Using practical inquiry to support Self-directed Learning:
A case study on ICT competence development program for elementary school teachers in a Swedish Municipality

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Sammanfattning/Abstract

Information and communication technology has for long been integrated into learning and teachers utilize all forms of digital technology for communication as well as to simplify learning. To adapt, teachers need to personally or through informal learning process, learn about new technologies and how to utilize them to improve learning. To personally educate themselves, the teachers need to dedicate time and resources to identify ICT competence areas where is needed and sort for resources to solve it. This thesis investigates the process of self-directed learning with a group of teachers in a planned competence development program within a local municipality’s educational department, on the use of digital technology to integrate into classrooms. With action research that integrates instructional learning from the organizations perspective and inquiry learning from teacher’s perspective, self-directed learning process was tested as a simple and structured process for self/collaborative learning, for participants. The result was a series of events that summarized why teachers could not follow the learning process, with a conclusion that in order for teachers to be self-directed in learning new ICT, the organizational need to allocate time not only for instructional learning, but also for inquiry learning.

Nyckelord: self-directed learning, competence development, inquiry learning, Instructional Learning, practical inquiry, information and communication technology.
Innehållsförteckning/Table of content

1. Introduction .......................................................................................................................... 5
   1.1 Purpose of Research ....................................................................................................... 6
   1.2 Research question ......................................................................................................... 7
   1.3 Research methodology ................................................................................................. 7
   1.4 Methodology process .................................................................................................... 8
2. Self-directed Learning .......................................................................................................... 9
   2.1 Definition ........................................................................................................................ 9
   2.2 Rationale for SDL for employer .................................................................................... 11
3. Learning modes to support SDL ........................................................................................ 13
   3.1 Modes of Learning ........................................................................................................ 14
      3.1.1 Teachers as instructor .............................................................................................. 14
      3.1.2 Learning by Inquiry ................................................................................................. 14
      3.1.3 Performance learning and Resolution .................................................................... 16
   3.2 Social characteristics of learners .................................................................................. 17
4. Research method and process ............................................................................................. 18
   4.1 Planning Phase ................................................................................................................ 18
      4.1.1 Planning and designing the learning content ............................................................ 19
      4.1.2 Planning content delivery ....................................................................................... 19
   4.2 Action phase .................................................................................................................. 19
      4.2.1 The instructional learning process ......................................................................... 20
   4.3 Observation phase ......................................................................................................... 21
   4.4 Motivation for choice of method ................................................................................... 22
   4.5 Ethical Issues ................................................................................................................. 23
   4.6 Reflection ....................................................................................................................... 23
5. Results ................................................................................................................................ 25
   5.1 Journal for Instructional learning process ..................................................................... 25
      5.1.1 Acceptance as participants ..................................................................................... 25
      5.1.2 Previous knowledge on using the technology ......................................................... 25
      5.1.3 Availability of technology for participants .............................................................. 25
      5.1.4 Engagement in practical learning ............................................................................ 25
      5.1.5 Collaboration during instructional learning ............................................................. 25
   5.2 Participants inquiry learning process .............................................................................. 26
      5.2.1 Process for Learning ................................................................................................ 26
      5.2.2 Instructor’s follow-up ............................................................................................... 26
      5.2.3 Classroom observation from participants ................................................................. 26
5.3 Learning experience within the research ................................................................. 27
5.3.1. Structure and content of instructional learning ........................................ 27
5.3.2. Time dedicated for instructional learning ...................................................... 27
5.3.3 Time dedicated for inquiry learning ................................................................. 27
5.3.4. Relevance of the competence development program .................................... 27
6. Analysis of results ........................................................................................................ 28
6.1 Participant’s practical inquiry in learning ............................................................. 28
6.2 Organizational structure for instructional learning ............................................. 31
6.2 Priority given to ICT and non-ICT competence development program .......... 31
7. Discussion ................................................................................................................ 32
7.1 Research result and self-directed learning ......................................................... 33
7.2 Extending self-directed learning beyond the individual learner ..................... 34
7.3 Reflection on research methodology ................................................................. 35
8. Conclusion and future research ............................................................................. 37

Bilder/figures
Figure 1 showing data collection process .................................................................... 7
Figure 2: Relationship between SDL, inquiry based learning and practical inquiry .................................................. 8
Figure 3: Learning as a life-long process ..................................................................... 12
Figure 4: CoI Framework (Garrison, Anderson & Archer, 2000) ............................. 13
Figure 5: Practical Inquiry Model (Garrison, Anderson & Archer, 2001) ............... 15
Figure 6: Application showing tools demonstrated. TeamBoard Draw tips © 2012 Epson America... 20
Figure 7: Pedagogical activity demonstrated and practiced by participants .......... 21
1. Introduction

The evolution of technology and its usage has created dynamic learning pattern in organizations and learning institutions. These technology, either the more complex information systems and IT-infrastructures or the simpler user based devices such as personal computers and tablets as well as the applications running on them, requires knowledge and competence from the users. In organizational environment, information systems are utilized for the execution of daily work routines as defined by the aims and objective of the organization. In learning institutions with specific examples from primary and secondary schools, apart from using technology as a tool for communication and fulfillment of other administrative task, the learning environment is also affected by the changes of technology which act as a catalyst for learning, by applying different teaching methods that integrates technology. On the one hand, technology as catalyst for learning can be collaborative, like learning platforms for communicating learning content within learning environment/classrooms, while on the other hand, learning methods can refer to different methods/combination of methods integrated in classroom that help in simplifying learning for students. Sometimes these technological integrations is not compulsory for teachers and/or students that is why the Swedish educational department (Skolverket) is suggesting a national IT-strategy for Swedish schools and the compulsory provision of computers to all students to support learning and develop digital competence, which according to a research by Grönlund (2014), observed an increment and quality in the way students use the internet to search for information, writing and presentation. He also emphasized how the introduction of computers in schools causes negative effects in term of workload and stress for teachers because they have to also cope with learning new technological application and also altering their known teaching methods.

With focus on the teacher learning environments such as primary and secondary schools, changes in technology when integrated in learning varies from time to time and teachers as primary users ought to be custodians of the knowledge/pedagogy, to a certain degree, conversant to using ICT and its corresponding methods for educating students. In workplaces, internal competence development programs are organized to bridge the gap both for new ICT users or those that need to update knowledge on certain areas of ICT within the organization. That is why work place learning, a means for acquiring knowledge for job execution in an organization is needed and important to address gaps even within areas of ICT in work environment.

Due to continuous changes in ICT, teachers in educational institutions need to undergo series of formal and informal (internal) training, but most importantly, the competence needed to apply the knowledge derived from these trainings lies on the continuous use of the information received from the trainings. According to the Swedish educational department (Skolverket 2016, p 6), the changes in ICT over time, when compared to ICT competence attained by teachers over time (between 2012 and 2015), is minimal. In the report, teachers are still in need of the same competences identified in 2012 such as “knowledge on digital tools, sound and film production and use of internet”. Possibly, the strategy used during competence development need to be refined. Teachers need to be motivated and interested in learning and applying ICT in classrooms and the application of self-directed learning as a field of study can
help understand the relationship on how the individual as a learning agent can increase knowledge in work environment.

