows us that the underlying world is intuitive. An important aspect of System Thinking is to not merely to focus on the symptoms of the problems. Instead the individual and the organization should try to question the solutions of past problem solving that may have resulted in new, other problems. By doing that, the system thinker can solve the core, which is often structural, issue. If you have a System Thinking approach when solving problems you could avoid shifting a problem to another system by solving the first system's issue. One example would be a manager who tries to solve the problem of high inventory costs by cutting the inventory level causing a negative effect on the sales team's service level. Such problems often go undetected since the person who solves the first problem usually is not the same person who inherits the

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second (Senge 2006). Marquandt (2011) summarizes System Thinking to something that “represents a conceptual framework with which to make full patterns clearer and determine how to change them effectively.” Marsick & Watkins (2003), write that a Learning Organization can “connect the organization to its environment”. This means that employees are helped to see the impact that their work has on the entire organization, and to scan the environment and use information to adjust their work behavior. The organization should also be connected to different communities that affect the organization.

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Able to see beyond the normal patterns and make the full picture more visible in order to change these patterns (Senge, 2006, Marquandt, 2011).
- See actions, organizations and people as systems that interact with and affect each other (Senge, 2006).
- Able to question past solutions in order to find if there is an unsolved, core issue, that affects the system. (Senge, 2006).
- Avoid solving problems by creating new ones by pushing the problem over to someone else (Senge, 2006).
- Seeing what work and actions that contributes and affect the entire organization (Marsick & Watkins, 2003).
- That can adjust their work after what the environment demands from the organization (Marsick & Watkins, 2003).
- Connecting the organization to communities that affect the organization (Marsick & Watkins, 2003).

How is System Thinking coming to expression when providing SI to 7th and 9th graders? We are interpreting the System Thinking abilities to being able to see how different actions affect not only the context in which the action is taken, but that the action also has an effect on contexts outside of it. In the terms of our study we are primarily looking for indications of students who, as a result of attending SI sessions, would increase their understanding of how math lays the foundation to their learning in other courses, of for example

physics. We are also linking System Thinking to their understanding of how a negative motivation in one subject may cause a negative spiral to their overall education. Students that increase their self awareness of their education as a whole and not just in separate subjects with independent relationships with different teachers is also considered to develop System Thinking qualities. Finally, in terms of continuous education, a System Thinking approach is considered to be present when students realize that their learning in lower secondary school would lay a foundation of continuous education at upper secondary school and even university.

### *3.2.2 To Use Technology and Systems To Strengthen Learning*

According to Marquandt (1999) a Learning Organization uses technology to optimize learning and productivity. Marsick and Watkins (2003) write that a Learning Organization can create systems to capture and share learning. This means that the organizations integrate high- and low-technology systems with the organizations work in order to increase the sharing of learning.

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Using, creating and integrating both advanced and simple technology with the work in order to enhance sharing of learning (Marsick and Watkins (2003);
- and they do this both outside and inside of the organization (Marquandt, 1999).

So how would this LOQ of using technology and systems to strengthen learning be observed as a consequence of our SI-program? The internet provides different instructive solutions and problem solving challenges with the purpose of strengthening learning in math. For example, we used an interactive learning website, matteboken.se, at all SI sessions where we used the smart board (a digital interactive white board). Examples that we believe express an increased use of technology for strengthening learning is if the students use the whiteboard, smart board, software or websites on the computer or even their own phones, but it would have to be in the purpose of increasing their learning. If the students simply use the computer because it is more fun or as a distraction we do not count that as an observation of LOQ at all. We do not expect to find any clear examples of the students using any

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advanced systems for their learning, since they are only 7th and 9th graders in a school that does not have rich amount of resources.

### 3.2.3 To See Deviating Opinions and Ideas as Something Positive

Gavin et al (2008) write that psychological safety is an important aspect when creating a “supportive learning environment”. It addresses the issue when employees fear to be: marginalized when they disagree with authority; judged when asking naive questions; afraid to show mistakes; or afraid to present a minority opinion. In a psychological safe environment the employees do not fear this and are feeling comfortable communicating their views and beliefs. According to Marsick & Watkins (2003), a Learning Organization should promote inquiry and dialogue, which mean that the organization let people gain “productive reasoning skills” in order to express the individuals’ own views. The individuals should also gain the capacity from the organization to listen and show interest in others points of view. Furthermore, it is important that the employees are able to show appreciation of differences since it helps learning by increasing the awareness among employees that there is a value of opposing ideas. When employees appreciate differences, competing viewpoints increases energy, motivation, induces new thinking and prevents fatigue and drift away from purpose (Gavin et al, 2008). Gavin et al (2008) also emphasizes the importance of daring to question authority.

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Appreciating different opinions (Gavin et al, 2008).
- Daring to state their viewpoints and opinions (Gavin et al, 2008).
- Showing interest in other people’s viewpoints (Marsick & Watkins, 2003).
- Listening to other people’s opinions (Marsick & Watkins, 2003).
- Daring to question authority (Gavin et al, 2008).

Qualities of an individual that sees deviating opinions and ideas as something positive is expressing, showing interest in, listening and appreciating deviating opinions and viewpoints. For a 7th or 9th grader we think that this is shown by an increased tolerance among the students. We are for example looking for the

occurrence of a situation when a student gives a deviating suggestion of a solution after another student has provided an answer. Another aspect we will observe is the social leaders in the classroom that affects the spirit of the classroom. If we are observing the students questioning these social leaders we consider this as they are questioning authority.

### 3.2.4 To Allow Others and Themselves to Make Mistakes

It is important that in a Learning Organization people dare to make mistakes, in order to learn from them (Marsick & Watkins, 1999). Openness to new ideas emphasizes the importance of an organization that is encouraging employees to take risks, test new things and explore the unknown (Gavin et al, 2008). Without being able to honestly admit mistake employees can be limited from taking necessary risks to move the organization forward (Gavin et al, 2008). Marquandt emphasizes the importance of having an organization that can deal with unexpected surprises and can see failures as opportunities to learn (Marquandt, 1999). Furthermore, learning is not merely about correcting problems and learning from mistakes. It is also about creating new concepts.

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Not fearing to make mistakes (Marsick & Watkins, 1999).
- Able to honestly admit mistakes (Gavin et al, 2008).
- Seeing unexpected surprises and failures as opportunities to learn (Marquandt, 1999).
- Testing new things and exploring the unknown (Gavin et al, 2008)
- Taking risks (Gavin et al, 2008)

The literature emphasizes the importance of being able to see positively on mistakes and have the courage to make them. In the case study we are looking for situations when the students are getting outside of their comfort zone, trying to solve more difficult problems than earlier, and coming with proposals that they are uncertain of. This could be the case if they to a greater extent dare to “raise their hand” or expressing ideas in the classroom. We are also looking for an increase of acceptance among the students when other students fail to solve a problem. This would most likely be observed by a decrease in

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rough and mean rhetoric between the students when one student is wrong. Finally, it is relevant to notice if the students to a greater extent admit when they are wrong in front of each other by simply saying: “I am wrong” or not defending their own position or opinion as strongly as before.

### *3.2.5 To Reflect on and Question Themselves and their surrounding environment*

Mental models are mindsets, deeply integrated assumptions, which influence the way people interpret the world. Mental models can be explained as prejudices or preconceptions we have about other people based on assumptions of how they dress or act. Senge’s (2006) writes that one way to work with mental models is to look on the organization’s internal picture of the world in order to be able to evaluate the surrounding world (Senge, 2006). Marquandt (2011) write that Mental Models can be our image of learning and work that influences interactions and behavior in specific situations. Gavin et al (2008) writes that a supportive learning environment should give time for reflection so that the employees can learn from their experiences and diagnose problems. Marsick and Watkins emphasize the importance of an organizational culture that supports questioning and feedback in order to promote inquiry and dialogue. Marquandt (2011) mentions Self-directed learning as one of the “key skills” of a Learning Organization. Self-directed learning means that the individual knows their own learning style, is able to assess their needs and competence and can connect business objectives to these learning needs.

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Questioning the prejudices and preconceptions about other people (Senge, 2006)
- Able to look internally at the organizations view of the surrounding world and able to evaluate it (Senge, 2006)
- Spending time on reflection (Gavin et al, 2008).
- Knowing how they learn in the best way (Marquandt, 2011)
- Able to link objectives to their learning needs (Marquandt, 2011)
- Giving feedback to their peers (Marsick & Watkins 2003).

We are looking for situations where the students challenge their prejudices about their own and others’ capability to solve problems. This could be expressed by having students taking on harder math problems than they previously thought they were able to solve. A realistic observation would be if a student shifts from a self-image and rhetoric of “I can’t solve this, I am not good at math” to something like “I can actually do this” or “I can, if I try”. The aspect can also come to expression if the students to a greater extent accept that new students take a leading role in the group dynamics, perhaps by having a new student by the board or having a student not associated with being a good math student, showing that they too can solve hard questions.

Promoting reflection is emphasized as a key aspect of the Learning Organization and if the students to a greater extent show or admit that they reflect upon their education, their role in the classroom, the school, the teacher and even their educational future, this would to us illustrate examples of a reflective student. It can also be that they ask us questions of how to get in to a certain high school or university. Another example would be if they come back with new thoughts obtained between sessions, showing that they have been thinking of what we went through on the last session. Additionally we are observing if they can show that they have increased their ability of critical thinking or to connect objectives, such as performing during a test or getting in to a certain high school, to their learning.

Feedback among peers is the final aspect of the reflective individual the Learning Organization seeks for. We realized very early that the form of feedback 7th and 9th graders would give each other usually is very harsh and honest. The key question is if they are giving each other constructive feedback to a greater extent as a result of SI. Such constructive feedback would come to expression with students that with a greater objectively precision can emphasize what is positive and negative with the SI tutoring and they do so in a more constructive manner. So in other words; instead of just saying for instance “math sucks”, they are able to point out the good aspects of the SI sessions and come with proposals for improvement.

### *3.2.6 To Collaborate and Prefer Learning Together with Others*

In organizations the intelligence of the team can exceed the intelligence of the team members. Still, other organizations with individuals with a high IQ may have a much lower “collective IQ”. The discipline of team learning confronts

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this paradox. Teams with a successful team learning capability perform extraordinary results as well as develop the team members to a level that would not be reached otherwise. The team's thinking characterizes the Team Learning capability, allowing the team to reach insights that would not be able to reach individually (Senge, 2006).

Marsick & Watkins (2003) means that the ability to Encourage collaboration and team learning is important for an organization in that sense that the work in the organization is designed to let groups access different thinking modes. Furthermore, groups should also be expected to learn and work together. Culturally the organizations should encourage, reward and value collaboration among individuals (Marsick & Watkins, 2003, Marquandt, 1999).

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Promoting dialogue among their peers (Marsick & Watkins 2003; Marquandt, 1999)
- Encouraging, valuing and contributing to reward collaboration (Marsick & Watkins 2003, Marquandt, 1999)
- Able to use different thinking modes when learning in group (Marsick & Watkins 2003)

The nature of the SI sessions is collaborative learning. The main reason for appreciating group work is the belief that a collective group of people is able to solve bigger problems than sole individuals. Making the students realize that they can use their peers to increase their learning would simply be an expression of this aspect. It would be even better if we could observe that their preference has moved from working alone to appreciate group work. It is also interesting to see if they encourage and reward each other while working in groups and if they are able to use different individuals thinking styles while solving a problem together. The most realistic way to observe this is if they instead of turning to the SI leader would turn to each other to solve problems together.

### 3.2.7 To Set Goals Individually and Together with Others

People with a higher degree of Personal Mastery have an ability to consistently realize the goals, which matter most to them, a personal vision.

Personal Mastery is the “spiritual” piece of the Learning Organization. The personal mastery affects the organization in that sense that an organization's commitment and capacity cannot be bigger than the sum of its members commitment (Senge, 2006). An organization should also be able to empower people toward a collective vision. People are involved in setting and implementing a common vision. In order to motivate people to learn from what they are held accountable for, responsibility is connected close to decision-making (Marsick & Watkins, 2006).

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Having a sense of what goals matter most to them and are committed to work towards those goals (Senge, 2006).
- Involved in setting the organizations common vision (Marsick & Watkins).
- Feeling responsibility for the actions they are accountable for (Marsick & Watkins, 2006).

We cannot assume that all students have a goal with their education. Hence, a first example of development of this LOQ would simply be that students without a personal goal for their education show that they have started to think about their future. The 9th graders, being very close to their high school applications, would naturally spend more time setting goals for themselves of what high school education to get into. However both the 7th graders and 9th graders could set up short and long term goals. It could be to pass a certain subject, reach a certain grade, improve their skills, get into a certain high school or even lay the foundation of getting into a specific university education.

We believe that the organization in our case would have to be defined to the class and the two subgroups of each class. We find it a bit extensive to expect that the student would set a vision together, at least something they would call a vision. However, during the SI sessions we are looking for examples of students coming together and setting a goal for each session, or task, with or without the assistance of the SI-leader.

### 3.2.8 To Share Knowledge With Others

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It is important that the Learning Organization has good processes for knowledge sharing. The purpose is that the processes ensure that the information essential for those who need it quickly and efficiently travels and reaches their target group. Gavin et al (2008) divide the knowledge sharing processes in to two processes: Internally focused, where the aim is to take corrective action, examples could be post-project audits or reviews that will be shared to other teams that performs the same task; and Externally oriented, processes that may include forums with costumers, experts to receive their view on the organizations challenges and activities (Gavin et al, 2008). Gavin et al (2008) gives learning processes a big role when creating a Learning Organization. Learning processes include activities to gather, interpret and spread information. The processes also include: experimentation and testing of new products; collection of data for trends; analysis and interpretation in order to identify and solve problems; and education and development of new and established employees (Gavin et al, 2008).

Conclusively it can be noted that a Learning Organization asks for a person that is:

- Sharing knowledge among their peers (Marquandt, 1999).
- Sharing knowledge internally in the organization order to correct internal sub optimization (Gavin et al, 2008).
- Gathering, interpreting, and spreading information (Gavin et al, 2008).
- Sharing knowledge outside of the organization in order to get external input on the organization's challenges and activities (Gavin et al, 2008).

Besides being group based; one major aspect of the SI-session concept is for the students to share their knowledge among each other. So by just participating in the SI sessions they would increase their experience as knowledge sharers. If the students are identifying where their peers fail in their reasoning and calculations and share this to them, this is considered to be an example where they act against sub-optimization. Also by sharing what they know to the SI-leader in order to improve the SI-sessions is considered to be an example where the students share knowledge in order to avoid sub-optimization.

### 3.3 Conclusions About The Learning Organization and the Individual

The literature has not reached a consensus regarding the typology of the Learning Organization. This is not necessarily a weakness. The denominator that the researched typologies have in common is that it involves learning for an organization in order to in some way change its own conditions for moving one step further in the future of its surrounding environment. However the method of how to reach this state varies among different authors. When researching about the attributes or “building blocks” that a Learning Organization should be built upon, we have “translated” those attributes to a description of an individual that a Learning Organization asks for. The themes of Learning Organization Qualities among individuals that are being studied in this thesis are:

- understanding systems and how actions influence each other;
- using technology and systems to strengthen learning;
- seeing deviating opinions and ideas as something positive;
- allowing others and themselves to make mistakes;
- reflecting on and question themselves and their surrounding environment;
- collaborating and preferring learning together with others;
- setting goals individually and together with others;
- sharing knowledge with others.

# Supplemental Instruction

# 4



## 4. Supplemental Instruction

This starts with describing a historical background as well as a description of Supplemental Instruction as an academic support program. This will be followed by a brief literature review of observing potential Learning Organizational Qualities among students as a cause of SI.

### 4.1 SI - A Historical Background

Supplemental Instruction (SI) was developed 1973 at University of Missouri, Kansas City (UMKC) as a response to a dramatic demographic change in their student body and a sudden rise in student attrition. The dramatic change followed a reduced academic selectivity of students, with a lower level of previous academic achievement than before, but the same faculty continued to teach at the institution and they had the same high academic expectations. As a direct consequence of an increased mismatch between student academic capability and faculty academic expectations, attrition at the institution went quickly from 20% to 45% (Widmar, 1994). So, in 1972 a paradox was created at UMKC, namely how to reduce student attrition with negligible funding and the faculty not permitting remedial nor developmental coursework. Deanna Martin, a then doctoral student in reading education, was hired to solve this problem, and started from looking at concerns with traditional approaches to helping students, e.g.: standardized tests being insufficient to predict students who needed assistance; services were often provided too late to help students; students lacking time or money to enroll in additional developmental courses; students often did not avail themselves of services for fear of being stigmatized; and inadequate evaluation of learning services (Widmar, 1994). The plan that Deanna Martin proposed appealed to UMKC's retention committee on several grounds, e.g.: SI could be evaluated in terms of reduced attrition and grade improvement; if the SI program in each course began before the first recording of examination scores and if SI were open to all students on a voluntary basis this would avoid an implication that student support was remedial; a small fiscal commitment to the pilot program since it required a minimum of faculty time; and that SI would promote independent learning by the students (Arendale, 2002).