The concept of self-directed learning originated from education sciences and made prominent by scholars like Knowles (1975); Guglielmino (1977/78), who defined SDL as the responsibility of learners taking action for planning and conducting their learning. To other scholars, SDL is a process of learning how to learn (Nalsbitt and Aburdene, 1985; Oddi, 1985, Smith, 1982). Self-directed approach to learning can be guided by inquiries, asking questions and searching for results using various information repositories/databases, even by collaborating with partners and colleagues. Thus, the act of learning by inquiry (Houle, 1980) can support self-directed learning. Guglielmino et al (1987) further placed SDL in workplaces as a continuous learning pattern/process for employees due the necessity for long live learning (UNESCO, 2011; OECD), brought about by the insufficiency of formal/preparatory education. This acts as a motivation for organizations to invest in internal competence development programs to continuously develop employee’s workplace knowledge. A certain percentage of these internal competence development programs conducted in organizations are short-term, precise and straight forward for employees to apply directly, but the content to be discussed are deeply rooted and process oriented, making internal competence development programs insufficient to equip employees with the necessary knowledge needed in such arena. This is why SDL is also seen as a process that consider the personality and skill of learners, which varies based on the learning objective (Griffen, 1978; Smith, 1982). For employees to potentially utilize knowledge from internal competence development program to increase and motivate workplace learning, there is need to further self-educate themselves based on the processes of SDL or other learning models. This does not mean that learners are to be isolated or learn on their own, rather the process can involve group-learning while maintaining the idea of self-directed learning to motivate and develop richer foundation for work place learning (Brookfield, 2009).

1.1 Purpose of Research

Despite the technological advancement in the society in general, digital competence which is one of the live long learning areas as described by the UNESCO (2011) report, has not really achieved its peak in educational organization. People are still entangled with the idea of digital divide (age gaps and unavailability of technology), rather than focusing on change, making learning and adaptation to new ICT very difficult. As such, this research will look into employees (teachers) personal learning characteristics within internal competence development programs in relation to learning and using ICT both as a tool for communication and its integration in classrooms. In a more simplified way, it will examine how teachers in a primary schools apply self-directed learning processes in furthering their learning of ICT within the frame of the internal learning programs.

Participants in the research is a group of teachers from a Swedish elementary school that will undergo a planned internal competence development program (the use of interactive board in classroom), organized by the educational department of a Swedish municipality to be delivered through an instructional learning process. This is a familiar process “for disseminating established skills, knowledge or sensitiveness” (Houle 1980, pp 32) like those seen between teachers and student. The content for instructional learning is design to help teachers gain
familiarity with the functions available in an interactive board as well as basic introduction on how it can be integrated within classroom subject to visualize and simplify learning. To further individualize learning, the teachers will utilize inquiry based learning, defined by Houle (1980, pp 31) as “creating some new synthesis, idea, technique, policy or strategy of action” to integrate the use of the interactive board in different school subjects.

1.2 Research question
Focus will be placed on the below research questions in respect to the above stated research group/arena:

- How can inquiry-based learning support teacher’s self-directedness in motivating and learning ICT in educational institution?
- In what way can organizations serve as catalyst for self-directed learning/learners?

Data collected from the study will be analyzed with the below variables. These variables are connected both to learners (teachers) and the organization (educational department), thereby shifting some responsibilities for self-directed learning to the organization.

- Practical inquiry; a method for inquiry based learning
- Organizational structure in respect to competence development program
- Priority given to ICT and non-ICT competence development program

Furthermore, the way learners access, process and utilize information depends on their personality, (Graziano & Eisenberg, 1997), and personality traits “the big five” (Costa & McCrae, 1994). This research will not take into account the personality traits of the teachers or try to analyze their individual capacity to learn. SDL will be seen from a universal point of view, with the assumption that participant in this research, has the ability to learn new things in their work environment.

1.3 Research methodology
An action research approach (Gilmore et. al 1986) was used to execute the research. The process is drawn from MacIsaac’s Simple Action Process Modell which involves Planning, taking action, observation and reflection (1995). Data was collected using mixes of methods from qualitative research (interview, logbook and survey).

Figure 1 showing data collection process
1.4 Methodology process

Participants received learning instruction on how to use interactive board within the framework of a planned internal competence development program in a Swedish municipality’s educational department. They were also provided with learning materials that assisted in individual learning about using the technology. While using logbooks, teachers could document their learning process and experiences in the entire self-learning process. To achieve self-directed learning, teachers will depend on making inquiries from different resources (people, learning materials, and internet) which defines inquiry based learning. However, there should be a method utilized for making enquiries that is why the practical inquiry (Garrison, et. al, 2001) is used as method to analyze self-directed learning process both for participants and the organization (see fig. 2).

For the purpose of this research, the information on the logbook will be documented from the date of the competence development program to the date they have their first interactive board integrated lesson. From the researcher’s perspective, observation will be done with each teacher while he/she uses the technology in the classroom. Finally, interview will be used to collect information about their practical experiences during the entire process. The interview gained access to teacher’s views on the learning process, its positive and negative effects as well as the organizational structure for planning and executing instructional learning process for the purpose of this study.

Reason for using this research/data collection method is due to the nature of the problem - a real work situation. Logbook will help in understanding reasons of inquiry based learning as a means to attain self-directed learning skills from a teacher perspective, as it has been observed that they are faced with time consuming task daily. It will also help in explaining priorities in what is being learned. Using observation is adequate to understand classroom dynamics and teacher-student reaction when learning is being simplified with ICT.

![Diagram of Relationship between SDL, Inquiry Based Learning, and Practical Inquiry](image)

*Figure 2: Relationship between SDL, inquiry based learning and practical inquiry*
2. Self-directed Learning

Learning is a continuous process for everyone, irrespective of age, gender or profession (Angelo, 2015). As children, learning as a compulsory process is attained at home from family and friends as well as the formal educational learning process (schools). The compulsory educational learning process takes the learner through teenage period and as adults, the process continues with choices of processional courses in higher institutions. These learning processes are all within the boundary of formal learning, where most of the information are grounded on theories and cultural practices (Houle, 1980; Bullock, 2013; Merriam, 2001). A practical and experimental learning process begins when the individual is employed in a real organization that handles real situation (Houle, 1980 p 104). Sometimes or based on the professional field, formal learning becomes insufficient because a newly employed worker have no previous knowledge to an organization’s specific culture, structure or information system. An example can be drawn from an accountant that has to be introduced to an entirely new accounting software and this makes organizations invest in internal competence development programs to enable the employee acquire the competence needed to operate the system or solving real time problems while using the system. Ferriter and Provenzano (2013) also described how the lack of innovation in a school made a teacher motivated and self-directed his own learning in creating and becoming a part of social media networks to gain knowledge on how to develop his teaching strategy.

As a complement to formal and internal learning processes, an employee is tasked with individual learning when he/she need certain knowledge/information that is probably not available as an internal competence development program or having to produce a solution to a problem of immediate attention. An example can be drawn from a class teacher who needs to introduce an application as means to support mathematical simplification, of course, the teacher will be task to self-direct his/her learning process in ways that is seen convenient in order to introduce it to student. Self-directed learning is a life-long process from an individual perspective and in an organizational perspective, promotes work-place learning for profitability and ability for individuals to develop skills and competences.

2.1 Definition

The concept of SDP originated from educational science to support adult education. Various definitions and theories have been put forward by scholars and researchers trying to relate SDL to other field of study and even applying it in educational organizations, personal task execution and even human cognition (Gureckis and Markant, 2012). According to Oddi (1987) who stated concerns about ambiguity in SDL’s various definitions due to synonymous and interchangeable terms used by researchers such as self-initiated learning (Penland 1979), self-teaching (Touch 1966), self-regulated learning (Pintrich, 2005), Autonomous learning (Gibbs, 1979; Chene, 1983) and many more, one could understand and draw conclusion that despite the irregularity in terminology, the concepts are directed to individualizing learning and learners as well as understanding their personal characteristics to learn. To further investigate the individual learner’s self-directed learning process, Guglielmino (1977) developed a scale for measuring self-directed learning readiness (SDLRS) as well as Grow’s Staged Self-Directed Learning (1991, 1994), a matrix constructed to help learners identify readiness to learn. Stockdale & Brockett
(2011) extended the SDLRS to include the Personal Responsibility Orientation (PRO-SLDRS) to argue and point out the responsibility of learners, with further analyses by Brockett et al (1991) that considers the personality construct of an individual as a factor for SDL. A notion agreeable by all researchers was analyzing SDL as a process related to lifelong learning (Henrick Et. al., 1998) and the ability for individuals to take responsibility for learning. Lifelong learning can be achieved in installments in form of learning projects either by learners or organizations, thereby making SDL a deliberate activity over a time period for learners (Boyer, 2013). An example is drawn from internal competence development programs for employers to their employees.

The definition of SDL given by Knowles (1975), which has been adapted by most researchers as the most fundamental and grounded definition (Hiemstra 1994; Oddi, 1987; Boyer et. al., 2013), will be used within the context of this research to avoid ambiguity and to present a clearer picture of SDL and its process. Knowles (1975, p. 18) defined SDL as “a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes”. Certain characteristics of learners according to the definition can be easily highlighted. These includes the following:

- Learners are responsible for learning
- Process of SDL is collaborative
- It utilizes different learning methods
- Planning and execution is necessary in SDL
- It iterates as a circular process

The definition in its entirety, bestowed responsibility for learning to the individual but does not limit the learning from collaborating with other and/or looking for resources that could support learning. The word “self” in the concept seems deceitful when we consider the SDL from a layman’s perspective, this is why some researchers have overlooked the idea of it being collaborative, thereby putting less emphasis on the collaborative profitability it offers. Oddi (1987) analyzed this aspect in his article referring to researchers who according to the definition and process of SDL, made learners the sole custodian of personal characteristics that can advocate learning. These mainly comes down to personality traits and the ability for learners to take initiative to plan and execute learning goals according to different learning process associated to learning.

Considering educational science in which SDL is rooted, different forms of learning takes place between teachers, students and the environment. The synergy of all these contributes to the students learning process and performance. As such, we can say that processes and learning modes described within and beyond SDL will need to be in the appropriate proportion to enable learners make use of all resources. In more clarity, a learner with support from the (1) teacher in form of instructional tutoring, (2) the provision of learning resources, (3) input from classroom collaboration and (4) learners personal ability, when combined in learning situation can support learning. This factors were also justified by Danis (1992) and Kirwan et al (2014) but Kiwan et al (2014) highlighted the characteristic of the learner while putting forward Brockett & Hiemstra’s (1991) Personal Responsibility Orientation (PRO) as a model that
prioritizes personal responsibility, a trademark for learners in making use of the instructional learning. In fact, the many ambiguous definitions of SDL also brought about several learning models and processes just like Heimstra’s (1991) PRO, to supporting independent learning and learners. Further examples are Houle’s (1980) mode of learning where process for self-learning is distributed between instruction, inquiry and performance; Grow’s (1991, 1994) Staged Self-Directed Learning (SSDL) matrix made it easier for learners to match their ability to a learning position; Danis’s (1992) model that iterates between learning strategy, content and its process as well as characteristic of the learner in the entire learning environment; and the more general process that defines SDL as a process (Knowles, 1975). This processes and models despite their convergence towards improving SDL, the learner need to identify which process seems convenient for their learning outcome. For instance, a learner might use Grow’s (1991, 1994) SSDL matrix to identify entry point in a language class to meet learning goals rather than using Danis’s (1992) model that is more adaptable for a PhD student. A suitable learning process relating to this research question and its participant will be that of Houle’s (1980) because it considers investigating learning from an organization and individual learner perspective, where the application of instructional and inquiry learning is necessary to meet the goals set by employer and employee.

2.2 Rationale for SDL for employer

Not many research has been done on SDL in productive organization as has been done in educational science, but an assumption is that the benefit and outcome is same to all adult learners (even employees/professionals in organizations). Researchers like Smith (1982) isolated collaboration and organizational tutorship from SDL with the argument that it should be individualized and that learning ought to be initiated by act of personal responsibility. Notwithstanding, several sectors like the healthcare sector has over the years recognized and applied self-directed learning, which according to the article by Angelo (2015), discussed rationale and advantages of SDL in the healthcare sector. The article recognizes competency in practice, innovation, quality in standard and transparency. As explained earlier, the context in which SDL is discussed, shifts its characteristic and process. In the healthcare sector (Angelo, 2015), SDL made practitioners comfortable to disclosure of competences to the public in open data, thereby giving citizens confidence and reliance of the practice. Recognition of individual or group quality, work qualification and competence to perform is information for the public and a character of professionalism (Houle 1980, p. 61), as such, continuous learning creates a sense of reassurance for citizens.

Guglielmino et. al. (1987) pointed out insufficiency in group based instructional learning process and this is understandable from an organizational perspective. An example can be draw from a group of teachers responsible for different subjects. If they all undergo the same internal competence development, the knowledge gained will have to be re-processed and applied by each teacher according to his/her subject area. This means that a personal learning process will be necessary for the teacher to apply and use the information, this is where SDL seems adequate. A concept synonymous to SDL is Self-enhancement (Houle, 1980, p. 47), a summation of all that has been learnt throughout a practitioner’s vocation including formal and informal education process. If Boyer’s (2013) argument about SDL being an installment learning
in form of short projects or the acquisition of specific knowledge, then this confirms that the summation of the products from all SDL’s process produces the self-enhanced learner.