Martin successfully pilot tested SI in 1973 during a human anatomy class at UMKC School of Dentistry, which gained significant financial support to expand the SI-program from 1976-1980. This financial result allowed SI to be spread successfully in a variety of courses in the professional schools of dentistry, pharmacy, and medicine, later leading to be implemented at the undergraduate level in 1981 (Martin et al.,

1983). In a historical review of SI, Arendale (2002) means that “social change is more likely to occur as a practical response to specific events than as the implementation of a well-developed ideology.” The choice to initially implement SI at the graduate and professional school level for later reaching undergraduate prevalence did, in retrospect, enable SI to take this step by avoiding faculty members to dismiss SI as something designed for less able students.

Since then, SI as a concept has gained a large impact and is, according to Martin in 2008, implemented at more than 1500 colleges and universities in around 30 countries (Martin, 2008).

### 4.2 Supplemental Instruction - An Overview

What is SI? The International Centre for Supplemental Instruction (ICSI) formulates a definition of SI covering a general description of SI, SI's purpose, and SI's participants. This definition is presented here:

“Supplemental Instruction (SI) is an academic assistance program that utilizes peer-assisted study sessions. SI sessions are regularly-scheduled, informal review sessions in which students compare notes, discuss readings, develop organizational tools, and predict test items. Students learn how to integrate course content and study skills while working together. The sessions are facilitated by “SI leaders”, students who have previously done well in the course and who attend all class lectures, take notes, and act as model students.”

The ICSI defines that the purpose of SI is to:

- Increase retention within targeted historically difficult courses
- Improve student grades in targeted historically difficult courses
- Increase the graduation rates of students

About the participants the ICSI writes:

SI is a “free service” offered to all students in a targeted course. SI is a non-remedial approach to learning as the program targets high-risk courses rather than high-risk students. All students are encouraged to attend SI sessions, as it

is a voluntary program. Students with varying levels of academic preparedness and diverse ethnicities participate. There is no remedial stigma attached to SI since the program targets high-risk courses rather than high-risk students.”

This definition provides a seed for an overview of SI. However, it is important to keep in mind that there is a tolerance for what is allowed to be called SI. In fact, the individual SI-programs at different institutions across the world holds different attributes from those defined by ICSI, but they are still called SI. Some of the numerous proofs of deviance will be exemplified here. North Carolina Agricultural and Technical State University has driven faculty led SI-sessions instead of student lead as defined by ICSI (Drake & Foresman, 2012) The SI program at the Faculty of Engineering at Lund University does not require SI-leaders to attend all class lectures but instead only once a week and the programs initiated at upper secondary schools are compulsory for the students (Mörner, 2014). At Halmstad University some of the SI-sessions are led simultaneously by two SI-leaders (Mörner, 2014). As a final remark on the tolerance of the definition of SI, a synoptical overview of the ICSI definition contrasted to other SI-program setups is provided in Table 3. Another interesting ability of SI is that it is discipline independent, which is illustrated by the diverse array of disciplines that use SI in Figure 5.

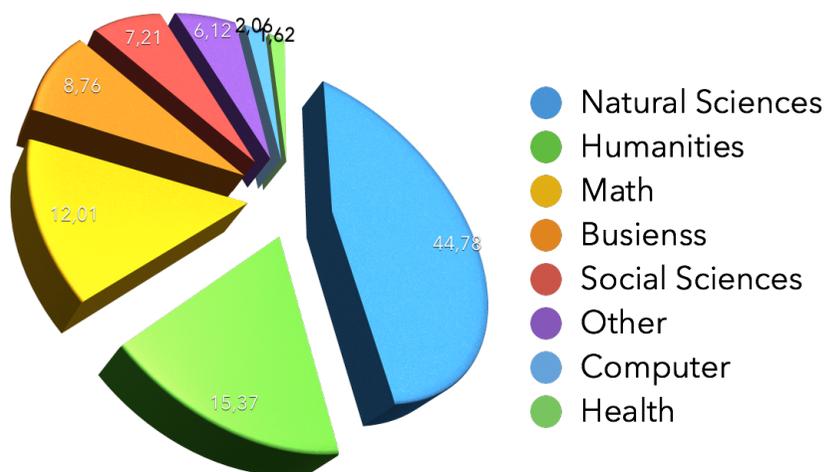


Figure 5 Academic disciplines using Supplemental Instruction. U.S. Data, Fall 2002 – Spring 2013, 69 institutions, 5,686 courses, n = 726,320 students © (University of Missouri-Kansas City, 2014).

#### 4.2.1 What is SI in the Classroom?

On a more conceptual level, SI is not only a method, but an approach to learning where intrinsic motivation and curiosity is the central drivers, and where self-governing and collective learning is emphasized (Olstedt, 2005). Since the supplemental instruction uses collaborative techniques as a basis, it also promotes social interaction in an academic environment, which, according to Tinto (2010), is a good way to increase retention.

To exemplify how a typical SI session could be like, it is usually based on material that the students have perceived as difficult during the preceding week. It can for instance relate to concepts, formulas, motivation or other problems. Alternatively, if the students do not have any suggestion of material to cover, the SI-leader will have prepared some material to work with. The work is then done in collaboration between the students. The form of collaboration is chosen by the SI leader dependent on the situation and the material. It can be small or large group discussions, or presentations, or competitions such as quizzes. The SI-leader and the participants’ imagination set the borders. The SI session is usually concluded by the students summarizing their results on the white board.

To get a more hands on description of what constitute SI in the classroom, a summary of SI principles or activities will be presented. These principles or activities are collected from an SI leader training manual and it was developed based upon the training from the University of Missouri-Kansas and has been modified to accommodate a diverse population (Hope and Witt, n.d.).

- Directing discussion back to the group, e.g. “Let’s rephrase that on the board and figure out what information we need.”
- Closure techniques. To ensure that students do not lose sight of the “big picture”, the last few minutes should be reserved for review.
- SI leaders are more effective when they are not perceived as authority figures.
- It is more effective to “model” how successful students learn a particular subject than it is to “tell” students what they need to know. Show them how to be independent learners.

Table 3	ICSI	Faculty of Engineering at Lund University	Upper Secondary Schools with SI-leaders from Lund	Halmstad University	North Carolina Agricultural and Technical State University	Case Study
<b>Peer-assisted study-sessions</b>	Yes	Yes	Yes	Yes	No	No
<b>Informal review sessions</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Regularly-scheduled sessions</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Students working together</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Students learn how to integrate course content and study skills</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Characteristics of SI-leaders</b>						
<b>Students</b>	Yes	Yes	Mostly by external university students, but occasionally by own students.	Yes	Not always. Sometimes by faculty.	No
<b>Attendance at all class lectures</b>	Yes	No, one lecture a week	None.	No, one lecture a week.	Unknown	None.
<b>Act as model students</b>	Yes	Yes	Yes	Yes	Non-applicable when faculty-led	Yes
<b>Single-led</b>	Yes	Yes	Yes	Sometimes led by two	Yes	Yes
<b>Characteristics of Participants</b>						
<b>Voluntary participation</b>	Yes	Yes	No, compulsory.	Yes	Yes	No
<b>Offered to all students in a targeted course</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Remedial stigma</b>	No	No	No	No	No	No

Table 3. A display of the flexibility of the concept of SI with an overview of different SI-program setups compared to the definition given by ICSI. The SI-program is categorized into SI-program components, SI-leader characteristics, and SI-participants characteristics, which are chosen in accordance to the ICSI definition. The examples of SI-program set ups that are compared to the ICSI definition are the set ups at Faculty of Engineering at Lund University, the Upper Secondary Schools that Lund University serve, the Halmstad University, the North Carolina Agricultural and Technical State University, and our case study at Apelgårdskolan.

- Avoid interrupting student answers.
- Do not simply provide answers.
- Wait for students to volunteer a well-developed answer, even if, it takes an uncomfortable amount of time.
- Collaborative learning techniques such as: group discussion; clusters, where group participants are divided into smaller groups for discussion; and individual presentation by one person to the group.
- Icebreaking / Check-ins. A major part of the SI leader training manual focuses on different ways of icebreaking to get the SI sessions started.

These principles and activities provide a distinct character to SI while yet providing a wide applicability in the classroom. Hence, a fundamental framework of SI is established when trying to causally link observations of LOQ among students to SI. Supplemental Instruction at Earlier Stages than University

### 4.3 Supplemental Instruction at Earlier Stages than University

Since our thesis is conducting a case study of a Supplemental Instruction program at a lower secondary school it is for a few reasons interesting to see if SI has been used in a school setting at earlier stages than at university level. Namely, the lower degree of SI-presence at early educational stages, the more deviated setting and the higher degree of exploratory nature of our case study. The higher degree of SI-presence at early educational stages, the more firm knowledge we will have in terms of expectations and design on how to conduct our case study.

The prevalence of Supplemental Instruction at universities is vast, with active SI-programs at some 1500 colleges and universities in 2008 (Martin, 2008). But how prevalent is SI at earlier stages in the educational sequence? The literature reveals an incredibly small occurrence of reports of SI at earlier stages than university level. By searching through the ICSI's annotated bibliography of Supplemental Instruction (University of Missouri-Kansas City, 2009) and using the keywords "Supplemental Instruction" + "secondary school" on google scholar, only a few examples of SI in pre-tertiary education

is shown. In fact, only a handful, known to the authors, papers reports this, and the cases are foremost in the upper secondary school (Malm, Mörner, Bryngfors, Edman & Gustafsson, 2012; Malm, Bryngfors & Mörner, 2012).

The prevalence in lower secondary school is, to the authors knowing, limited to two found examples. The first example is not very applicable since it only covered fifteen 7th and 8th grade students with disabilities (Peoples, 1993). The second example is related to our case study, and here Martin and Arendale (1993) are reporting on the use of SI at a culturally-diverse urban high school on 9th and 10th graders. Over half the students were economically disadvantaged and an equal number were one or two years behind grade levels in reading and mathematics. The effects of the study showed a boost in student grades and interviews with students and teachers suggest that participation in the SI program also promoted higher levels of class participation and higher achievement on standardized test scores.

In conclusion, our case study of testing the effects of SI on junior high school children is considered to be exploratory, but with one example by Martin and Arendale (1993) indicating effects of 9 and 10th graders receiving better grades, higher achievement on standardized test scores and a higher level of class participation.

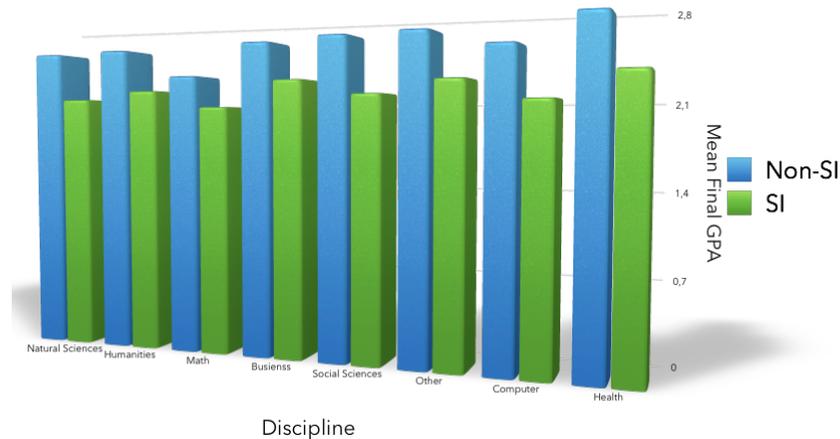
### 4.4 Supplemental Instruction and its Effectiveness

By this stage in the theoretical review of SI we hope that you as a reader have built an understanding and intuition of SI as an academic support program. By being that, you are fully prepared to understand not only the effects of SI, but foremost the root of these effects. The effects presented in the literature are almost exclusively related to either improving grades or increasing retention, and only a small portion, to the authors' awareness, is presenting softer values such as attitudes to learning and motivation. We have chosen to categorize the effects into retention, student grades, and LOQ effects of SI participants and will be presented in the same order.

#### 4.4.1 Supplemental Instruction and retention

Supplemental Instruction was partially born from a need of increasing student retention. This is also reflected in the literature as one of two most prevalent

metrics on SI's effects. How effective then is SI in dealing with attrition? One indication of this effect is found in Figure 6, which displays a vast collection of data (60 institutions, 5,686 courses and 696,031 students) on student retention for SI and non-SI participants over an eleven years long period. Here, it is a profound difference (with the exception of the computer discipline) in the rate of which students are graded D, F or are withdrawn. For instance, in the business and health disciplines the SI participants have 48% and 41% the amount of DFW rate compared to the non-SI participants. Conclusively, there are reasons to believe that SI has a profound effect on retention. Also, note the diversity of the disciplines that SI is applied.

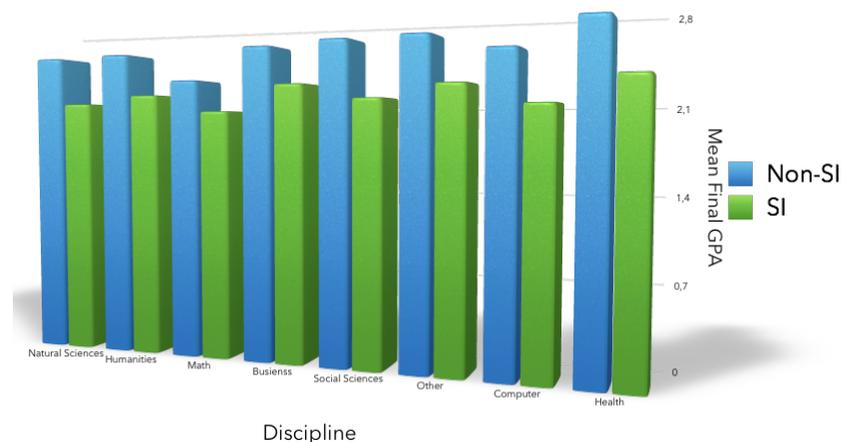


**Figure 6 Percentage of D/fail/withdrawal (DFW) final course grades for SI and non-SI participants separated by discipline. U.S. data, fall 2002 – Spring 2013, 69 institutions, 5,686 Courses, n = 696,031 students © (University of Missouri-Kansas City, 2014).**

#### 4.4.2 Supplemental Instruction and Student Grades

The second of the two most prevalent metrics on the effects of SI is student grades. This metric's high prevalence is logical, on an analogous basis as student retention, given that the purpose of SI is partially to improve student grades. SI has a profound effect on student grades, which is illustrated in figure 7. The figure displays a vast collection of data, from 69 institutions, 5,686 courses and 726,320 students presenting the students' mean final GPA over 8 diversely different disciplines where SI has been applied. And the results are rather unanimous. Students participating in SI are in average

receiving higher GPA's than students not participating in SI. For example, the average GPA of SI participants compared to non-SI participants where 2.66 and 2.19 respectively in the social sciences, and 2.35 and 2.09 in math where the relative effect of SI was weakest in this study.



**Figure 7 Mean final grades of SI and non-SI participants separated by discipline. U.S. data, fall 2002 – Spring 2013, 69 institutions, 5,686 courses, n = 726,320 students © (University of Missouri-Kansas City, 2014).**

#### 4.4.3 LOQ Effects of SI participants

What is the literature saying about SI as a tool for developing LOQs? Most articles focus on student grades and retention but there are numerous other publications on the effects of SI on SI participants. Malm, Mörner, Bryngfors, Edman & Gustafsson (2012) evaluated the effects of SI on SI-leaders and SI-students at 11 upper secondary schools in Sweden by handing out questionnaires regarding the SI sessions influence on their studies and general skills. The article concludes that SI does not generate all of the tested skills, such as developing the students' way of studying, which will be useful in other courses. However, SI seems to develop several general skills for a large portion of the over 120 respondents, especially the ability for teamwork and collaboration in groups, as well as the ability to present problems/solutions in front of others. The study also compared two parallel first year classes with regard to learning in mathematics at one school, one having SI and one not having SI. The classes had similar composition in terms of gender and distribution of math grades, indicating

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similar initial view on math studies. Here, the responses showed a pronounced difference in average class answer, in favor for the SI-classes, regarding how they best learn mathematics: solving problems on the white board in front of others (3.3 vs 2.5 on a scale of 1, never true, to 5, always true), working in small groups (3.5 vs 2.9), working with a class mate (3.9 vs 3.4), and explaining to a class mate (4.2 vs 3.8). The study also examined the teachers' views on the SI sessions' contribution for their students. Examples of clear influence of SI sessions are evident in comments on the open-ended questions "Comment on how useful it has been for you to have SI sessions to complement your teaching" and "What do you see as the main influence that the SI sessions have had on your students?". Examples of comments:

"They have learned how to work together."

"The students that regularly attend SI sessions during their time in upper secondary school have developed drastically, not just knowledge wise but also in their confidence in their own ability. I have also noticed that the students help each other more often. I see this as an effect of the SI sessions, where they see that explaining to a fellow student helps their own understanding."

Another example of effects is reported by Malm, Bryngfors & Mörner (2012) that described transfer effects to other courses, i.e. the attendees of SI gained a higher course credit production over the following studies after participating in SI. This transfer effects was attributed to better study strategies and skills, self-esteem, and an established network of study partners.

Last but not least, an unpublished set of data describing 1350 SI participants' views on SI from Fall 2011 through Fall 2013 at the Faculty of Engineering, Lund University indicates further examples of LOQs among individuals as a result of SI. The data is from questionnaires with a set of statements that the respondents could agree on on three levels: do not agree at all or to a little extent, half-agreed, and agrees completely or to a great extent. If selecting all statements that at least 40 % of the respondents agreed completely or to a great extent, the following LOQs among individuals can be observed: Improving problem solving skills; improving teamwork and cooperation in group; development of critical thinking through group discussion; trained ability to present to others; development of way of studying, which will be useful in other

courses; improved self-confidence; 90% experiences it to have been easy to ask questions; and gained a better understanding of what is expected from me in the course.

In conclusion, the following examples of effects on the individual have been found in the presented studies:

#### *4.4.4 To Understand Systems and How Actions Influence Each other*

For the first two examples of the type of LOQ regarding being able to understand systems and how actions influence each other, the characteristics of being better prepared or even to better perform is qualifying to be considered as such LOQ. The gained understanding of what is expected from the SI participant is an understanding of the "bigger picture", thus qualifies to be considered as such LOQ. Examples from the selected data:

- Transfer effects to other courses in terms of a higher passing frequency (Malm, Bryngfors & Mörner, 2012).
- Development of way of studying, which will be useful in other courses (Malm, 2014).
- And gained a better understanding of what is expected from me in the course (Malm, 2014).

#### *4.4.5 To Use Technology and Systems To Strengthen Learning*

No examples of SI participants developed their ability to use technology and systems to strengthen learning were found in the selected data that was reviewed.

#### *4.4.6 To See Deviating Opinions and Ideas as Something Positive*

No examples of SI participants developed their ability to see deviating opinions and ideas as something positive were found in the selected data that was reviewed.

#### *4.4.7 To Allow Others and Themselves to Make Mistakes*

Regarding the LOQ of allowing others and themselves to make mistakes, the selected data showed three examples. All examples are qualified on the basis

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of showing components of not fearing to make mistakes, and able to honestly admit mistakes. Examples from the selected data:

- Learning to ask questions, according to Malm, Bryngfors & Mörner (2010).
- Students are more positive about showing their work to the class, according to Malm, Mörner, Bryngfors, Edman & Gustafsson (2012).

#### 4.4.8 *To Reflect on and Question Themselves and their surrounding environment*

Within this LOQ the selected data showed the example of that SI developed critical thinking through group discussion (Malm, Bryngfors & Mörner, 2010).

#### 4.4.9 *To Collaborate and Prefer Learning Together with Others*

The LOQ of collaborating and preferring learning together with others is generously prevalent in the selected data of SIs effects on individuals:

- Improved ability to work in a group;
- Improving ability to discuss problems in the subject, according to Malm, Bryngfors & Mörner (2010).
- Improved teamwork and cooperation in group, according to (Malm, 2014)
- Development of critical thinking through group discussion;
- Development of students' ability of teamwork and collaboration in group;
- They have learned to work together, according to Malm, Mörner, Bryngfors, Edman & Gustafsson (2012).

#### 4.4.10 *To Set Goals Individually and Together with Others*

No examples of SI participants developed their ability to use technology and systems to strengthen learning were found in the selected data that was reviewed.

#### 4.4.11 *To Share Knowledge With Others*

The quality of sharing knowledge with others is frequently prevalent in the selected literature:

- Improving ability to discuss problems in the subject, according to Malm, Bryngfors & Mörner (2010).
- And solving problems on the white board in front of others, according to Malm, Bryngfors & Mörner (2012).
- Trained ability to present to others, according to (Malm, 2014)
- Students are more positive about showing their work to the class;
- Students understand the value of verbally communicating mathematics;

Ability to present problems/solutions in the subject, in front of others, according to Malm, Mörner, Bryngfors, Edman & Gustafsson (2012).

### 4.5 **Conclusion About SI and the Individual**

There seems to be a correlation with the development of the following qualities among students as a result of students attending SI sessions:

- To Understand Systems and How Actions Influence Each Other
- To Allow Others and Themselves to Make Mistakes
- To Collaborate and Prefer Learning Together with Others
- To Share Knowledge With Others
- To Act as Role Models when Being In a Leader Position

# The Case Study of SI @ Apelgårdsskolan

5



## 5. The Case Study of SI @ Apelgårdsskolan

This chapter aims to describe describes the setting in which this thesis' case study was conducted as well as specifying how Supplemental Instruction was implemented. The description starts with the lower secondary school and continues with the SI program's participants, SI sessions, the SI leader and a set of principles used throughout the SI sessions.

### 5.1 The Lower Secondary School, Apelgårdsskolan

The thesis' aim is to evaluate how well SI can train individuals to be suitable for Learning Organizations. Another important objective is to examine how early SI is applicable to induce such an effect. The amount of research about SI's impact on participating individuals is vastly more extensive at university level than in upper secondary school, but at the lower secondary school level there is almost no previous research at all. Since SI has been proven to work well at both universities and upper secondary schools, we find the next appropriate step to be to examine SI's applicability in a lower secondary school, and we choose Apelgårdsskolan. Apelgårdsskolan is a school covering all classes from 0th (6 year-olds) to 9th grade. In addition to choosing younger participants of SI, Apelgårdsskolan, is situated in Rosengård, which is a socially challenged area in Sweden characterized of alienation with socio-economic challenges (Skoog, 2014). In short, the students of Apelgårdsskolan are generally at larger risk of not succeeding in school. Apelgårdsskolan had never come in contact with SI before, and in order to integrate us as much as possible to the case school, we met with the headmaster and administrative board of the school and got the chance to introduce ourselves and SI for the whole school's teacher staff at their capacity-building day. We also received full access to the school building with our own keys and work space.

### 5.2 The SI-Program

#### 5.2.1 SI Participants

Our SI program targeted one 7th grade and one 9th grade class. Our initial wish was to incorporate 8th grade students in the SI-program. The reason for this was to be able to follow up the project during the fall of 2014 with the same students (then in the 9th grade) working as SI-leaders for the at that point 8th graders. However, after advising the responsible teacher staff we changed our mind. Apelgårdsskolan had both a 7th grade and the 9th grade class with an appropriate need of extra supportive activities. According to the teachers, the 7th grade class had problems with its team spirit and the 9th graders were in particular need of an academic boost before the upper secondary school applications. Furthermore, the 8th graders

initially targeted were also involved in several other research projects. By excluding the 8th grade we also avoided the risk of having other activities affecting change in the observed abilities among the students, making it more likely to correlate a change to our study.

The students were divided into 4 different groups, two groups splitting one of the 7th grade classes, which will be called 7:1 and 7:2, and two groups splitting one of the 9th grade classes, which will be called 9:1 and 9:2. These groups received 9 sessions each attached to the math class. These groups had their sessions scheduled at different times during the day: 7:1 had their sessions scheduled for 11-12 am; 7:2 for 1-2 pm; 9:1 for 2-3 pm; and 9:2 for 8-9 am. The composition of each group was established in collaboration with their responsible teacher in order to establish a balance between gender and aptitude, minimize the risk of conflicts or other sources of defocusing during class and to increase order in the class. Furthermore, we received a crash course of the specific needs of the students, e.g. "you should not talk this particular language to this child" or "you should not touch this child in any way".

#### 5.2.2 SI-Sessions

Each group received 9 (except 9B:2 that received 8) mandatory SI-sessions all of a 1 hour duration. This included collecting the SI-students from the ordinary math class and transporting them to the room where the SI-session would take place – usually less than five minutes. From the third round (of nine) and forward, each session was observed by one observer with the purpose of observing LOQs among the students, and typical SI situations. The observer was positioned in the periphery of the classroom to minimize group dynamics interference.

The first two rounds of sessions were designed as a pre-study, with the aim to quickly get a sense of this unexplored nature for SI so that the rest of the program could have SI with a more mature approach. For instance, initially we tried a more self-organized structure, where the students were asked to propose issues and tasks themselves. We soon learnt that they had a hard time to stay within the subject of math and we also lost several students attention in the process. Hence, we learned that the SI leader must be very well prepared with a lot of tasks for the students to get engaged in, thus increasing their attention in general but also their attention on math, or what the SI session was focusing on.

### 5.2.3 SI-leader

For the first two rounds the SI-sessions were co-led by both of this thesis' authors, Erik and Johan, after which the next 7 rounds were led solely by Johan, with Erik performing in-class observations. Erik was at the beginning of the study a newly trained SI-leader at Lund University with no pure SI experience beforehand. Johan on the other hand, had rigorous training and experience as SI-leader, SI-coach that observes and develops active SI-leaders, and as a SI-method supervisor at both high school and university level. Thus, the SI-leaders were not exactly peers to the students, but the relation was not formal as a student-teacher relation either. For more background on the SI-leaders and their pre-conceptions when entering this study, see section "The Authors' Frame of Pre-conceptions" in chapter "From questions to answers".

### 5.2.4 A Fundamental Framework of Systematic Application of SI to Rely on when Tracing LOQ Among Individuals to SI

This section is a consequence of one of the challenges of this thesis, namely to establish internal validity of linking any observed LOQ among individuals to SI. Remember, the set of SI activities and principles presented in 4.2.1 "What is SI in the Classroom?": Directing discussion back to the group, checking in / ice breaking, closing the session with a session review, avoid being an authority figure, "model" how successful students learn a particular subject instead of "telling" the students what they need to know, avoid interrupting student answers, do not simply provide answers, wait for students to volunteer a well-developed answer, and collaborative learning techniques. Now, in order to trace internal validity of LOQs among individuals being caused by SI, the SI-leading from the 3rd round of sessions and onwards was systematically applied according to a set of principles or activities identical or similar to these. Our principles and activities were carefully applied from the 3rd round of SI sessions and onwards, and resulted of three things: (1) the need of having a structured framework of systematic application of SI to rely on when tracing LOQ among individuals to SI; (2) the dos and don'ts observed in the pre-study; and (3) of Johan's way of SI-leading which has its roots in his SI training.

- All SI session in this thesis started with a check-in session where the SI-leader asked the students reflecting questions such as; "what do I need in order to perform today?" or "what is important for my learning today?". This was carried out with the purpose of breaking the ice and increasing the attention on the SI-session among the students,

to get them reflecting on their own learning, and to make each student break their own silence in order to more easily participate in collective learning.

- Almost all SI sessions concluded with a check-out that let the students reflect and summarize their learning and key takeaways from the SI-session. In this way the sessions was closed with a session review.
- The SI leader persistently avoided to provide answers.
- The SI leader persistently directed discussion back to the student group.
- The SI leader persistently modelled how successful students learn instead of telling the students what they need to know. This was carried out by e.g.:
  - o Persistently encouraging students to take initiative related to learn together with other students.
  - o Persistently giving positive feedback to students who take initiative related to learn together.
  - o Persistently encouraging students to take initiative related to teaching the other students.
  - o Persistently giving positive feedback to students who take initiative related to teaching the other students.

Will these SI sessions be considered to be SI sessions? This is a very important question to understand when claiming causality between observed LOQs and the SI sessions. The first half of the answer is that Supplemental Instruction does not have a distinct frame of definition, as could be seen in Table 2. However, the second part of the answer is that the SI sessions as explained in this section are indeed following principles and elements of SI facilitated by an experienced SI leader.

# Tools for Measuring LOOQs

# 6



## 6. Tools for Measuring LOQ

This chapter will describe the measuring tools used in the case study at Apelgårdsskolan for detecting Learning Organization Qualities among 7th and 9th grade students. Each tool will be discussed in terms of how they work, and their expected contribution to fulfilling the thesis' purpose.

### 6.1 Before and after Questionnaire answered by SI and Non-SI Participants - Our Failed Measurement

Early in our study we aimed to measure the amount of learning in the two classes that participated in SI and in two classes that did not participate in SI by using a modified Dimensions of Learning Organization Questionnaire that is originally developed by Watkins and Marsick (2003). NOTE: NOT to be confused with Learning Organizational Qualities. The different dimensions are measured through 43 questions on a six-point Likert-scale. Respondents are asked to determine the extent to which each of the questions reflects their organization in the aspects of learning culture, where 1 means "almost never" and 6 means "almost always". This questionnaire has since it first was written been validated in several empirical studies that propose that it has a satisfactory level of reliability estimations (Ellinger, Yang, & Howton, 2002; Watkins & Marsick, 2003; Yang, 2003).

We used Watkins & Marsick's questionnaire when constructing the "before and after questionnaire", but excluded questions that addressed the organizational level, organizational performance, management, and other non-applicable items since they are too far from the focus on the individual. The additional questions regarding management position and what was valued as non-applicable data were ignored. This left a total of 13 questions. The modified set of questions can be seen in their non-edited form in Appendix A. The whole questionnaire can be found online.

Before the SI-program started, the modified questionnaire was handed out to four classes in total, the 7th and 9th grade class that received SI, and their parallel classes that did not receive SI. We noticed already after the before-measurement that we received questionnaires that were torn apart, down-jotted, unreadable, and answered pure randomly. We believe this is due to mainly two reasons. Since, even this version of the questionnaire is simplified to fit the students at the school, it is still comprehensive to them. And the short attention span among the students combined with a generally intense level of "in class turbulence" did not match the required effort. As a consequence, the

[1][www.partnersforlearning.com/questions.php](http://www.partnersforlearning.com/questions.php).

modified before and after questionnaire was not sent out again to the students after the SI-program and since the before and after effect then is impossible to detect, the results from the first hand out will not be presented.

However, the Watkins and Marsick's questionnaire was proved useful when used in other parts of the study, which will be presented in the next two sections (6.2 and 6.3).

### 6.2 Continuous Evaluation of the SI sessions Using a Questionnaire answered by the Authors

In order to get a perspective of emerging LOQs over time, the SI-sessions were from the 4th to the 9th round of sessions observed in class and also reviewed afterwards. After each session the authors reviewed the session according to another modified questionnaire based on Watkins and Marsick (2003), covering the same dimensions as the discarded questionnaire that the students received but is holding the original formulations in English. This questionnaire can be found in Appendix B, and was graded from 1 to 5 by the authors, with 1 meaning "not at all", 2 meaning "a little", 3 meaning "average", 4 meaning "a lot" and 5 meaning "completely". One way to look at this measurement is as a LOQ journal that the authors wrote continuously instantly after each SI-session. In order to connect the 13 dimensions in the questionnaire to the eight LOQs used in this study, this was done very conservatively to avoid compromising of the tool's validity. This left six dimensions spanning over five of the eight LOQs.

Our grading of each group's dimensions is not based on any systematic framework. As a matter of fact, when sending out the original DLOQ to organizations, the respondents are not responding according to any systematic framework other than their own judgment at the time. In a similar manner, the authors responded to their modified DLOQ in the same way, using their own judgment. What is different, each grading was preceded by a discussion together in order to recognize both authors' (the SI leader's and the observer's) perspectives. Therefore, the reliability is indeed much compromised. Also, this journal measures the culture at a group level, not an individual. For instance, when responding to the statement, e.g. "In my organization people treat each other with respect" the organization was considered being the group as a whole including the SI leader. Hence, since this thesis' purpose focuses on the

individual, the validity of this tool is also indeed much compromised. However, if the groups' amount of having LOQs seems to change during the course of the SI program, then it is reasonable that this has something to do with a change of the individuals. This constitutes another dimension of the reality that is tried to be observed. Conclusively, this measuring tool will be used as a reference variable to how the groups have changed during the course of the program.

### 6.3 Post SI-Questionnaire Answered by SI Participants

With the purpose of observing LOQ among individuals as an effect of the SI sessions and a questionnaire was designed and handed out to the SI participants after the SI-program. The questionnaire consists of 39 statements with closed vertical oriented answer options. To the statements the respondents agreed on a five-graded Likert-scale from 1-5, where 1 meant, "I do not agree at all" and 5 meant, "I fully agree". 12 statements were related to the willingness of becoming an SI-leader, while the rest are directly related to the effects of the SI sessions. The other 27 statements consisted of three components: 1) "The SI sessions"; 2) a word or phrase describing a change; 3) and an attribute subject to that change. For instance: "The SI sessions have increased my motivation to start in upper secondary school."

Not all of the questions were considered to correspond to a certain LOQ, but some was interesting for the stakeholders of the case study. The questionnaire was answered anonymously by 24 SI-participants, seven in 7A:1, six in 7A:2, six in 9B:1, and five in 9B:1.

In order to increase the reliability, all questionnaires was answered after all SI sessions, during a tenth round of supposed to be SI sessions. This gave the students a moment for reflection and enough time to not stressfully answering the questionnaire. Also the language was simplified to suit the chosen group of respondents. Still, there are sources of decreased reliability in the individuals' different interpretations, and the risk of the students tweaking their answers in order to express potential frustration or admiration of the SI program. In order to increase the validity to find dismissive respondents an inverted scale can be used (Bryman & Bell, 2005), this was however not used, leading to a further decrease in validity. The next chapter will present a selection of these results, LOQ by LOQ, with an emphasis on the distribution of the answers, i.e. what portions graded five, or four etc.

### 6.4 In Classroom Observations

The data observed was first gathered in an unstructured excel spreadsheet that only contained group name and date as guidance. Observations were written down in the order they came up. Bryman and Bell (2005) says that it usually takes some degree of unstructured observations before it is possible to know how to organize an observation schedule. In order to have more manageable data the following schedule was made after the pre-study: name of situation (Name); description of situation (Description); Action of SI-leader (Action); Reaction of the student after the action (Effect); which group (Group), Date of the observation (Date).