Figure 3: Learning as a life-long process

Irrespective of where the product of learning will be applied, either for professional use in any kind of organization or for individual use to support life-long learning and self enhancement, the rationale of SDL is justifiable and is proven to be adequate to help set these goals and actualize them.
3. Learning modes to support SDL

The way organization plan and deliver internal competence development programs differs from that of higher educational institutions. This variation can be due to organizational goals, structure, learning environment, human and financial capital, profitability and so many more. A feature that is common between both is the use of technology and the ability to deliver learning context. This research is concerned with Self-directed learning for teachers in elementary schools and its usage, to improve ICT competence to simplify learning, which is also applicable in higher educational institutions but the use of technology as a collaborative tool in higher education seems more viable due to high demand of student’s obligation to engage in learning while using different learning models. In organizations (local municipality responsible for elementary education) the nature of competence development programs for teachers and the further application of knowledge in classrooms is a process seen in two different phases:

- Competence development program organized by the educational department in line with the demands from teachers as well as trends coupled with the development of learning in classrooms.
- Self-development processes directed by the teachers to apply the knowledge gained from the competence development program

With Houle’s (1980) mode of learning consisting of inquiry, instructional and performance modes of learning, and the community of inquiry model proposed by Garrison et al (2000) consisting of the social, cognitive and teaching presence, an analysis will be made on how an organization (educational department in local municipality) will support its employees (elementary school teachers) in attaining self-directed learning.

![Figure 4: CoI Framework (Garrison, Anderson & Archer, 2000)](image-url)
3.1 Modes of Learning
Houle’s (1980) was interested in the adult learner and the continuity associated to learning as professionals in work environment. He detailed the learning progression from the formal learning environment (childhood) through the adult continuous learning in organization. This progression not only involve learners but also the organizers of learning content. Professionalism demands routine and the systematic use of models for learning and as presented, the inquiry, instructional and performance modes of learning can enable organizations and individual learners to plan, execute and monitor progression of new knowledge and its implication when tested. About 20 years later, Garrison et al. (2000) introduced the “Community of Inquiry”. The model supports learners or group of learners in acquiring rich results during learning from three perspectives “the social, cognitive and teaching presence”. His concept is however directed to online learning community where technology replaces the natural social setting of the traditional learning environment but could still be applicable in blended learning or organizational/work environment. On like Houle (1980), his model was more confined and integrated with different aspects. However, Houle (1980) discussed these as separate entities in adult learning.

3.1.1. Teachers as instructor
Houle (1980) discussed modes of learning as a liner process with an assumption of a starting point “the instructional model” utilized by organizers and presenters of learning materials (teachers) to disseminate knowledge, skills and necessary learning information. For Garrison et al (2000), he referred to this as the “teaching presence” in an online community of learners. He argued that despite the learning environment being computer dependent, the teachers should be the coordinator and definer of the environment with regards to creating regulation that foster qualitative online learning. Both researchers refer to the teachers as custodians of knowledge but the inclusion of the learning environment being supported by computer collaborative systems (Garrison et. al; 2000), learning by inquiry becomes a natural phenomenon. In order for learning to occur, the teachers or instructors have to match the expected learning outcome/goals to the content/material. The word “expected learning outcome” symbolizes a predicted level of understanding demanded by the teacher and the learning content. There is in fact a lot more learning and idea generation when the learning environment or community is considered to be interactive. Therefore, the product of the instructional learning or teacher presence (Houle, 1980; Garrison et. al 2000) is a summation of the content learning content and every other learning channel used for knowledge sharing within the learning community.

3.1.2. Learning by Inquiry
Learning takes place in many forms and environment. A uniqueness can be seen in the modes and occurrence of learning being systematic, process oriented and a product of new ideas or the affirmation of previous knowledge. Inquiry mode of learning in most cases is continuous but varies according to the learner and what is being learnt. In scientific research, the act of inquiry has no boundaries, it provides freedom to learning in different environment and usability of variety of educational materials and tools (Ching and Ho, 2015).
Parallel to Houle (1980) who defined Inquiry learning in adult learners and professionalism “as a process of creating some new synthesis, idea, technique, policy or strategy”, there exist differences in applying learning by inquiry in organizations and higher educational institutions and defines the learning space, time and even supporting learning materials used. On the one hand is the guidance students receive from teacher through instructional learning and on the other hand, organizations recommend and plan competence development programs for employees. These category of learners by series of iteration and interaction with the learning environment (online or face-to-face learning environment), utilizes the process of inquiry as a personal and collaborative learning technique. For students in higher institutions, inquiry is prominent and makes learning constructive as can be seen in the conception, planning, investigation and execution of thesis projects (Ching and Ho, 2015). The fusion of learning and society prompted researchers to investigate collaboration on learning environment such as the technological environment that deals with network connectivity of learning and learners (Swan et. al; 2009), which is as an extension of Dewey’s (1959) paper that pronounced the learning institution as a social community and that its social constructs promotes creation of new ideas and relationship amongst learners. As such, learning by inquiry in itself is collaborative either with the use of modern collaborative techniques in a community of inquiry as overemphasized by Svan et al. (2009) and Garrison et al (2000, 2001), or the traditional face-to-face interaction of a group of learners.

The inquiry learning process was viewed from a different perspective by Garrison et al (2000); Garrison (1999, 2001) and Svan et al (2009) which were all a continuation of Garrison’s original article of 2000 that considers cognitive presence as an important factor in a community of inquiry. The extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson & Archer, 2001) defines cognitive presence. To explain the relationship of the processes of learners and their attitude towards ideas generation for establishing a learning process, a model that examines the constructs of the cognitive presence was developed by Garrison, et al (2001) called the “Practical inquiry”

![Practical Inquiry Model (Garrison, Anderson & Archer, 2001)](image-url)
Garrison, et al (2001), and Svan et al (2009) gave brief explanation of stages (Triggering event, exploration, integration and resolution) as well as the human emotional behavior (perception, deliberation, conception and action) that constitute the practical inquiry model. This model is based upon developing critical thinking and problem solving competences of learners through diagnosing the problem arena and taking personal or collaborative steps to identifying a possible solution. Of course, the practical enquiry process also take into account the learning community or environment for iterating the process as well as the personal traits which is a social characteristics to consider when working with group of people in a face-to-face or online platform.

In higher educational institutions, triggering events being the first stage of the process might originate from a teacher handing out assignments to students to solve, as such, this process in some cases is initiated by the teacher and then student apply the inquiry process. In organizations on the contrary, events are triggered from causes that are directly related to achieving organizational goals and one could see the connection between practical inquiry and experience as being related to solving domain-specific problem (Garrison et. al, 2001). Students do also encounter domain-specific problem but theirs could be seen as short-termed and the application of critical thinking is limited mostly within the boundaries of theoretical frameworks and literature analysis. In essence, personal capacity (knowledge and access to information) need to be matched with the environment and interacting groups for learners to effectively begin the practical inquiry process of “triggering multiple events”.