An example of an observation where our observation schedule were used look like this:

Name	Description	Action	Effect	Group	Date
Check-in	Students noisy during check-in	SI-leader uses talking piece while checking in	The group listens to the one student holding the talking piece.	7A:1	10/3

When presenting the observations they are explained in text and not in the boxed layout from observation schedule. They are also not presented SI session by SI session, but LOQ type by LOQ type.

It is important that the observer does not have to do any interpretations while observing (Bryman & Bell, 2005). Both the unstructured and the structured datasheets of the in classroom observations only contain what was seen or heard. No conscious interpretations were made while writing down any of the situations in class. If a student laughed or smiled, that was noted and not that the student was happy. If the student said anything mean to another student it was noted what the student said, not that the student was angry. It is hard to possibly claim to know how the students feel; instead just a transparent communication of what was seen is provided. However, unconscious interpretations will be made when the observer are choosing what and how to write down the observations.

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The main reliability problem for structured observations is the difference between different observers, or in this case, difference in the observer's mood from observation to observation (Bryman & Bell, 2005). Bryman and Bell (2005) further considers it to be hard to reach an absolute reliability for structured observations, yet, they also consider that this aspect should not be exaggerated. Differences between or during observations would have the main effect that it would make it harder to do internal comparison of the results. Compared to the validity problem of showing that SI cause the desired effect, this reliability problem is considered to have secondary importance. A validity problem for structured observations is to make measurements that are representing the aimed term that is up for measurement, in this case LOQ of individuals as a result of SI (Bryman & Bell, 2005). The predefined expectations of how to observe LOQ of a student is not the main issue. For example; if the students are discussing their further education with the SI-leader, it is likely that reader trust that this has actually occurred. It is instead the causality between the observed SI action, primarily noted "Action", and the LOQ effect noted "Effect", which needs to be validated. Furthermore, non-observable factors may cause the Effect instead of the Action observed. The students may also change their behavior due to the fact that they know that they are being observed (Bryman & Bell 2005). To deal with this problem the Effect observed was noted within an immediate timeframe to the Action taken. Furthermore, Name and Description contribute to put the observed Effect into the context of what SI action that may have caused the Effect. Also, as mentioned in section 3.1 the observer was positioned in the periphery of the classroom to minimize group dynamics interference, something that also puts the observer outside of the group. Several observations were made that was considered to be examples of LOQ of a student. For example several occasions were observed where the all the students groups asked questions about continuous education, solved high school math questions and used the smart board. The actions that prevented these observations had no commonalities to the SI actions or elements stated in section 5.1 why the data from those observations has been excluded.

[2] Internally we have been calling this "Hemingway observations" since the American author's writing style is famous for never writing what the character thought, just what they did. Hemingway observations are more commonly called the "Iceberg principle" (Sorkhabi, 2013). This is however not a scientific term, why we exclude it in the presentation of the thesis.

Conclusively, one major part of the observations at Apelgårdsskolan contains examples of disruptive behavior. The language among students came across as very harsh and cruel. Phrases as: "Shut up, your idiot"; "I swear I will kill you"; "F\*ck your momma" were not unusual to observe in the groups. References to criminal gangs, violence and drugs were also commonly observed. Group 7:1 and 9:1 were the two groups that had most frequently incidents of such disruptive behavior. Nevertheless, all groups showed examples of verbal and physical violence between students. It is with this in mind the reader should see the results from the in class observations.

## 6.5 Student Interviews

We chose to conduct structural interviews with open-ended questions (no predefined answer options). Structural interviewing is a research instrument that is used to standardize the questioning and also the registration of answers (Bryman & Bell, 2005). We believe that with open-ended questions, the respondents will not be directed to answer with any particular bias. To avoid further bias the SI-leader was not present during the interviews, instead the same person who conducted the in class observations conducted the interviews. This was to avoid to make the children give potential exaggerated friendly or unfriendly answers. The interviews were carried out face-to-face during the scheduled time for SI-session the week after the 9th and last round SI-sessions. The respondents were chosen on a voluntary basis, everyone who did not want to be interviewed did not have to. All in all 15 interviews were carried out for about 5-10 minutes. The questions were asked with the same wording and in the same specific order. The interviewer also worked on to have the same tone of voice to avoid affecting the respondent in any direction. A common source of error is that the respondents understand the questions differently (Bryman & Bell, 2005). The students also had different levels of understanding for the Swedish language. To increase the reliability and validity questions were explained if the students did not understand them or if their answers addressed something completely different (for example some thought we said SO instead of SI, which is the short for Social Sciences in the Swedish school system). A final action to increase validation is to avoid interpretation while register the respondents answers. Therefore we used Word's recording tool parallel with keeping our own notes. It enabled a post interview audit of the registered answers

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The questions can be found in their original appearance, in Swedish, in Appendix C. The translated open-ended questions are:

- Q 1. If you were to describe Supplemental Instruction how would you do that?
- Q 2. How have the SI sessions affected your motivation?
- Q 3. How are the SI sessions differing from the ordinary tutoring?
- Q 4. What has been best with the SI sessions?
- Q 5. What has been worst with the SI sessions?
- Q 6. What would you like to have been done differently [with the SI sessions]?
- Q 7. Would you consider leading SI sessions in the future?
- Q 8. If you are in the 9th grade, how young students do you think you could manage [to lead SI sessions for]?
- Q 9. What would make you want to become an SI-leader?
- Q 10. Anything to add?

The answers that indicate LOQ will be presented in the next chapter. They will also show which answer that belonged to which question. The interviews as a whole can be found in the appendix D. Due to student integrity we have coded the names.

[3] Question 7-9 was not expected to give any LOQ outcome, perhaps other than some reasoning regarding leadership in a Learning Organization. Since we excluded the LOQ that addresses leadership the answers from those questions is solely interesting for the stakeholders of this thesis, Region Skåne, Apelgårdsskolan and the SI-community, who all have shown interested to see potential lower secondary school SI-leaders. Those questions will not be subject of analysis in further on in the thesis.

# Results from the Case Study

# 7



## 7. Results from the Case Study

This chapter aims to present each measurement tool's observations from the case study at Apelgårdsskolan, and conclude it with an analysis of if the observations indicate LOQ among students. The chapter will start with a walkthrough of the logic used when analyzing if the observations indicate LOQ among students. Thereafter, the observations and analyses will be presented LOQ by LOQ. In each presentation of LOQ observations, the reader will see each measurement tool present its finding.

### 7.1 The measurements Indicating LOQ Among Students

Since the validity and reliability of our measurement tools is compromised, their results are not directly indicating LOQs among individuals. Therefore, the presented raw results must be processed into a judgment of if the observations correspond to LOQs among students. Each tool's result by itself does not contribute with any indicating value, but together they can increase the overall validity and value. Therefore, the analyses will focus on the total triangulated picture. Since this thesis aims to examine the development of LOQs among individuals, the triangulation analysis will be centered on observations indicating changes. Also, it is interesting to recognize if a particular LOQ at least has been observed in a tool's measurement. An observation, even though it is not an observed LOQ development, indicates an ability to measure that certain LOQ. This will strengthen the tool's validity. For each type of LOQ in this chapter, this analysis will result in a matrix with this form:

Name of LOQ									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis*	

Each measuring tool may have an eye indicating a successful observation, and a delta indicating a development of the current LOQ during the SI-program. For the avoidance of doubt we want to emphasize that the assignment of a delta do not mean that it is claimed that the LOQ have been developed as consequence of the SI-method. Further discussion regarding the development's causality to the SI-method will be of matter in the next chapter. What is worth mentioning is that all measurement tools will not be able to observe signs of a Learning Organization Qualities among students for

The last column relates to the SI literature review in chapter 4. It is used to strengthen the triangulation analysis of how strong each LOQ is validly observed.

all different LOQs. N/A will be assigned to those measurement tools that did not measure the LOQ at all. An empty cell in the tables means that the tool did try to observe a development of the LOQ, but failed. With this understanding in mind we welcome you to read the findings of our case.

### 7.2 To Understand Systems and How Actions Influence Each other

The continuous post SI session evaluations did not show any results for this LOQ. The in classroom observations found a couple of examples of related to the LOQ among students about understanding systems and how actions influence each other. One SI variable is that the SI-leader conduct a check in and breaks the ice with asking the students what their needs are



**The Eye:** The eye is assigned to measurement tools that have observed a certain LOQ.



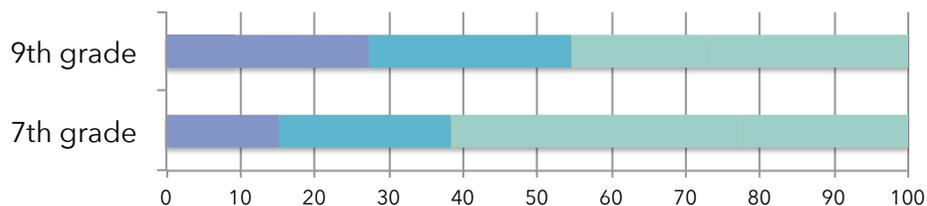
**The Delta:** The delta is assigned to measurement tools that shows an indication that the LOQ have been increased through out the time period of the SI-program for today, what they want to do

etc. The examples where the students suggested subject relevant activities increased throughout the program, which is further presented under "To Set Goals Individually and Together with Others". Once the students started to suggest math relevant task, they also in a much bigger extent showed interest for math questions connected to issues beyond their coursework. The students wanted preparation for national tests, other mathematical based subjects as physics and even upper secondary school questions. All groups, even the 7th graders, asked for questions from upper secondary school, that they came to solve together.

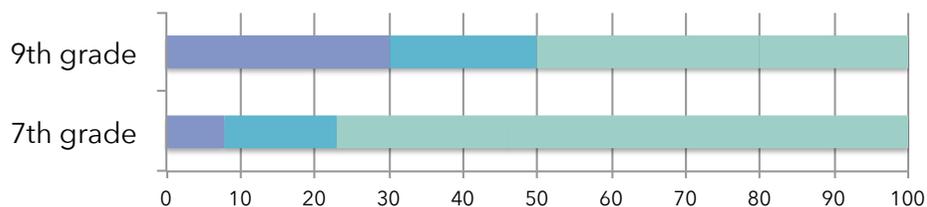
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

The SI sessions have taught me things that I have use for in other courses



The SI sessions have made me see how math can be used outside of school.



The answers to the two statements indicates that almost half of the students in the 9<sup>th</sup> grade and a majority in the 7<sup>th</sup> grade consider that the SI sessions have provided them with something that they use outside of the SI-sessions and the school environment.

The interviews revealed some indications of this LOQ being both prevalent and developed. On the question “How has the SI sessions affected your motivation?” four answers were related to this LOQ. A 7<sup>th</sup> grader answered

*“Much more. It has affected me within all subjects. It has affected me in that extent that I have started to think about the future.”*

A 9<sup>th</sup> grader answered:

*“Rather much. Earlier it was boring math. Now it continues after each other. There is a connection between rules. You have made us realize that.”*

And another 9<sup>th</sup> grader answered:

*“Strong. I have never been excellent at math. Now when you get the chances then you become more secure. Plus in smaller groups it is easier to explain. We have learnt physics as well. And together!”*

All three answers show the occurrence of the LOQ, even though it was an open-ended question. The first answer also indicates a development since the SI sessions had had an affection to the student in that extent that he started to think about the future, which is congruent with what we look for in the study do be able to denote it LOQ.

To Understand Systems and How Actions Influence Each Other									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
N/A	N/A	👁️	🔺	👁️	🔺	👁️	🔺	👁️	🔺

**Triangulation Analysis:** Except for the Continuous post SI session evaluations, all measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The same measurements also indicate that there is a development of this LOQ among students throughout the period of the SI-program. The continuous Post SI Session Evaluations tool didn't even contain a question that was addressing this LOQ. This means that there is no presence of a tool that tried to measure this LOQ and failed. Conclusively, there are reasons to believe that the SI program had developed the quality of 7<sup>th</sup> and 9<sup>th</sup> graders understanding systems and how actions influence each other.

### 7.3 To Use Technology and Systems To Strengthen Learning

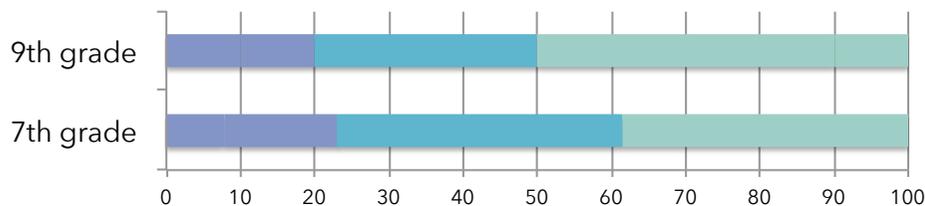
The continuous post SI session evaluations did not show any results for this LOQ.

The in classroom observations indicated a development of the quality of using technology and systems to strengthen learning. During the last SI sessions with the 9A:2 group the SI leader persistently repeated that the students together should explain Pythagoras theorem. While doing so one student took initiative to use the smart board in order to draw the triangle while a second and third student explained the theorem for the rest of the group. The 9<sup>th</sup> grader who used the computer had during previous SI-meetings just used the computer for non-educational purposes.

The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

The SI sessions have made me more willing to use technology and other tools for my learning.



In the post SI program questionnaire there was one statement that corresponded to this LOQ. The chart indicates that half of the 9th grade and almost 40% of the responding 7th grade students considered the SI sessions to have a high impact.

The interviews did not show any results that indicated a presence or a development of the LOQ.

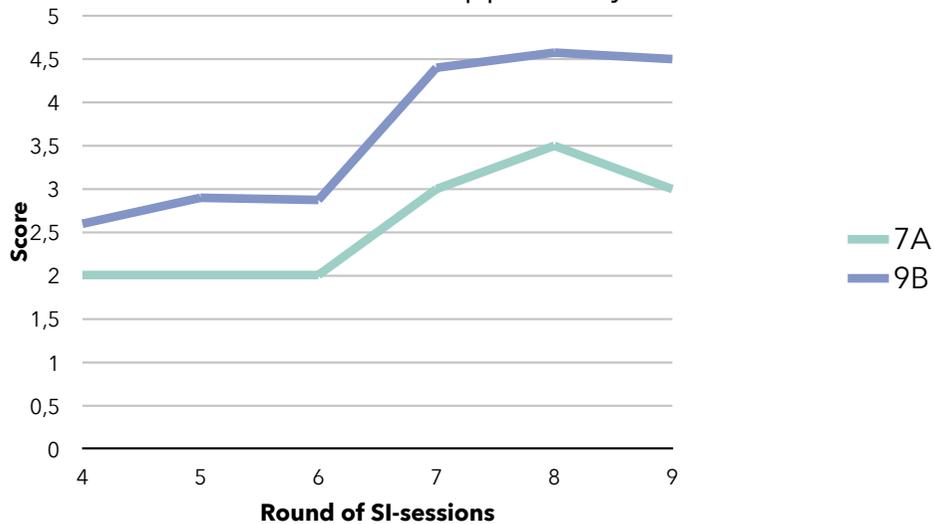
To Use Technology and Systems To Strengthen Learning									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
N/A	N/A	👁️	📐	👁️					

**Triangulation Analysis:** Only the In class observations and the Post-program Questionnaire gives us results that show us that the students have been using technology to strengthen their Learning during the SI sessions. The in class observations indicates a development of this LOQ. Conclusively, there is little reason to believe that the SI program develops the quality of 7th and 9th graders using technology and systems to strengthen learning.

### 7.4 To See Deviating Opinions and Ideas as Something Positive

The continuous post SI session evaluations had the dimension “In my organization, people view problems in their work as an opportunity to learn”, which is related to the LOQ of seeing deviating opinions and ideas as something positive. This “journal” indicates a development of this type of LOQ throughout the last six round of the SI program as can be seen in graph below . Note that the 9th graders SI sessions was by the authors experienced as more learning.

In my organization, people view problems in their work as an opportunity to learn.



This graph shows the authors' scores of how the class including the SI leader corresponded to the statement "In my organization, people view problems in their work as an opportunity to learn."

No clear examples where the students as a consequence of SI would see deviating opinions and ideas as something positive was observed during the in classroom observations.

The post SI questionnaire did not contain any statements that corresponds to this LOQ.

The interviews did not observe any presence of this LOQ.