It is a natural phenomenon to explore any problem scenario which can include but not limited to collaborating with others in a shared community. Sometimes, it’s the duty of the problem solver to connect him/herself to various communities in an attempt to get a greater understanding of the problem. Through practical inquiry stages and depending on the problem, several alternatives present itself for integration into the problem arena. Integration involves testing and re-testing to ensure that the solution is a match for the problem before it is applied as a deliberate action. Garrison, et al (2001), and Svan et al (2009) pointed out the need for recursion within the practical inquiry model, thereby revisiting a previous stage to redefine various parameters. Inquiry learning mode and the practical inquiry model are same in some extent but practical inquiry is a method for inquiry based learning and motivate learners in developing the competence of identifying a problem domain as well as systematically resolving it as a natural process for learning.

3.1.3. Performance learning and Resolution

The last stage in the practical inquiry process “resolution” has a strong resemblance to the performance mode of learning. The former can be seen as the product of the other three stages and has to do with practically applying new ideas in any problem area (Garrison, et. al, 2001). The latter is similar to the resolution stage of practical inquiry but according to Houle (1980) performance mode of learner has to be “habitual”. The constant application of same procedures or processes under supervision and collaboration makes performance mode of learning similar to carrying out experiments.
Houle (1980) associated it to “change theory” in workplace and the performance learning depends on the instructional and inquiry learning modes because the input in form of new knowledge is tested and re-evaluated if necessary.

### 3.2 Social characteristics of learners

Social characteristics of today’s learner plays a great role on how the learner interacts with the learning environment. Higher educational institutions that offer online courses can benefit greatly from the social presence in the community of inquiry where learners mimic activities like those witnessed in traditional classroom. Learners in a social setting expresses themselves using personal characteristics such as behavior and emotion to make themselves understood (Garrison & Arbaugh, 2007). It is natural that students collaborate and share ideas in discussion forums in an online learning community. The instructors design the settings so that learners can get familiar with themselves before the beginning of any course. This creates an effective and open communication and group cohesion for positive learning outcome (Garrison, 1999). Downey’s idea on social learning is seen from the perspective that socializing through education reforms the society and also argued by Houle (1980, p 149) where learners desire to reach social goal to contribute to change. This argument is true because socializing with learners present learning context from different human perspectives and through the use of practical inquiry, these ideas are transformed into knowledge for individual and his/her environment. Social presence in organizations hold high value in the distribution of knowledge through experience and most times replaces by the concept of participation, a stimuli to self-directed learning (Houle 1980, p 146). Summing this section, a practical analysis of the modes of learning discussed above will be put into an organizational context both from instructor and learner perspectives in respect to the research question.
4. Research method and process

The study examined in this paper is part of an ongoing competence development programmed by the educational department of a Swedish municipality, where the author of this paper works and is responsible for planning, delivering and evaluating learning with ICT for teachers in elementary schools (kindergarten, primary and upper secondary schools). The regular process or procedure used in identifying and executing competence development programs in the municipality seems similar to MacIsaac’s (1995) process of action research involving planning competence development programs in respect to needs or deficiency identified by respective school heads, taking action in form of delivering all planned competence development programs and finally evaluating the outcome against the input in form of observation, reflection and strategic expectation. As such, action research is utilized to examine a case study (Creswell, 2003) drawn from one of the competence development program, to evaluate and investigate teacher’s self-directedness towards learning new ICT skills.

For this process, the planning stage was effective for organizing the competence development program and matching the learning content to the demand. The instructor identifies and selects the appropriate learning resources, systematically structure the content in a pedagogical manner that will be easily absorbed by the learners and also providing materials for learners to use even after the instructional learning exercise. It was also necessary that the instructor test the process (technical appliances and pedagogical content delivery) to ensure its quality when in use.

The action stage was focused on delivering the planned content to the concerned learning group. This stage detailed the instructional learning process (instructor-learner discussion/interaction), which is more of a practical engagement whereby the instructor exemplifies and allows the learners to execute same activity thereby motivating hands-on activity.

Subsequently, the observation stage was used to gather data during the instructional learning as well as the entire study process. The data will serve as a basis for analyzing the thesis question(s) and also strategic decision for planning of competence development programs in the organization.

4.1 Planning Phase

To effectively plan competence development programs, one has to identify areas that need to be addressed, developed or revisited. For academic year 2015/2016, an interview was conducted with all school heads in the municipality, to help identify what area of ICT for learning, should be prioritized. The discussion with the school heads was focused on developing individual ICT skills on teachers that will further be transformed to collective development for the schools. The response from the interview varied but at the end, it was narrowed down to developing teacher competence within areas such as tablet usability, social media, ICT-learning methods/blended learning, basic computer and interactive board usage. Therefore, the planning phase was directed to developing competence development programs in areas identified above, but to narrow the investigation, this thesis will investigate self-directed learning process in one of the competence development programs “improving use of
interactive boards in classroom”. The need to develop both the technical and pedagogical use of interactive board was as a result of insufficient knowledge possessed by teachers as well as the need to improve ICT competence. Partly, the insufficiency was as a result of less emphasis on securing learning program for teachers when the technology was purchased and installed in classrooms. This made a point very clear that equal amount of time/money is also need to educate users on how to effectively utilize the technology.

The study was conducted in one of the elementary schools with the municipality, with participants natural selected because due to an already scheduled competence development program on how to use interactive board. There were a total of 7 teachers but 4 teachers voluntarily participated. The youngest is aged between 25-30 years with less than 5 years’ work experience as a teacher; two participants between ages 35-40 years had between 5 to 10 years work experience, while the fourth participant is above 50 years of age with a work experience of over 15 years. Collectively and according to participants’ educational qualification as teachers’, they have competency to teach mathematics, Swedish language, health and sports and lastly, Swedish as a foreign language, to students between ages 6 to 9. The school is design to accommodate only students between these ages.

4.1.1 Planning and designing the learning content
In designing the learning content to match the insufficiency of ICT knowledge, both the technical/functional and pedagogical arenas of the interactive board were considered. The interactive board has a user manual that illustrates what and how each function/tool on the interactive board can be used. A friendlier version of the user manual was found on the internet and manually translated from the native language (English) to the instructional language used in schools by participants (Swedish). Tailoring the interactive board to serve as a pedagogical tool to simply learning and group activities, an example using combination of different functions was used to design a simple pedagogical exercise that shows the capability of the technology while giving participants the liberty to tailor in various classroom activities according to their pedagogical/subject plan.

4.1.2 Planning content delivery
All prepared content (materials and presentation) was rendered to the participants through instructional learning mode (Houle, 1980) and involved the combination of theoretical explanation and practical testing of the interactive board. The intention of the researcher and goal of the educational department of the municipality is to encourage teachers through practical experimentation/testing, to get acquainted in using the interactive board not just as technology that projects video images, but applying the interactive functions to simplify learning as well as making learning a group activity between teachers and students. Also, a duration of two hours was dedicated for the instructional learning, with the researcher as the instructor.

4.2 Action phase
The study was to observe how a group of teachers, after a competence development program/course on the use of interactive board in classrooms, will develop skills and naturally apply and integrate the technology in classrooms. Actually, the particular technology as this case may be, is of minimal importance for this research. Rather, the study examines the process
from the day the competence development program was delivered, to a day in the future when
the teacher will deliver a classroom lecture while integrating the technology as a pedagogical
instrument, with reference to the materials presented by the researcher during instructional
learning as well as learning materials the participants will get during their inquiry learning
process.

The outcome of this phase will be the observation of participant’s individual learning
progression, with each participant using a learning pace in line with daily working schedules.
With this in mind, every data collected within the study process becomes unique for each
participant.

4.2.1 The instructional learning process
The session was introduced by informing participants the reason for the meeting and further
asking their permission on having them participate in the study to improve self-directed
learning on ICT. With all participants equipped with personal computers, they installed the
interactive board’s software, giving them access to work independently irrespective of time and
place. Which means participants can plan classroom lectures/activities away from the physical
interactive board located in classrooms, to later deliver same activity together with the
students with their personal computers connected to the interactive board. For efficiency, the
files could also be opened from the computer that is permanently connected with the
interactive board. The instructor proceeded with demonstrating how the interactive board’s
application can be started, as well as the functions/tools within the application.

![Figure 6: Application showing tools demonstrated. TeamBoard Draw tips © 2012 Epson
America.](image)

The above diagram shows the respective tool available for usage within the interactive board.
The instructor further discussed how the tools can be used. With the software application
installed on participants’ personal computer, they also tested various functions the tools could
offer.
In line with the goal of the competence development program, participants after the session, should be able to use the tools to plan and design interactive lessons where the interactive board will serve as a working space for teachers and students in the classroom. It was important that the instructor demonstrates how the tools when combined, can produce simple pedagogical activity. The below is a simple pedagogical activity demonstrated in the session.

![Image of interactive board with labels for vowels and consonants]

Figure 7: Pedagogical activity demonstrated and practiced by participants.

Above stated is an activity designed for students to identify vowels and consonants in the alphabet. When a student approaches the board, he/she identifies and drag an alphabet with a finger to where it belongs (vowel or consonant). Assuming the student drags the alphabet “A” to the section “Vokal”, a copy of the alphabet is placed underneath the column, leaving the original alphabet at its position. This activity was to show an example of how the tools can be combined, while the participants can further leverage the possibility within their pedagogical plans to design whatever activity they can, or rather, activities that can be possible with functions on this particular interactive board.

To conclude the instructional learning process, learning materials were handed to participants as well as communication channels between the participants and instructor. To be exact, three learning channels were confirmed and made known to participants (user manual, interactive lesson within the interactive board and lastly, the instructor’s competence that is always available upon request).

4.3 Observation phase

Naturally to evaluate the competence development process according to the organizations procedure, predetermined data collection methods is very important, both for analysis and for measuring certain development trends in individual (participants) and group (schools) basis. In this study, the following methods were used to observe and collect information:

4.3.1. Personal journals: Participants within the research were asked to document their learning process in an entry journal. With their approval during the instructional learning process, notebooks were handed to every participant for them to document their process, beginning
from the moment they receive the notebooks. For uniformity and to ease analysis, a process (to-do list) was handed to participants with step-by-step instructions for them to follow and document their progression. If followed appropriately, it will stimulate inquiry learning and reconfirm the efficiency of self-directed learning. An example of a journal record is the entry made by all participants during the session with the instructor.

**Process for self/collaborative learning**

1. *Take notes about today’s lessons/activities about using the technology (teamboard)*
2. *Learn how to use the functions and tools*
3. *Make a plan to include the technology in an already planned class activity*
4. *Plan the class activity according to point 3 above (make use of the learning resources (journal entry, user manual and interactive lessons on the technology)*
5. *Take note and/or identify difficulties encountered when using the technology*
6. *Go through the learning resources to try and handle the difficulties you encounter. If needed get help from colleagues or the instructor*
7. *Present your lesson plan/classroom activity to your colleagues for feedback*
8. *Update your lesson plan/classroom activity if needed according to feedback received from colleagues*
9. *Execute lesson plan/classroom activity together with students (book a time with the instructor for classroom observation)*

Also document the following:

a. *How much time invested in the entire process (worktime and personal time)*

b. *Time taken (from the day you receive the competence development to the first classroom activity using the technology)*

Journal entries were also used by the researcher to document several activities and correspondences with the participants within the period of the study.

**4.3.2. Interview**: An interactive way of gathering information and sharing of knowledge between a researcher and participant. It cuts through provision of not only data but the ability to allow the researcher push for more personal response that can be interpreted in different ways based on characteristic of the participants. For this study, it was important to gain descriptive understanding of participants work environment as well as information that are relevant, in order to access their self-directedness in learning new ICT skills. Interview is used to seek a deeper truth on the study carried out.

**4.4 Motivation for choice of method**

It can be said that the method utilized in the study was naturally selected due to the procedure for planning and executing competence development programs by the researcher in his work environment. Moreover, activities were iterative and the outcome within each stage of the study determined what method or step to introduce in the next. The data are all qualitatively collected and analyzed descriptively with consideration to participants’ ethical grounds. Of course, to understand a teacher’s ability to independently identify gaps, deficiency or development opportunities in ICT competence, make inquiries using different learning tools
and resources on how to execute the task, while having in mind how and when to evaluate the competence gained, a researcher will have to really discuss and interact with the teacher. Using other forms of data collection methods might be insufficient for this research, thereby failing a test for quality in the data. Further communication and follow-ups after the competence development program were on individual basis and the data collected is unique for each participant, although the result of the study will be enough within this study to make a generalization or probably an assumption of the outcome if the study is investigated in a larger work environment.

4.5 Ethical Issues
An important issue was the ethical consideration of the participants in respect to anonymity and confidentiality as well as relationship negotiation within action research (Banegas and Villacañas de Castro, 2015). It was certain that before commencement of the research process, anonymity and confidentiality of participants was of great importance but along the line, other factors became visible and had to be professionally handled. These includes:

- Respect for participants during negotiation for sudden participation
- Handling individual follow-up/meeting with participants to reduce stress
- Process/result confidentiality to avoid harming organizational relationship

The participants were selected as a result of natural occurrence (an already planned competence development program) with approval by the head of school to use the planned instructional learning process for the research. As such, participants’ negotiation was done on the day of the instructional learning and consent for participation was received after discussing the reason for the research, process and responsibilities as participants and researcher, which general created an avenue for voluntary participation (Cook, 2010).

Ethical issues in action research are more sensitive compared to traditional researches (Nolen and Putten, 2007) and has to be handled professionally. The aspect of work-load on teachers while executing their daily task, creates stressful environment (Schumacher and Hill, 1991). It was important to respect their work environment while reminding them about the option of voluntary participation. Subsequently, as both participants and researcher are within same organization, it is necessary that process and results remain confidential, as relationships between participants, researcher and school head must be protected (Cook, 2010). Measures for strict confidentiality was taken within this research to withhold relationship status during and after research.