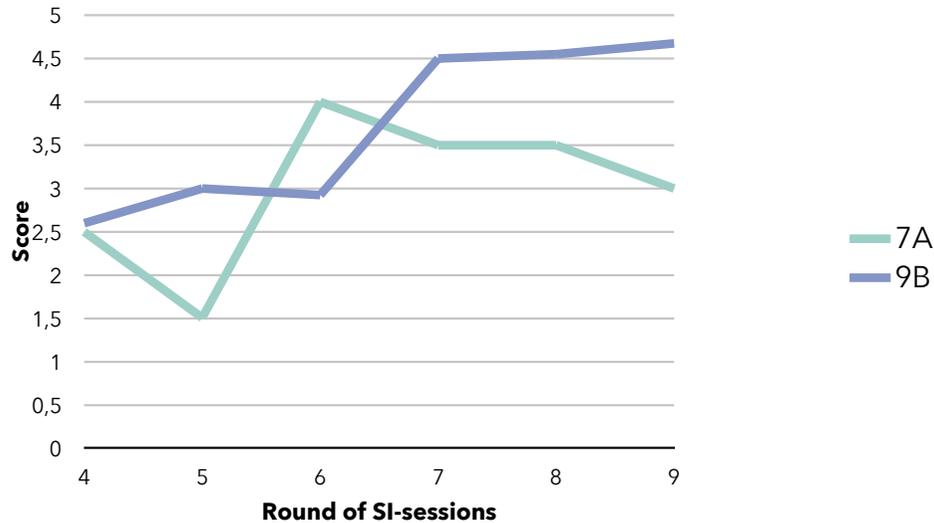
To See Deviating Opinions and Ideas as Something Positive									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	

**Triangulation Analysis:** Only the Continuous post SI session evaluations and the in class observations showed results that can be linked to how this LOQ is expected to appear among the students. A weak development was indicated from the Continuous post SI session evaluations. Conclusively, there is little reason to believe that the SI program developed the quality 7th and 9th graders seeing deviating opinions and ideas as something positive among the students

### 7.5 To Allow Others and Themselves to Make Mistakes

The continuous post SI session evaluations had the dimension "In my organization, people openly discuss mistakes in order to learn from them", which is related to the LOQ of allowing others and themselves to make mistakes. The groups in the 9th grade showed a steady improvement throughout the program, whereas the 7th grade groups showed a fluctuating and weakly increase in score.

In my organization, people openly discuss mistakes in order to learn from them.



This graph shows the authors' scores of how the class including the SI leader corresponded to the statement "In my organization, people openly discuss mistakes in order to learn from them."

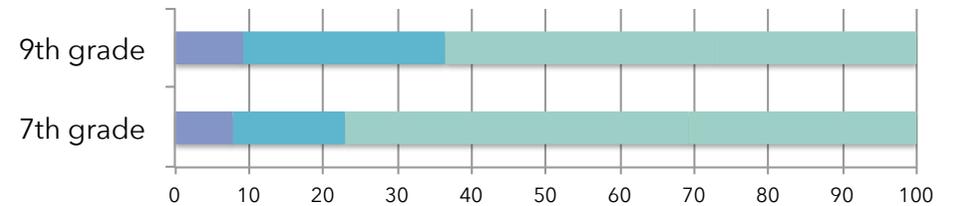
The in classroom observations showed both occurrence and development of the quality of allowing others and themselves to make mistakes. During one of the last meetings of the program the SI-leader asked the students: "what was the key-takeaway from today's meeting?" One 7<sup>th</sup> grader answered: "It was to present by the board. I dare to that more now." The number of students standing by the board explaining to the group increased from 1-2 different students per SI-meeting to 2-4 students for the final meetings. The number of times the SI-leader had to encourage the students to go up to board without any response was much higher in the early stage of the program. One other specific example is from an observation of a student with generally very protective rhetoric and appearance. He would not let any other student help him while he was not explaining by the board nor would he give up his role by the board once he had taken it. During a meeting in the end of the program the

SI-leader asked the student follow up questions while he was standing by the board. He realized and admitted that he was wrong and let another student take the lead.

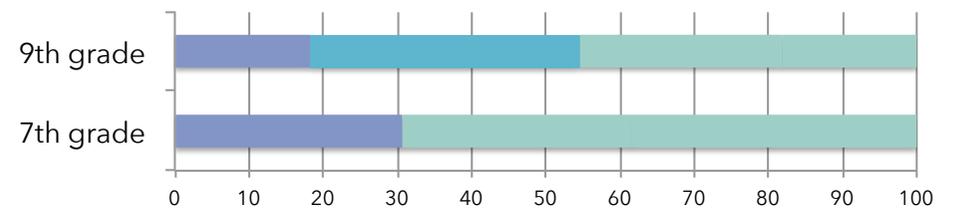
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

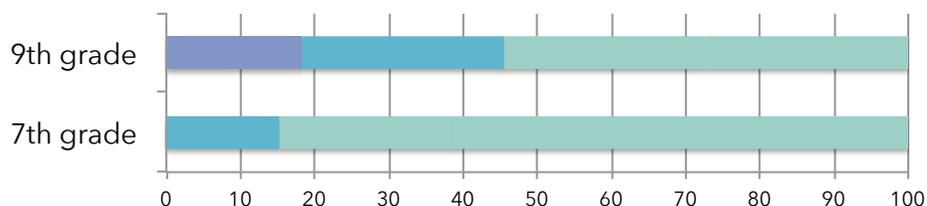
The SI sessions have made me try solving more difficult tasks than before.



The SI sessions have made me more comfortable with presenting in front of others.



The SI sessions have to a greater extent given me courage to try new things.



The answers to the upper statement implies that a majority of both the 9<sup>th</sup> and 7<sup>th</sup> graders consider SI to make them try to solve more difficult tasks than before.

In terms of making the students more comfortable with presenting in front of others the answers implies that the SI sessions have indeed had a positive influence, especially among the 7<sup>th</sup> graders. An even more positive influence is shown for given the students courage to try new things.

The interviews showed a couple of examples of this LOQ from the answers of three open ended questions. Three open ended questions. To the question “If you were to describe Supplemental Instruction how would you do that?” a boy in the 9<sup>th</sup> answered:

*“A social group. Everyone can say what they think. And you receive help with math tasks you need help with. You can be yourself.”* (Boy I, 9:1)”

This statement of being able be himself and that “everyone can say what they think” indicating an environment where you do not have to fear to make mistakes.

Other examples of students that did not fear to make mistakes emerged from the question: “How has the SI sessions affected your motivation?” where a boy in the 7<sup>th</sup> grade answered:

*“I feel safe to say what I think. In front of a class, then you maybe can say something wrong. Nothing happens there, in the classroom. It is not the same thing. If I am wrong here I do not have the same feeling as in the class. If I say something wrong. It is not the same feeling. It is a better feeling here.”*

A last example of not fearing to make mistakes came up from the question “How are the SI Sessions differing from the ordinary tutoring?” a girl in the 9<sup>th</sup> class answered

*“You can talk more about your problems without being embarrassed.”.*

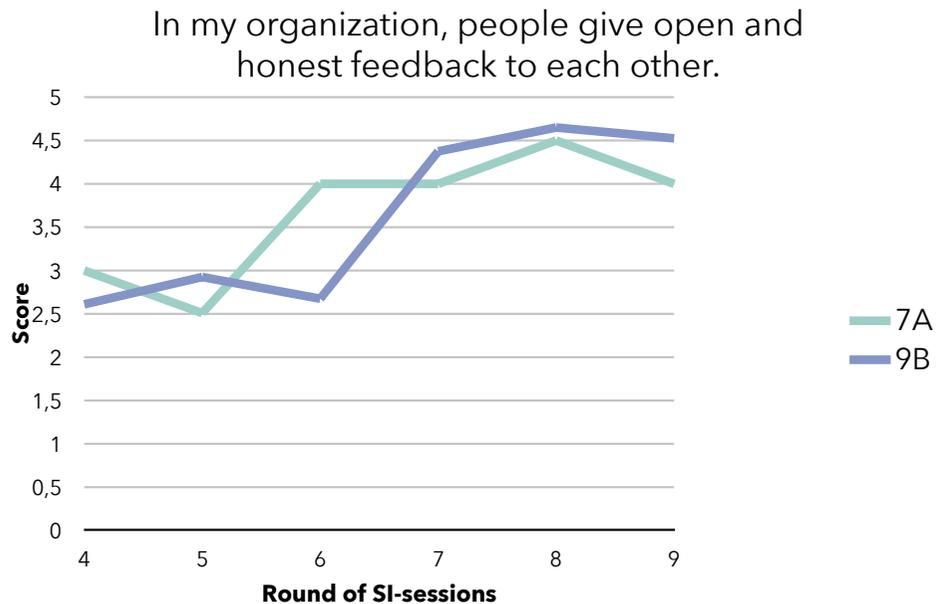
All in all, the interviews showed signs of LOQ at the SI sessions, but there was an absence of anything that indicated that there had been a development of this LOQ during the SI-program.

To Allow Others and Themselves to Make Mistakes									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	

**Triangulation Analysis:** Except for the in class observations, all measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The Continuous post SI session evaluations, the Post program questionnaire and the SI literature analysis indicate that there is a development of this LOQ among students throughout the period of the SI-program. Conclusively, there is modest reason to believe that the SI program develops the quality of 7<sup>th</sup> and 9<sup>th</sup> graders allowing others and themselves to make mistakes.

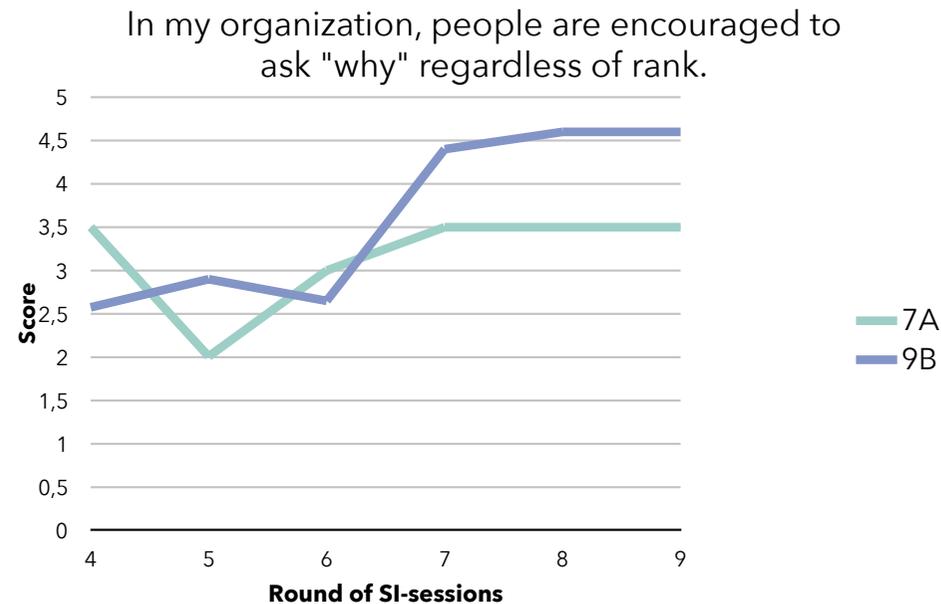
## 7.6 To Reflect on and Question Themselves and their Surrounding Environment

The continuous post SI session evaluations had the dimension “In my organization, people give open and honest feedback to each other.”, which is related to the LOQ of an individual who reflect on and question themselves and their surrounding environment. The experience of all groups followed a similar incline throughout the last six rounds of SI sessions.



This graph shows the authors' scores of how the class including the SI leader corresponded to the statement "In my organization, people give open and honest feedback to each other.", on the vertical axis, whereas the horizontal axis shows the last six rounds of SI session of the SI program.

Another statement was according to the authors judgment related to this LOQ, namely "In my organization, people are encouraged to ask why regardless of rank. Interestingly, the 7th grade groups were experienced to decrease after the first evaluated round, to later increase back to the same level. The 9th grade groups was experienced to increase from 2,5 to 4,5.



This graph shows the authors' scores of how the class including the SI leader corresponded to the statement "In my organization, people are encouraged to ask why regardless of rank.", on the vertical axis, whereas the horizontal axis shows the last six rounds of SI session of the SI program.

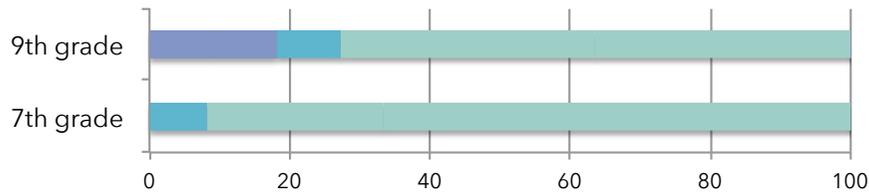
The in classroom observations showed examples of this LOQ. Almost exclusively all meetings were ended with the SI-leader asking the students for their key takeaways. Interestingly, the students mentioned takeaways related to mathematics and problem solving in a bigger extent later in the program. Early in the program students often focused on the SI-leaders storytelling or jokes. As an observation of situations where the students reflected and questioned their surrounding environment, one 7<sup>th</sup> grade group increased its disruptive behavior half way through the program. During this time, the SI-leader asked, as a check-out question, if the students had any ideas how to make the sessions better. The students were able to provide the SI-leader with a variety of feedback. The feedback included: incentives to make disruptive students avoid damaging the SI-meetings; the self-reflection of less noisy students and that the SI-leader was too nice to disruptive students.

Another specific observation comes from a 7<sup>th</sup> grade group were one of the weaker students, Student A, were standing by the whiteboard trying to solve an upper secondary school C-grade task. Student A missed a parenthesis in the equation and the SI-leader said, “If I say parenthesis”. Immediately after that leading question, Student B joined the first by the white board and placed the parenthesis in the right place. The SI-leader then asked student A if she now understood, she answered: “Yes, student B is very good at explaining”. All in all, the classroom observations contained examples as well of trends of a growing amount of self-reflection among the students.

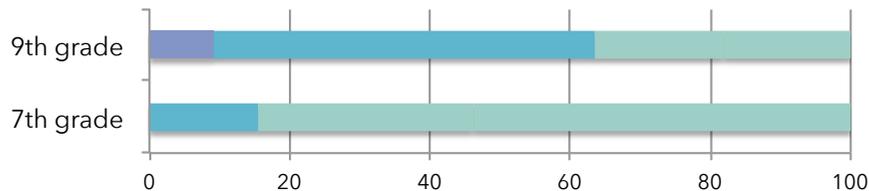
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

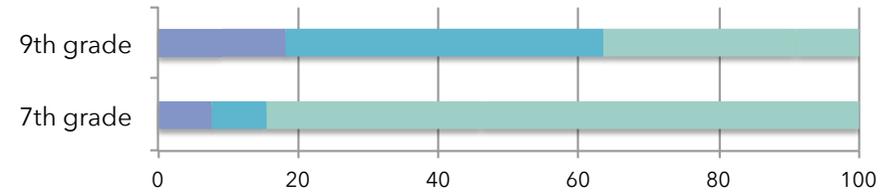
The SI sessions have made me realize that I am better at math than before.



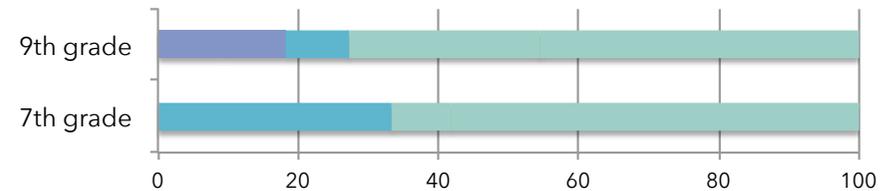
The SI sessions have made me understand how I am learning in the best way.



The SI sessions have made me think more about how I am learning in the best way.



The SI sessions have made me think about what I am good and bad at.



For the most upper two statements show a distinctly larger proportion among the 7<sup>th</sup> compared to the 9<sup>th</sup> graders that believes that the SI-sessions have caused them to understand and think more about how they are learning in the best way. More than 80 % of the responding 7<sup>th</sup> graders agreed to a high extent whereas the same figure for the 9<sup>th</sup> graders was less than 40 %. The answers to the statement “The SI sessions have made me think about what I am good and bad at” show a greater proportion (over 70 %) among the 9<sup>th</sup> graders that agrees to a high extent. Also the 7<sup>th</sup> graders answered highly positively to this statement with almost 70 % agreeing to a high extent. It is also interesting to see how positive the indications are of the SI sessions making the students realize that they are better at math than before.

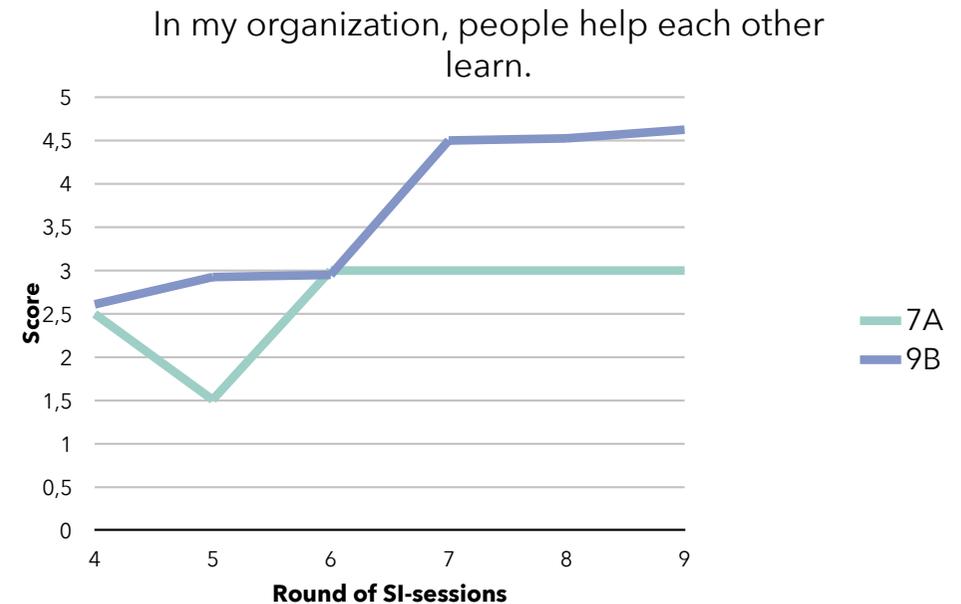
The interviews did not observe any presence of this LOQ.