4.6 Reflection
The research method and process was made possible due to the nature of the research as well as the position of the researcher in the organization. Observation over a period of time with planning, delivering and follow-up of competence development program in the educational department of the municipality, necessitated the study and warranted the use of Action research (Gilmore et al 1986). The researcher’s role in action research is very important, apart from the formal planning and execution of the research, the results produced becomes vital information for the organization to plan for changes within areas related to both the participants and the organization at large. The planning phase of the action research was an
important and necessary aspect of the study, the researcher had to shape the learning content to accommodate the needed competence. Inquiry was relevant using several methods for searching information. The internet was a perfect information resource but competence was required to sort through information and select the most appropriate. In order to reflect upon the outcome of the action research stages, data collected during the process, with emphasis on the “observation stage” will represent the results of this investigation. Furthermore, the result will be analyzed and discussed in two different categories:

1. Analyses of participant’s self-directedness towards learning the new ICT: This analyses will be grounded on Garrison, Anderson & Archer (2001) Practical Inquiry Model against the journal entries collected by both the participants and the researcher and will be directed towards answering the research question of “How can inquiry-based learning support teacher’s self-directedness in motivating and learning ICT in educational institution?”

- Using the variables “Organizational structure in respect to competence development program” and “Priority given to ICT and non-ICT competence development program”, an analysis will be made on trying to understand the role of the organization in supporting and motivating teachers’ self-directed learning process, thus answering the second research question “In what way can organizations serve as catalyst to self-directed learning/learners?” According to an article from Pathfinder International “Organizational structure reflect the level of growth, or stage, of the institution”, possible by responsibilities and role of management and employees. Furthermore, Buchanan and Huczynski (2004) defined structure as “A formal system of task and reporting relationships that controls, co-ordinates and motivates employees so that they work together to achieve Organizational goals”. The primary aim for structuring an organization is to achieve goals and the presence of internal competence development programs is a channel for its effectiveness (Tampoe, 1994), thus the necessity to analyze if the structure supports a flexible learning environment for teachers. Likewise, Priority given to ICT and non-ICT competence development program, can be understood as the situation whereby teachers are giving the option to choose between different competence development programs to attend or alternatively, the organization automatically selects programs on their behalf. With this option, we can examine how other competence development programs are affected due to the choice made by the teacher. Data for this analyses is drawn from the interview carried out with participants after the study.
5. Results
This chapter presents the result collected through various data collection methods in the research. The presentation is in three categories, the first being the journal entries/observation from the researcher’s perspective. The data within this category are discussion and communication between researcher and participants documented throughout the research process. The second category of results I related to participants inquiry learning process and activities ought to be executed by the participants within their learning phase. The final category summarizes the research with an interview conducted with participants to gain information about the entire research process. There exist sub-categories within each category and they are derived from questions asked during the study or areas of interest as discussed with the research process.

5.1. Journal for Instructional learning process
This category summarizes the discussion and communication that the instructor was engaged in with participants and this made up part of the instructional learning process.

5.1.1. Acceptance as participants
Unawareness by participants about the competence development program/topic being used as a case study created concern and discussion. Participants needed to know the purpose of the research and also if approval have been granted by the school head before commencement. It was also important to them that there should be appropriate time allocated for their participation.

5.1.2. Previous knowledge on using the technology
All participants have very little knowledge about using the technology. The previous knowledge they all have is using the technology as an image or film projecting solution, which include viewing of films connected to lecture materials for the entire class to watch. One of the participants however have used the technology to make simple annotation and displaying numbers.

5.1.3. Availability of technology for participants
The school has three interactive boards located in three different classes and all teachers have access to the boards when needed, by changing class location to accommodate the teacher that needs the technology. Also, a software version is available for installation on personal computers but participants were unaware of this alternative.

5.1.4. Engagement in practical learning
Participant responded positively to the practical hands-on learning. The instructor continuously asked for participants opinion regarding the difficulty or ease on the practical examples. The response showed that the participants were totally engaged and followed the practical steps as described and presented by the instructor.

5.1.5. Collaboration during instructional learning
Participants were seated in close proximity that promoted collaboration. They assisted each other to fulfill the task and when needed, got help from the instructor.
5.2 Participants inquiry learning process
Participants were asked to document their learning progress in form of journal entries, through a simple step-by-step process.

5.2.1. Process for Learning
All participants took notes during the instructional learning process. The notes included practical examples and comments on how the technology is used and serves as referral if they needed help while setting up classroom activity with the technology integrated. Apart from this, no other entry was made by all four participants in line with the processes for self/collaborative learning. Amongst the four participants in the research, only one participant could conclude the process for self/collaborative learning process in section 4.3.1. However, no entries were made in the participant’s journal to examine the inquiry learning process.

5.2.2. Instructor’s follow-up
The following questions was asked by the instructor during a visit to the participants, midway through the research process.

- Do you need any help with regards to using the interactive board?
- Do you need help in planning a class activity while integrating the technology?

All participants were stressed when asked the above questions. They all presented series of other activities that needed to be done within allocated school time. They also have not had time to look at the materials from the competence development due to other priorities ahead. One participant re-emphasizes the need for approval from the school head for the process to be carried out while others were concentrated on projects within the school that are structured and time consuming. One participant was engaged in a teacher development course within mathematics, organized by the Swedish education department that runs for a whole year. Another participant was preparing students for national exams. A participant explained the need for priority, which irrespective of what has to be done (ICT or other activities), learning about using ICT in classrooms is part of a teacher’s responsibility. With that comment, the participant schedule a date for observation in the classroom, in line with the process in chapter 4.3.1.

5.2.3. Classroom observation from participants
Teacher’s perspective: In-class activity was conducted with two groups of 12 students in the first year of compulsory school (age 7). The subject was mathematics with topic about shapes and how many corners each shape has. First, the lessons began by the teacher asking the students how the interactive board has been used previously in the class. Later, a lecture slides was presented on the interactive board for students to read. Furthermore, the teacher explain how students can draw shapes using tools on the interactive board while asking students to come forward to draw shapes which were discussed by the class.

Student’s perspective: Students unanimously said the interactive board has been used for showing images, drawings and projecting films related to subjects like biology, as well as presenting the school blog. They read what the teacher presented on the slide and tested the tools for drawing various shapes while they all discussed about the characteristics of the shapes. Finally, they gave further recommendation on how the interactive board can be used
to learn about various animals and their names as well as solving mathematical problems like addition.

5.3 Learning experience within the research
A concluding interview to gain information about the competence development process which main focus is to develop competences of ICT usage for learning. Below is a generalized response from participants when interviewed.

5.3.1 Structure and content of instructional learning
Structure and the content of the competence development program was adequate for its purpose. They understood what the context was and also the pedagogical method for delivering the content was good.

5.3.2 Time dedicated for instructional learning
The two hours allocated for the instructional learning was inadequate for learning about the technology. All ICT competence development program need to be organized for longer periods that allows for testing the methods in classrooms and periodic follow-ups in collaborative meetings. Also, the organizers and heads of schools have to take into account all other competence development programs.