To Reflect on and Question Themselves and their Surrounding Environment									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
👁️	▲	👁️	▲	👁️	▲			👁️	▲

**Triangulation Analysis:** Except for the interviews, all measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The same measurements also indicate that there is a development of this LOQ among students throughout the period of the SI-program. Conclusively, there are reasons to believe that the SI program had developed the quality of 7th and 9th graders reflecting on and questioning themselves and their surrounding environment.

### 7.7 To Collaborate and Prefer Learning Together with Others

The continuous post SI session evaluations had the dimension “In my organization, people help each other learn”, which is related to the LOQ of collaborating and preferring learning together with others. As in the post SI evaluations in the other LOQs, the 9th grade groups were experienced as more learning towards the end, in comparison with the 7th grade groups. The 7th grade groups fluctuated and showed all in all a negligible shift from the authors’ views.



This graph shows the authors’ scores of how the class including the SI leader corresponded to the statement “In my organization, help each other learn”, on the vertical axis, whereas the horizontal axis shows the last six rounds of SI session of the SI program.

Let us have a look at the in classroom observations. Since one of the core aspect of SI is to learn together, the group learning part was present from the beginning of the program. Interesting to notice throughout the observations was the development of the group learning. The key SI variables that the SI leader used was to ask follow up questions; asking for volunteers by the board and what the students wanted to learn. In the beginning the students usually talked to the SI leader, trying to get or even guess the correct answer. They had a very hard time agreeing on a subject or a common task. Their rhetoric was more competitive than collaborative and it was usually just one student who took the lead to explain to others. Independently, all groups had more interactions and dialogues among each other were more commonly observed in the end than in the beginning.

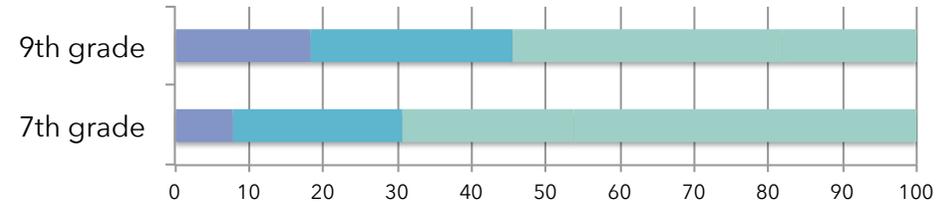
The best example of development was the final SI session with group 9A:2. The SI-leader started the meeting by asking what the students wanted to focus on. The group of 10 students agreed to focus on Pythagoras Theorem. The SI-leader then asked if anyone would volunteer to develop a question on the topic of Pythagoras Theorem. One student who had previously showed understanding of the Theorem volunteered. The dynamics observed from this occasion compared to the early meetings differed in various ways. The students were now talking to each other instead to the SI-leader. They also had discussions with other students than the one standing by the board. They also had discussions with other students than the one standing by the board. Other students joined in by the board and in calmly manner contributed with further understanding of the question. The students still sitting at their benches gave feedback to all students by the board. Both in terms of where they missed calculation rules and also regarding the students' personation and explanation skills. All in all, this LOQ was observed to be developed among the students throughout the SI program.

In terms of the post SI questionnaire five statements related to this LOQ. Among the responding 9<sup>th</sup> graders the scores indicates rather weak positive scores. The responding 7<sup>th</sup> graders had three scores indicating a strong positive effect on this LOQ as a consequence of the SI sessions. Similarly to the other statements that contrasted to the ordinary math lessons, that particular question is despite their strong scores not considered as a strong effect. All in all, this tool observed developments in the LOQ among students.

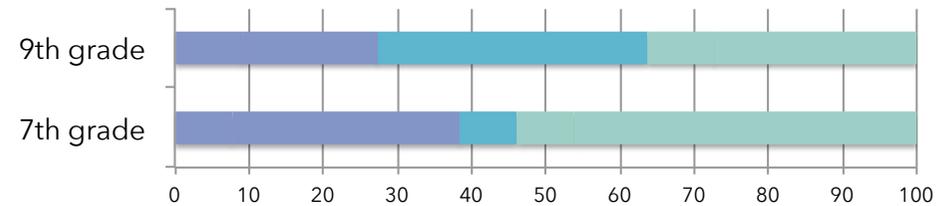
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

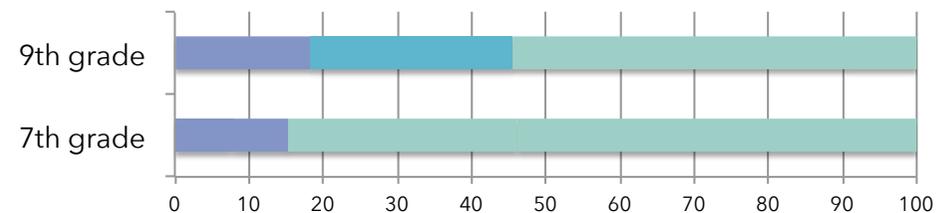
The SI sessions have made me see a greater value of learning together with others.



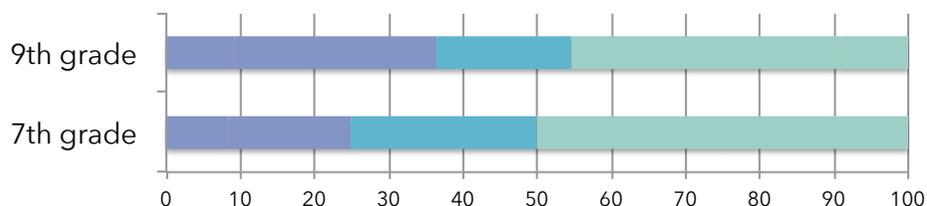
The SI sessions have created a better unity among the classmates.



The SI sessions have made me appreciate group work to a greater extent.



The SI sessions have increased my understanding of how I can teach others.



If we start with the statement regarding the SI sessions creating a better unity among the classmates it is a wide spread in the answers. In terms of the two middle statements of affecting the students' preferences and values regarding group work the charts shows that students in both the 7<sup>th</sup> and 9<sup>th</sup> grade agree to that SI-session have had a positive impact. Lastly, both groups show that around half of the students highly agree to that the SI-sessions have increased their understanding of how they can teach others.

The interviews revealed indications of an increased willingness or ability to cooperate among the students. To the question "If you were to describe SI, how would you do that?" a girl in the 9<sup>th</sup> grade responded:

*"Those meetings, they seem fun. I have never been able to collaborate with anyone. It feels like the whole class suddenly is shutting up. [it] Takes away most of the disruptive behavior."*

And on the question "How has the SI sessions affected your motivation?" a boy in the 9<sup>th</sup> grade responded:

*"I want to learn more. I have learnt more. More motivated to work with other students."*

And on the question "Do you have anything to add?" a 7<sup>th</sup> grader responded

*"I actually believe that I have learned quite a lot. For example mental arithmetic and cooperation."*

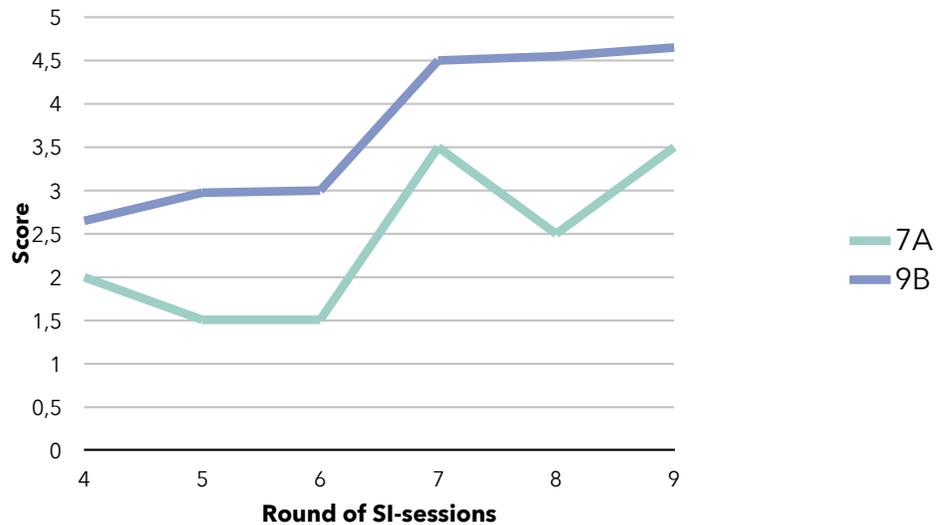
To Collaborate and Prefer Learning Together with Others									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
👁️	🔺	👁️	🔺	👁️	🔺	👁️	🔺	👁️	🔺

**Triangulation Analysis:** All measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The same measurements also indicate that there is a development of this LOQ among students throughout the period of the SI-program. This also means that there is no presence of a tool that tried to measure this LOQ and failed. Conclusively, there are reasons to believe that the SI program had developed the quality of 7<sup>th</sup> and 9<sup>th</sup> graders understanding systems and how actions influence each other.

### 7.8 To Set Goals Individually and Together with Others

The continuous post SI session evaluations had the dimension "In my organization, people identify skills they need for future work tasks.", which is related to the LOQ of setting goals individually and together with others. Once again, the 9<sup>th</sup> grade groups showed a more distinct increase of their scores compared to the 7<sup>th</sup> grade group.

In my organization, people identify skills they need for future work tasks.



This graph shows the authors' scores of how the class including the SI leader corresponded to the statement "In my organization, people identify skills they need for future work tasks.", on the vertical axis, whereas the horizontal axis shows the last six rounds of SI session of the SI program.

Continuing with the in classroom observations, there is one observation that indicates a development of the students being able to set goals individually and together. As mentioned before, during the beginning of the program, the check in questions were often responded with suggestions of irrelevant and unserious activities, e.g. watch a movie, play soccer or take the day off. While at the end of the program all four groups to a larger extent were able to suggest math related tasks. They would name the specific abilities for calculation rules as percentage, division and parts, as goals. But they also asked for a higher difficulty of the tasks. During one meeting the 7A:2 group even wanted to work for a better understanding of mathematical expressions.

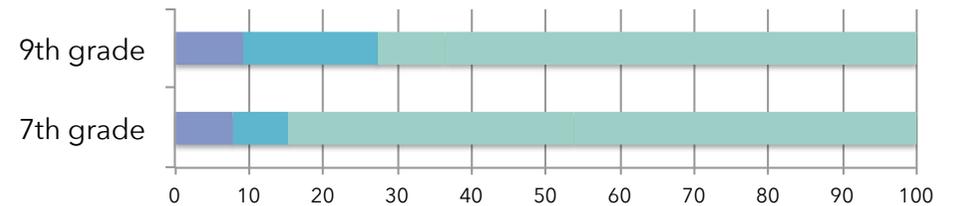
The responses on the post SI questionnaire were overall in favor of the SI sessions having developed this LOQ among the respondents. Four questions were related to tis

LOQ and among the responding 7<sup>th</sup> graders all scores indicates a strong effect. Among the responding 9<sup>th</sup> graders, 2 questions indicates a strong positive effect, one a moderately strong effect and the last one a weak or negligible effect. More details and statements formulations can be found in the table below.

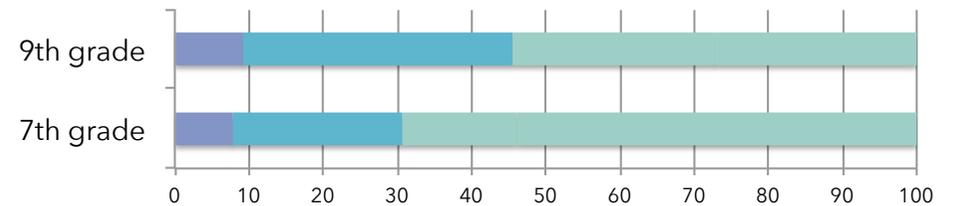
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

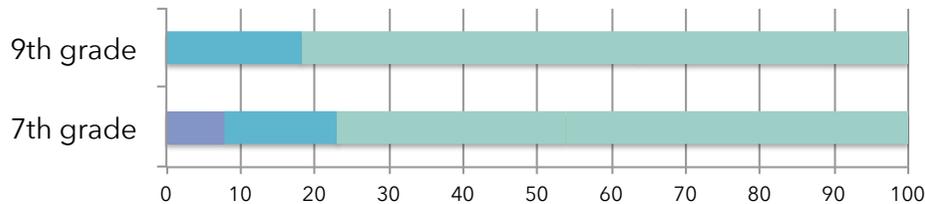
The SI sessions have given me greater motivation to start upper secondary school.



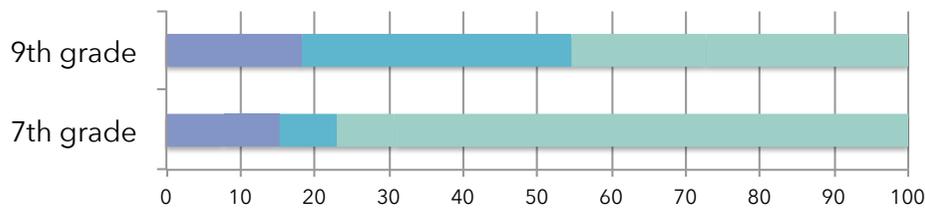
The SI sessions have given me greater motivation to study at post-secondary school.



The SI sessions have strengthened my self-confidence to manage my ongoing studies.



The SI sessions have made me setting more goals to myself.



In terms of motivation of continuous education a big proportion of the students in both groups have highly agreed to the statements. Both groups seem to have gained a bigger increase for motivation for upper secondary school studies than post-secondary school education. The group of students that highly agree to that the SI-sessions have caused them to set more goals for themselves is over 70% for the 7<sup>th</sup> graders but below 50 % for the 9<sup>th</sup> graders. Lastly, the SI sessions seem to have had a profound influence on the students' self-confidence to manage their ongoing studies. Almost 80 % of the students highly agree to this.

The interviews revealed two examples of an increased confidence and commitment to work with goals in form of further education. On the question “How has the SI sessions affected your motivation?” two answers from two 9<sup>th</sup> graders were:

*“It has given me self-confidence to know how big you can be in the future. Get a good job and good education.”*

And

*“In a good way actually. It has given me the hope to learn math and continue study and educate myself at University.”*

All in all an indication of a development of this LOQ has been found in the interviews.

To Set Goals Individually and Together with Others									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
👁	🔺	👁	🔺	👁	🔺	👁	🔺	👁	🔺

**Triangulation Analysis:** All measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The same measurements also indicate that there is a development of this LOQ among students throughout the period of the SI-program. This also means that there is no presence of a tool that tried to measure this LOQ and failed. Conclusively, there are reasons to believe that the SI program had developed the quality of 7<sup>th</sup> and 9<sup>th</sup> graders understanding systems and how actions influence each other.

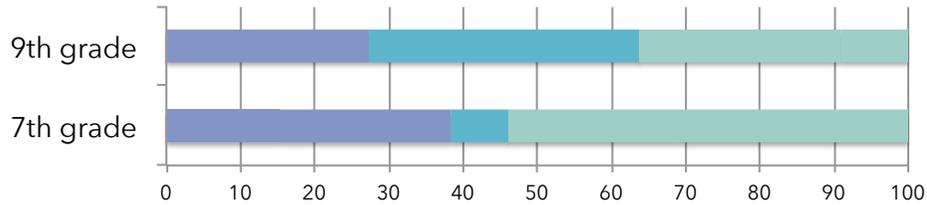
## 7.9 To Share Knowledge With Others

From the in classroom observations most examples of the LOQ in this section has been observed together with the LOQ “Collaborate and Prefer Learning Together with Others” or “Reflecting and Question Themselves and their Surrounding Environment”. To share knowledge with others, has focus on the avoidance of sub-optimization by knowledge sharing. The students were in a greater extent observed to increase their communication to tell each other were they missed crucial links in their calculations. The SI-leader also obtained more feedback regarding how to improve the SI-meetings while closing the SI-meetings in the end of the program.

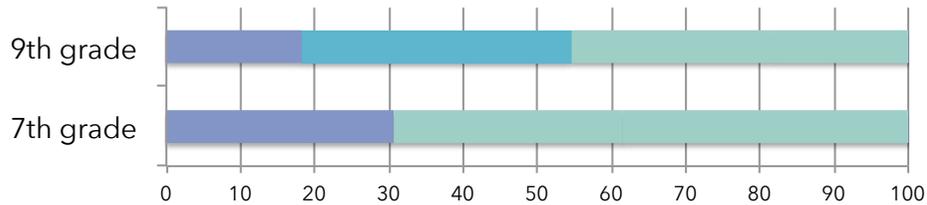
The following statements were considered to correspond to this certain LOQ.

	Low (1-2)	Medium (3)	High (4-5)
Attendees' answers to questions about understanding systems and how actions influence each other. Below the distribution of the alternative answers are given.			

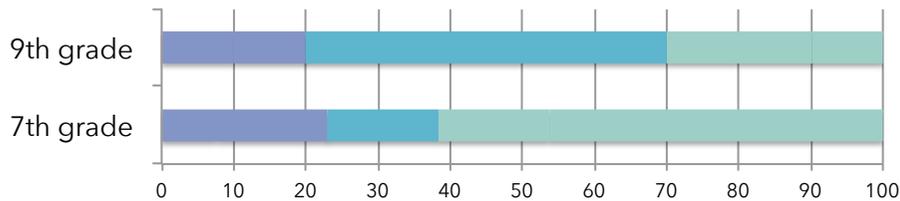
The SI sessions have made me better in communicating with my classmates.



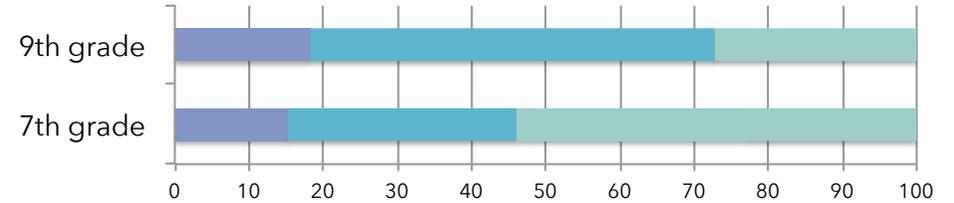
The SI sessions have made me more comfortable with presenting in front of others.



The SI sessions have made me share more of what I can to my classmates.



The SI sessions have made my classmates share more of what they can to me.



The answers show for all statements a presence of students indicating a development in to the quality of sharing knowledge. Notably is that the proportion of 9<sup>th</sup> graders that highly agree is below 50% and more than 50% for the 7<sup>th</sup> graders.

During the interviews the topic of sharing knowledge was frequently brought up by the respondents. A couple of answers were related to the prevalence of knowledge sharing during the SI sessions. On the question “If you were to describe SI how would you do that?” a 7<sup>th</sup> grader responded:

*“Instead of being quiet, you talk more. I talk more and then I get more ideas and the ideas make me better at math.”*

To the same question a 9<sup>th</sup> grader responded:

*“Nice atmosphere. You have learnt by explaining better to each other.”*

On the question “How has the SI sessions affected your motivation?” a 7<sup>th</sup> grader responded

*“I have also learnt to explain better. And tell what I know to others”*

On the question “What would make you want to become an SI leader?” three responses from the 9<sup>th</sup> grade were:

*“To teach my knowledge.” “It is fun to teach. Listen to others how they solve their problems. You are the best.”*

*“I do not like to present, like a teacher. It is fun to explain, but still stressful. Maybe I am a little bit less nervous now.”*

In conclusion, the quality of sharing knowledge has been observed during the interviews. Both as something that occurs during the SI sessions, but also as ability that some student's indicate that either themselves or other have improved.

To Share Knowledge With Others									
Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
N/A	N/A								

**Triangulation Analysis:** Except for the Continuous post SI session evaluations, all measurement tools have shown results that can be linked to how this LOQ is expected to appear among the students. The same measurements also indicate that there is a development of this LOQ among students throughout the period of the SI-program. The continuous Post SI Session Evaluations tool didn't even contain a question that was addressing this LOQ. This means that there is no presence of a tool that tried to measure this LOQ and failed. Conclusively, there are reasons to believe that the SI program had developed the quality of 7th and 9th graders sharing knowledge with others.

# From Answers to Questions

8



## 8. From Answers to Questions

This chapter discusses how the study has managed to fulfill its purpose. It starts by discussing how the three aspects of the road map presented in the second chapter have been tackled. It continues with a discussion of how well the LOQs we observed was developed as a consequence of SI.

### 8.1 Was the LOQs Correctly Defined?

Are the LOQs presented in chapter 3 really representing qualities that a Learning Organization desires? The literature review found a difference between what Learning Organization authors implicate that such an organization is. This was also considered not only to be confusing, but instead also to give flexibility for an organization that wants to become a Learning Organization. In our case this gave flexibility when we wanted to define LOQs of an individual. Thus, when reviewing the descriptive aspects of a Learning Organization that would be translated to individual qualities, a broad scope of descriptions of a Learning Organizations was used. Even though some Learning Organization authors emphasize the importance of different qualities it is assumed that none of our definitions of LOQs would be harmful for any definition of the Learning Organization. Finally it can be noted that we understand if the theoretical framework may come across as somewhat shallow. Nonetheless, our opinion is that we have provided an adequate, and for the purpose, validly enough definition of what LOQs are.

The Learning Organization literature is abstract and has a diverse typology. This made it a challenge to state what we would consider be an expression of LOQs when it appeared among the students. Especially for the quality of *Understanding systems and how actions influence each other* it was hard to come up with examples of how this quality would appear among the students. For the quality of *Using technology and systems to strengthen learning* the example must stand in relation to how much technology the lower secondary school had access to, which in this case was limited. We consider the other LOQs to be somewhat self-explanatory and it was not as hard to come up with examples that could be considered to correspond to the LOQs. Nevertheless, it is hard to prove if any of the stated examples really have an impact on the individuals' qualities to act within a Learning Organization. Yet, if some of the examples would be observed and as long as they are not considered negatively correlated to LOQ. Then these would at least indicate that the students would have developed LOQs of an individual.

### 8.2 Was what we were doing SI?

Throughout the program the SI leader has persistently taken actions that are SI typical in order to make sure that SI-elements to the greatest possible extent were present in the classroom. Yet there is a presence of several other factors that may have been the cause to these developments. There are indications that contradict that SI is the only variable that has caused the development of LOQs. Several measurements show that SI-leaders and the observer's presence and personality have had an impact on the students. However, it is impossible to facilitate an SI sessions without having an SI leader, thus the factor of the SI leaders personal traits cannot be excluded as something not logical within the framework of SI. There is also a flexibility in what is allowed to be called SI. As could be seen in Table 2, there is no distinct frame of definition that excludes the SI program in this study to be SI, All in all, the SI sessions have indeed exposed the attendees to SI.

### 8.3 Was what we measured LOQs?

According to Matrix 1 there is little or no reason to believe that Using technology and systems to strengthen learning and Seeing deviating opinions and ideas as something positive have been developed during the SI program. There is modest reason to believe that the quality of Allowing others and themselves to make mistakes and using Technology and systems to strengthen learning. This is due to a few results in the triangulation analysis. What the Matrix does not show is how well the observations of LOQ correspond to how LOQs was defined and expected to appear. It is our opinion that the quality of Understanding systems and how actions influence each other have vague correspondence to the examples of how LOQs would appear among students. Except for the in class observations, the results of the quality of Setting goals individually and together merely showed results of the individual's goals and future and not goals set together. A big part of this LOQ was therefore lost. This leaves us with results that makes us reasonably believe in a development of the following themes of LOQs:

- To Reflect on and Question Themselves and their Surrounding Environment
- To Collaborate and Prefer Learning Together with Others
- To Share Knowledge With Others

believe that variables typical for SI would induce LOQs among individuals at early stage.

Even though the data provided from this highly explorative thesis and case study, can be, and is questioned, we still believe that there is a reason to believe that SI develops some LOQs of individuals. Foremost, the collective learning and reflection qualities can be designated as having causality to SI. Finally, the absence of an inadequate logic, a logic that contradicts a presence of causality, indicates an internal congruence of this study between SI and LOQs among individuals. By other words even though the trustworthiness of the results that speaks for causality can be questioned, there is nothing that contradicts that SI can have a positive effect of developing some of the LOQs.

### 8.4 Was the LOQs we were measuring a onsequence of something that was SI?

	Matrix 1									
	Continuous Post SI Session Evaluations		In class Observations		Post-program Questionnaire		Interviews		SI literature Analysis	
To Understand Systems and How Actions Influence Each Other	N/A	N/A								
To Use Technology and Systems To Strengthen Learning	N/A	N/A								
To See Deviating Opinions and Ideas as Something Positive										
To Allow Others and Themselves to Make Mistakes										
To Reflect on and Question Themselves and their Surrounding Environment										
To Collaborate and Prefer Learning Together with Others										
To Set Goals Individually and Together with Others										
To Share Knowledge With Others	N/A	N/A								

Even though the data provided from this highly explorative thesis and case study can be, and is questioned, we still believe that there is reason to believe that the program developed some LOQs of individuals.

Foremost the following LOQs were considered to have been observed:

- To Reflect on and Question Themselves and their Surrounding Environment
- To Collaborate and Prefer Learning Together with Others
- To Share Knowledge With Others

The greatest methodological challenge of this thesis was to show that this development is a result of not only the SI program, but SI per se. According to Matrix 1 the overall strongest indication of developments of LOQs are those related to reflection, learning together as a group and sharing knowledge. Previous research shows that SI develops similar qualities among university students that may be considered to be LOQs. This speaks in favor of that SI at a lower secondary school would develop similar or the same LOQs.

The collective learning aspect is one of the core elements of Supplemental Instruction, why the qualities of *Collaborate and prefer learning together* and *Sharing knowledge with others* are the clearest observed developments of LOQs. Imagine if the SI-leader would have the role as a substitute teacher instead. The SI leader would then use conventional teaching methods and stop to persistently use the SI typical elements such as encouraging students to teach each other and learn together. Everything else would be the same. The setting of collective learning would likely be lost and probably the indication of LOQs related to this as well. Such a setup would provide valuable comparative results of what developments of LOQs that have causality to other factors than just SI. Are these observed developments of LOQs among 7th and 9th grade students uniquely related to SI? Probably not. It is likely that other peer-to-peer learning methods that would let the students take a leading role in the classroom would see a development of similar LOQs. Still, the scope of this thesis is not to compare SI to other possible solutions or even comparing it to conventional tutoring.

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As for *Reflecting on and question themselves and their surrounding environment* the SI leader made structured reflections both during the beginning and the end of a session a major and continuous part of the SI program layout. Reflecting on the learning needs of the student is within the concept of SI. Consequently, we do not find it reasonable to claim that our SI program layout has had an impact on this LOQ for the students.

The absence of an inadequate logic, a logic that contradicts a presence of causality, indicates an internal congruence in this study between SI and LOQs among individuals. By other words even though the trustworthiness of the results that speaks for causality can be questioned, there is nothing that contradicts that SI can have a positive effect of developing some of the LOQs.

Finally, it needs to be discussed whether or not the observed LOQs have a lasting effect on the individuals. Without a lasting effect there would be no future upside for Learning Organizations wanting to take advantage of the individuals' LOQs. So what can we really say about the lasting effect? Regarding the development of LOQs it is in this study not measured if they will "stay" with the individual. Also, the data indicates that the students are positive towards SI as something that boosts their LOQs. Therefore it can be argued that the data just shows a shift of attitude towards the LOQs and not an increase of the skills the LOQs represent. Nonetheless, to have a positive attitude towards the LOQs must be valuable for a Learning Organization. Yet, it is hard for us to claim that this shift in attitude is sustained within the individuals. So what is left that is fairly unquestionable? Arguably, the students will always have the experience of working with SI. This experience will probably increase the likelihood of students recognizing and wanting to be part of SI programs or similar activities in their future education. And as previous research suggests, taking part in SI programs will develop qualities similar to LOQs. The experience itself should therefore pave the way of future contexts were the students could develop more rigorous set of skills and lasting LOQs.

# Answers & Future Research

9



## 9. Answers & Future Research

### 9.1 What are Learning Organization Qualities (LOQs) of an Individual?

After the literature review and analysis in chapter 3 it is concluded that one way to define LOQs of an individual is:

- To Understand Systems and How Actions Influence Each Other
- To Use Technology and Systems To Strengthen Learning
- To See Deviating Opinions and Ideas as Something Positive
- To Allow Others and Themselves to Make Mistakes
- To Reflect on and Question Themselves and their Surrounding Environment
- To Collaborate and Prefer Learning Together with Others
- To Set Goals Individually and Together with Others
- To Share Knowledge With Others
- To Act as Role Models when Being In a Leader Position

The last leadership aspect has been excluded from further observations, due to the complexity to observe this in the case study.

### 9.2 What Development of LOQs of an Individual can be Observed among the 7th and 9th Graders when Conducting this Study's SI-program?

These LOQs was considered to not or moderately indicate a development among the students:

- To Use Technology and Systems To Strengthen Learning
- To See Deviating Opinions and Ideas as Something Positive

- To Allow Others and Themselves to Make Mistakes

These LOQs were observed by several measurements but was excluded due to weak correspondence between the results and to the LOQs definition and examples of how the LOQ would appear among students:

- To Understand Systems and How Actions Influence Each Other
- To Set Goals Individually and Together with Others

These LOQs were considered to indicate a development among the students as reason SI program:

- To Reflect on and Question Themselves and their Surrounding Environment
- To Collaborate and Prefer Learning Together with Others
- To Share Knowledge With Others

### 9.3 Is there reason to believe that SI can develop Learning Organization Qualities among 7th and 9th grade students?

It is too early to evaluate to what extent SI is able to develop such qualities. This requires a more exhaustive systematic approach of what SI elements develop LOQs among individuals. This also requires a larger, controlled study, with more validly use of measuring tools. The results and the SI program indicate that the following qualities most likely developed due to SI:

- To Reflect on and Question Themselves and their Surrounding Environment
- To Collaborate and Prefer Learning Together with Others
- To Share Knowledge With Others

It is not possible from this study to determine whether or not the LOQs developed in this program will last over time..

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## 9.4 Recommendations & Further research

Region Skåne is considering using SI as a tool to provide the region with technically skilled work force. Since the surrounding environment of the companies demanding this work force is rapidly changing in an accelerating pace, the work force should be able to work in Learning Organizations. Instead of solely focusing on pre-knowledge, Region Skåne should see the opportunity to develop the necessary “preabilities” of the Region’s students.

To fully see the potential of SI Region Skåne should fund a bigger pilot study that:

- Let the 7th graders who had SI at Apelgårdsskolan, continue have SI for two more years, to observe the sustained effects of LOQs but also other supposed effects such as decreased youth unemployment and segregation.
- Examines the causality between SI and Learning Organization Qualities in a closed study. The closed study should see if the development of LOQs is independent from SI leader to SI leader.
- Build an infrastructure of peer-to-peer based methods that sustain a culture of peer-to-peer learning.

Further scientific research would be to use the framework of the LOQs to measure it at current SI-program around the world.

Literature

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Skoog, Ulrika, (2014) Mail Correspondance

Mörner, L. (2014). Interview on Supplemental Instruction design. Lund University.

# Appendixes

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# Appendixes

## Appendix A

		Nästan aldrig					Nästan alltid
1	Jag tycker Zlatan är king.	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
1	Jag pratar öppet om mina misstag med andra för att lära mig ifrån dem.	<input type="checkbox"/>					
2	Jag kan ta reda på saker jag måste kunna inför nya arbetsuppgifter.	<input type="checkbox"/>					
3	Jag hjälper andra att lära sig.	<input type="checkbox"/>					
4	Jag ger eller lånar ut mina saker eller min tid för att hjälpa andra att lära sig.	<input type="checkbox"/>					
5	Jag ger andra tid att tänka efter när de lär sig.	<input type="checkbox"/>					
6	Jag ser problem som en						

	chans/möjlighet att lära mig.	<input type="checkbox"/>					
7	Jag belönar/uppmuntrar andra när de lär sig.	<input type="checkbox"/>					
8	Jag berättar ärligt och öppet vad mina klasskamrater gör bra och kan göra bättre	<input type="checkbox"/>					
9	Jag lyssnar på andras åsikter innan jag själv säger något.	<input type="checkbox"/>					
10	Jag vågar fråga "varför" oavsett andra personers status (ålder, klass, lärare)	<input type="checkbox"/>					
11	När jag berättar min åsikt så frågar jag samtidigt om andras.	<input type="checkbox"/>					
12	Jag behandlar mina klasskamrater och lärare med respekt.	<input type="checkbox"/>					
13	Jag lägger tid på att få mina klasskamrater att lita på mig	<input type="checkbox"/>					

## Appendix B

In my organization, people openly discuss mistakes in order to learn from them.

In my organization, people identify skills they need for future work tasks.

In my organization, people help each other learn.

In my organization, people can get money and other resources to support their learning.

In my organization, people are given time to support learning.

In my organization, people view problems in their work as an opportunity to learn.

In my organization, people are rewarded for learning.

In my organization, people give open and honest feedback to each other.

In my organization, people listen to others' views before speaking.

In my organization, people are encouraged to ask "why" regardless of rank.

In my organization, whenever people state their view, they also ask what others think.

In my organization, people treat each other with respect.

1.1.1 In my organization, people spend time building trust with each other.

## Appendix C

### Original Questions (Swedish)

Q 1. Om du skulle beskriva SI, hur skulle du beskriva det då

Q 2. Hur har SI-mötena påverkat din motivation?

Q 3. Hur skiljer sig SI-mötena från den vanliga undervisningen?

Q 4. Vad har varit det bästa med SI-mötena?

Q 5. Vad har varit det sämsta med SI-mötena?

Q 6. Vad skulle du vilja gjorts annorlunda?

Q 7. Skulle du vilja hålla i SI-möten i framtiden?

Q 8. När/om du går i 9:an, hur unga elever tror du att du hade klarat av?

Q 9. Vad hade fått dig att vilja bli SI-ledare?

Q 10. Något du vill lägga till?

## Appendix D

### INTERVIEW 1. Boy A, 7:2, high attendance (8 out of 9 sessions)

Q 1. *If you were to describe Supplemental Instruction how would you do that? If you were to describe Supplemental Instruction how would you do that?*

I would say that I have learnt more from it. They are helping me, they are making math more fun, I would say.

Instead of just working with the book. You get to work by the board.

Instead of being quiet, you talk more. I talk more and then I get more ideas and the ideas make me better at math.

I have got to know the students in my class better.

I feel safer regarding math.

Q 2. *How has the SI-meetings affected your motivation?*

Much more. It has affected me within all subjects. It has affected me in that extent that I have started to think about the future.

It has helped me also. If I have better motivation, then I am better at math.

I feel safe to say what I think. In front of a class, then you maybe can say something wrong. Nothing happens there, in the classroom. It is not the same thing.

Follow up: - how do you mean?

If I am wrong here. I do not have the same feeling as in the class. If I say something wrong. It is not the same feeling. It is a better feeling here.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

From the regular math?

It much more fun. I learn more from it. And...it is much more fun, have I said that?

Q 4. *What has been best with the SI-meetings?*

That I become better at math.

Q 5. *What has been worst with the SI-meetings?*

Nothing

**Follow up question:** Nothing? Something?

Not for me, maybe for others Not for me.

Q 6. *What would you like to have been done differently?*

What do you mean?

Maybe another subject. I would have taken, either English or Sciences. Within Sciences I would take Chemistry.

Q 7. *Would you consider leading SI-meetings in the future?*

In the future? Eh.

Why not?

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th grade.

Q 9. *What would make you want to become a SI-leader?*

Alot of things, that you get to do different things. To meet new people. Go to different countries. It is more fun.

Q 10 *Anything to add?*

No.

### INTERVIEW 2. Boy B, 7:2, high attendance (8 out of 9 sessions)

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

That it is good to work with and that you learn. It is easier to work in smaller groups. And to express yourself, everyone gets to express themselves so that the best thought comes.

I believe that you learn quit a lot from SI. If you are the one that are willing to work hard, then you can do that through SI.

Q 2. *How has the SI-meetings affected your motivation?*

*To what?*

Regarding the school has it affected me a lot because you get to travel everywhere, because you work hard in school.

I have also learnt to explain better. And tell what I know to others.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

You express yourself more. In the ordinary it is more about working in the book, here is more working by the white board, which I believe is easier to learn from.

A bit more explanation, how you can work in different ways. Everyone get to be by the white board. More fun math here. That is what I think.

Q 4. *What has been best with the SI-meetings?*

That we have good teachers. Fun tasks. It is the working environment that is bad.

Q 5. *What has been worst with the SI-meetings?*

The working environment.

Q 6. *What would you like to have been done differently?*

Maybe to try to change the groups. Those who do not want to learn or be a part of SI, exclude them from the group. De are just interfering with those who want to learn.

Q 7. *Would you consider leading SI-meetings in the future?*

YES. Every year.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th, 6th, 7th grade. It depends how good I am at math, so that I have something to learn them.

Q 9. *What would make you want to become a SI-leader?*

It is nice to work with students and teach them what you know. Then tell it on.

Q 10 *Anything to add?*

That we really want to continue have you and SI.

### **INTERVIEW 3. Boy, 7:2, high attendance (8 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Good help and you get self confidence. You get us to believe in ourselves.

Good thing for us. And yes.

Q 2. *How has the SI-meetings affected your motivation?*

Positively. Made me get more will to fight and put an effort in school.

You give us inspiration.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Smaller group and you concentrate better. You embrace more. If it is a big group, someone is sitting with the phone. It is focus on you and nothing else.

Q 4. *What has been best with the SI-meetings?*

The best is that you believe in new things and new ways to learn.

Q 5. *What has been worst with the SI-meetings?*

nothing

Q 6. *What would you like to have been done differently?*

No it is good the way it is right now.

Q 7. *Would you consider leading SI-meetings in the future?*

Yes if I receive some support from you.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

Maybe in the 7th grade.

Q 9. *What would make you want to become a SI-leader?*

Don't know really.

Q 10 *Anything to add? Anything to add?*

No.

### **INTERVIEW 4. Boy D, 7:2, medium attendance (6 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

You can learn a lot. It us who do not put in the effort.

It is good to be here. You learn a lot.

Q 2. *How has the SI-meetings affected your motivation?*

I do not know. We learn.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

It becomes more easy. When you are many it becomes messy. There are many who takes the chance to say something if you are not too may.

It is a smaller group.

Q 4. *What has been best with the SI-meetings?*

When we were supposed to be 2 and 2 and then work.

Q 5. *What has been worst with the SI-meetings?*

I do not know when. When no one listened.

Q 6. *What would you like to have been done differently?*

I do not know.

Q 7. *Would you consider leading SI-meetings in the future?*

Yes.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th to 7th grade.

Q 9. *What would make you want to become a SI-leader?*

I do not know

Q 10 *Anything to add? Anything to add?*

No.

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**INTERVIEW 5. Boy E, 7:1, high attendance (8 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

I think it was good.

You learned.

It is the students fault that they talk too much.

We have worked with division and such things. Different things.

Q 2. *How has the SI-meetings affected your motivation?*

Destroyed or what?

Actually, I do not know.

Become better. That is what I think

At math and such things. Division, all things.

We work god and stuff.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

The ordinary tutoring doesn't explain as much.

A bit easier.

Q 4. *What has been best with the SI-meetings?*

That we could say whatever we wanted. For example what we wanted to work with. Democracy.

We did those things like pass the cone.

Q 5. *What has been worst with the SI-meetings?*

That the student talked too much. The students destroyed.

That the teachers should have been harder.

Q 6. *What would you like to have been done differently?*

Helped you as teachers.

Worked better.

Q 7. *Would you consider leading SI-meetings in the future?*

Yes.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

9th graders

Q 9. *What would make you want to become a SI-leader?*

The teachers. They make it more fun.

Q 10 *Anything to add?*

I actually believe that I have learnt me quite a lot.

For example cooperation and mental arithmetic.

**INTERVIEW 6. Girl A, 7:2, medium attendance (4 out of 9 meetings)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Good. Okay.

Q 2. *How has the SI-meetings affected your motivation?*

Do not know.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Well, here he explains better. The other one is slow.

Q 4. *What has been best with the SI-meetings?*

Ask questions in the ring. With the little duck.

Q 5. *What has been worst with the SI-meetings?*

That it becomes messy.

Q 6. *What would you like to have been done differently?*

Nothing, it is okay.

Q 7. *Would you consider leading SI-meetings in the future?*

Yes.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

Max 15-14 students and 5th-6th graders.

Q 9. *What would make you want to become a SI-leader?*

That you get to travel.

Q 10 *Anything to add? Anything to add?*

No.

**INTERVIEW 7. Girl B, 7:2, high attendance (8 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

You help us, better. If we do not understand, you show another way if you know what I mean.

You are good at explaining.

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We go through hard words. You help us solve such hard tasks.

Q 2. *How has the SI-meetings affected your motivation?*

Good. If everyone else had behaved it would be easier to concentrate.

It has been chaos. Not always. But I have also wanted to talk about your travels and such.

Better concentrated. Easier and better.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

It is easier here. You collaborate more. You dare more because it is smaller group. Here you can get more help.

Q 4. *What has been best with the SI-meetings?*

It is not like ordinary math.

Like the celebrity math.

You learn math. But in a fun way.

Q 5. *What has been worst with the SI-meetings?*

Maybe you should tell those who do not listen to concentrate.

Like Albinot, he was very concentrated. He was interested because he wanted to learn.

The others affected me.

Q 6. *What would you like to have been done differently?*

If you do want to be harder on us. Maybe you should call in someone that can be. If you do this we can do this fun thing the last 15 minutes.

Q 7. *Would you consider leading SI-meetings in the future?*

With a friend. Maybe Albinot. Someone that is smart.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

4th-5th grade.

Q 9. *What would make you want to become a SI-leader?*

Math in fun way.

Because you can travel. A lot of travelling. It is not a boring job. You wake up and looking forward to go to job.

Q 10 *Anything to add? Anything to add?*

No

#### **INTERVIEW 8. Boy F, 9:2, high attendance (6 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Fun. Exciting. You get to learn something new.

Calculate in different ways. New arithmetic.

Hard tasks. Becomes easier to solve.

Q 2. *How has the SI-meetings affected your motivation?*

I want to learn more.

I have learnt more.

More motivated to work with other students.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Funnier. You want to come to SI. More exciting.

Q 4. *What has been best with the SI-meetings?*

Discuss a hard task. And then solve it.

Q 5. *What has been worst with the SI-meetings?*

Nothing special.

Q 6. *What would you like to have been done differently?*

Okay. everything has been good.

Q 7. *Would you consider leading SI-meetings in the future?*

I am not good at being a leader and such.

I am not afraid for those in my class.

If I meet new, I can have a hard time talk to them.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th or 6th graders. 6th if I go to High School.

Q 9. *What would make you want to become a SI-leader?*

To teach my knowledge.

It has been fun every time. Not boring. Nice to get to know you too.

Q 10 *Anything to add?*

No

#### **INTERVIEW 9. Girl C, 9:2, high attendance (6 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Good. Learning. Fun.

What we are doing here?

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We go through math in a fun way. And in a way that it sticks.

Q 2. *How has the SI-meetings affected your motivation?*

Positively. I see math in a fun and simple way.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

The classes do not have as much space. It is easier when we are a smaller group.

Many hesitate in the class.

Many dares, even beginners, those who are not on the same level. They are afraid to ask. These small groups helps those who do not dare.

Q 4. *What has been best with the SI-meetings?*

That we have learnt different things. Math and some things outside of math.

Q 5. *What has been worst with the SI-meetings?*

Maybe that we just have 1 once a week.

Q 6. *What would you like to have been done differently?*

Nothing special directly.

Q 7. *Would you consider leading SI-meetings in the future?*

If I were good enough in math. Maybe in Swedish and English, and social sciences.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

Up to the 7th grade.

Q 9. *What would make you want to become a SI-leader?*

You and Johan. Would never have thought of it unless you would have come to us.

Q 10 *Anything to add?*

No

#### **INTERVIEW 10. Girl D, 9:2, high attendance (6 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

You have made us learn so much. You are really awesome.

It is hard explain. We learn a lot from you. You are good at explaining. Give us chances. If we say something, then you await our answer.

You have taught us how to answer hard questions.

Q 2. *How has the SI-meetings affected your motivation?*

Strong.

I have never been excellent at math. Now when you get the chances then you become more secure. Plus in smaller groups it is easier to explain.

We have learnt physics as well. And together!

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Much better than the ordinary tutoring.

You give us chances to explain. You await our answer before you tell us the correct answer.

Q 4. *What has been best with the SI-meetings?*

That we have learnt a lot.

Q 5. *What has been worst with the SI-meetings?*

Don't know.

Q 6. *What would you like to have been done differently?*

Don't know.

Q 7. *Would you consider leading SI-meetings in the future?*

If I would be good at math, then I would want to.

Swedish English maybe.

Why not?

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

Half class and maybe 5th graders .

Q 9. *What would make you want to become a SI-leader?*

It is fun to teach. Listen to others how they solve their problems.

Your are the best.

Q 10 *Anything to add?*

No

#### **INTERVIEW 11. Boy G, 9:2, high attendance (6 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Helpful. Nice. Nice atmosphere.

You have learnt by explaining better to each other.

Q 2. *How has the SI-meetings affected your motivation?*

Rather much. Before it was boring math. Now the it continues after each other. There is a connection between rules. You have made us realize that.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Nicer. It is...you learn more. Because you discuss every task. If you wonder anything you can ask.

Q 4. *What has been best with the SI-meetings?*

You are nice. And you learn a lot. More than usual classes. You can ask anything, not just the subject we are within.

Q 5. *What has been worst with the SI-meetings?*

Sometimes there occur fights between students.

Q 6. *What would you like to have been done differently?*

Not what I can think of.

Q 7. *Would you consider leading SI-meetings in the future?*

No, not my thing.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

No.

Q 9. *What would make you want to become a SI-leader?*

I do not like to present. Like a teacher.

It is fun to explain. But still stressful.

Maybe I am little bit less nervous now.

Q 10 *Anything to add? Anything to add?*

No

### **INTERVIEW 12. Boy H, 9:2, high attendance (7 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

It is good. You learn a lot and such things.

You should have it at other schools.

Q 2. *How has the SI-meetings affected your motivation?*

You learn from others in the groups. Cooperation.

You dare to talk more.

You raise your hand.

There are many in class. If I ask there maybe I will be embarrassed, everyone know it. In smaller groups it is more relaxed to ask those things.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Smaller groups. You dare to speak. It such a lesson you are looking forward to. You want it all the time.

It is not that messy.

Q 4. *What has been best with the SI-meetings?*

You learn more about math.

For example equations, math E,

You get more self-confidence.

Q 5. *What has been worst with the SI-meetings?*

Nothing.

Q 6. *What would you like to have been done differently?*

Maybe divided us by skills, step wise. Those who can really good math.

Q 7. *Would you consider leading SI-meetings in the future?*

I am not sure.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th grade. I can do it if I get help from you two. If I am not self there.

Q 9. *What would make you want to become a SI-leader?*

Talk to others. Create discussions. Solve problems with others.

It is nice to teach.

I like present and such.

Q 10 *Anything to add?*

No.

### **INTERVIEW 13. Boy I, 9:1, high attendance (7 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

A social group. Everyone can tell what they think.

And you receive help with math tasks you need help with.

You can be yourself.

Q 2. *How has the SI-meetings affected your motivation?*

It has given me self confidence to know how big you can be in the future. Get a good job and good education.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

You can talk more about your problems without being embarrassed.

And they explain better here.

Up there is mandatory what you need to know. If you do not get a task because you haven't done it in a while, then perhaps the teachers become irritated.

Q 4. *What has been best with the SI-meetings?*

To explain assignments.

Q 5. *What has been worst with the SI-meetings?*

A lot of talking.

Some takes over.

Q 6. *What would you like to have been done differently?*

Try to get along with those you do not get along with.

Q 7. *Would you consider leading SI-meetings in the future?*

Maybe, maybe not.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

6th-5th graders.

Q 9. *What would make you want to become a SI-leader?*

That many have received help from it then I would really want to do it. Just so it doesn't become unnecessary meetings.

Q 10 *Anything to add?*

no

#### **INTERVIEW 14. Girl E, 9:2, high attendance (6 out of 8 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Those meetings, they seem fun. I have never been able to collaborate with anyone. It feels like the whole class suddenly is shutting up. Takes away most of the flip.

Go through math solutions in new unusual ways.

For example I take the easy way out if you know what I mean, but this meetings give me understanding.

Q 2. *How has the SI-meetings affected your motivation?*

Yes.

You realize that you can find a small interest in math.

Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

Much more free. During the math, you worry if you do not contribute during the class you do not get graded in the same way.

Q 4. *What has been best with the SI-meetings?*

The discussions.

Matteboken.se

Q 5. *What has been worst with the SI-meetings?*

First group. I am easily provoked.

Q 6. *What would you like to have been done differently?*

You learn a lot during these meetings. There were a lot of new cases. Less of complex tasks.

Q 7. *Would you consider leading SI-meetings in the future?*

Not alone. Definite not alone.

Maybe with a friend.

You need the knowledge.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

5th

Q 9. *What would make you want to become a SI-leader?*

I think for most examples math teachers are supposed to be boring. You were very youthful. I believe that to show that just because you are teacher of math then you do not have to boring.

Q 10 *Anything to add?*

No

#### **INTERVIEW 15. Boy J, 9:1, high attendance (8 out of 9 sessions)**

Q 1. *If you were to describe Supplemental Instruction how would you do that?*

Good. It is cooperation and everything. Everyone gets to express themselves.

It is fun.

We have learnt different math things. Cooperation maybe.

Q 2. *How has the SI-meetings affected your motivation?*

In a good way actually. It has given me the hope to learn math and continue study and educate myself at University.

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Q 3. *How are the SI-meetings differing from the ordinary tutoring?*

It is more fun.

Q 4. *What has been best with the SI-meetings?*

That we got to know you.

Q 5. *What has been worst with the SI-meetings?*

We haven't learnt as much as the other group, it has been more chaotic.

Q 6. *What would you like to have been done differently?*

Done some tasks on paper to. Paper and math tasks.

Q 7. *Would you consider leading SI-meetings in the future?*

It depends.

Not for the small, they don't care.

Q 8. *If you are in the 9th grade, how young students do you think you could manage [to lead SI-sessions for]?*

9th graders know that they need it to manage, so they listen.

Such the other group you have had.

Q 9. *What would make you want to become a SI-leader?*

Meet new people, meet people, students.

You get to travel.

Q 10 *Anything to add? Anything to add?*

No.