5.3.3 Time dedicated for inquiry learning
Participants had no time to follow or document the process. There were other activities that were prioritized. They do however have time allocated for planning other activities and this time can as well be used for the purpose of learning new ICT.

5.3.4 Relevance of the competence development program
ICT for learning, just like other aspects of the teaching job, is relevant and important for teachers to increase their minimum level of applying new technologies to learning.
6. Analysis of results
This chapter analyses the results with reference to inquiry learning (Houle 1980) with emphasis on the practical inquiry model (Garrison, et. al, 2001; Svan et al, 2009), seen as a method supporting self-directed learning from a learner and instructor perspective. More so, an analysis of the organizations structure for planning and executing competence development programs is discussed using the variables mentioned in section 1.4 and Houle’s (1980) instructional learning, as a catalyst for self-directed learning.

6.1 Participant’s practical inquiry in learning
Practical inquiry model (Garrison, et. al, 2001; Svan et al, 2009) accounts for learning through different stages of the model, which iterates through process that enable a learner revisit previous stages. Depending on the learning situation in concern, learners can begin the process from any of the four stages (trigger events, exploration, integration and resolution). As evident in this research, the “trigging event” stage was motivated by the organizations identified development areas, analyzed by the heads of schools, education department and input from teachers. This means that there exist a combined and collaborative effort of problem identification, which is directed to teachers in the schools. Thus, the instructional learning (Houle, 1980; Garrison et. al 2000) which is part of the self-directed learning process from the point of the instructor’s perspective, was the channel used to present the already identified problem, to further be resolved by teachers (participants in the research) and the instructor. Garrison (1999) emphasized the need for a shared world in practical inquiry when considering an online learning environment, where communication has to be open and effective. This research took place in a physical learning environment, where relationship and group cohesion has already been established. The participants are colleagues within the same physical work environment, which is why collaboration amongst teachers during practical exercise of instructional learning process was successful according to the results. Within the instructional learning process, participants learnt from each other and assisted with solving the practical exercise with the functions of the interactive board. The shared world within the practical inquiry process (Garrison, 1999) represents a common ground where learners (in this case, teachers and instructor) are faced with same problem, with an attempt to collectively seek solution.

According to this research process, we can assume that there was a bit of “triggering events” stage while teachers were exploring the problem because process for self/collaborative learning highlighted by the instructor tends to motivate participants along a learning path (see section 4.3.1). The information from the instructional learning is adapted by participants as an extension of the problem within the teacher’s learning domain, thereby raising the question from a teacher’s perspective “how do I as a teacher learn about the technology and use it in planning classrooms lessons”. In other words, the identified problem/development opportunity is now redefined in a context within the teacher’s work environment. Naturally and in line with the competence development process, all new learning ideas can be seen by teachers as a problem or development opportunity, due to the fact that they have been presented with new information, as in this case the interactive board and the challenges faced to apply the newly introduced knowledge into classrooms. This adjustment from their regular way of using
technology in this research instigated the discussion for participant’s acceptance level in using the competence development program to assess self-directed learning process. They had the impression that the process will be used officially for assessing their individual performance on a path to learning about technology. According to them, they already have a full schedule, so the inclusion of a new task will be stressful to them.

Evaluating participant’s previous knowledge of using the technology made the “triggering event” stage unique for each participant which meant they had to invest different level of time, effort and inquiry process to learn about the same technology. This solidifies the fact that inquiry learning process, as part of the self-directed learning process according to Knowles (1975, p. 18), is both the responsibility of the individual learner, the collaborative effort of learners, as well as the instructor (see section 5.1.2)

Having established the fact that “triggering event” was a collaborative effort in identifying ICT deficiency in the organization, as well as an individual effort by participants in learning about using the new technology, an exploration of the problem environment was carried out by participants after the instructional learning. Bryan (2014) re-emphasized the importance of self-directedness in learning as an activity between oneself and the digital environment, which is a fact that was accounted for while preparing the process for self/collaborative learning for participants in the research. In consonance to Hiemstra (1994), this process contained various activities and learning materials/resources that encouraged collaboration and self-study as discussed by the advantages in the modules of self-directed learning (Herrick et. al, 1998). The exploration stage should enable participants seek answers either from colleagues or the learning materials provided by the instructor as well as the journal entry made by participants during the instructional learning process. Participants were tasked with exploring the learning environment; that is learning the functions and tools within the interactive board, with a concluding activity that involved presenting a lesson with the technology integrated. The learning experience should therefore become a combination of technology and pedagogy, which is interpreted as a natural 21st century skill for delivering learning. According to results from the research, both the technological/functional learning and its corresponding pedagogical integration was not prioritized by participants due to the fact that other activities that seemed more important at that period (considering time and the natural school routine), had to be done first, thereby making it impossible for the researcher to ascertain or evaluate the self-directed learning process for individual participants.

It is pertinent to understand that self-directed learning also involves support from the instructor (Hiemstra, 1994) and this opportunity was provided to participants through a midway follow-up exercise by the instructor, ensuring a resourceful learning process that encourages practical assistance or feedback for the proposed learning activity both for teachers and the students. The interplay of the participants and learning resources form a supporting discourse of the community of inquiry (Garrison; 1999) and help increase quality of the exploratory stage in the practical inquiry mode. Of course, COI mimic the experiences of the physical learning environment but currently, learning materials and collaboration can be sought beyond the boundary of the physical learning institutions. This resourceful way of learning using technology and the internet was also presented to the participants during the instructional
learning with anticipation that it could enhance their exploratory process and guide them through self-directed learning process.

Participants under the exploratory stage, supported by various learning resources and collaborative effort, would be able to come up with alternatives to addressing how to use and integrate the technology in classroom. These alternatives ought to be connected and tested to identify viable explanation (Garrison; 1999), as to what functions/tools on the interactive board will be perfect in creating the pedagogical activity. From the instructor’s perspective within this research, integration stage was used in selecting the viable instruction material. For example, there were different variation of the interactive board’s user manual and in order to identify the appropriate material that matches the competence development program, the instructor read through various materials in order to identify a suitable alternative for the instructional learning (see section 4 and 4.1). For participants in this research, there were no result to explain how the integration stage was adapted in their inquiry learning process due to the results presented in section 5.3.3.

The integration stage of the practical inquiry model prepares learners for applying the selected alternative within the problem area in an act of resolution and the process for self/collaborative learning for participants within this research signified a resolution stage “Execute lesson plan/classroom activity together with students”. The combined output from previous stages in the practical inquiry, present itself as the product of learning, or rather, a stage where an evaluation of the previous learning input can be made (Houle, 1980). It was difficult for all but one participants to arrive at this stage. Although the process was not documented in line with the instruction for the personal learning process, but the participant conducted a class activity while using the interactive board. Learning in this case was collaborative because the students as well were practically involved, demonstrating the pedagogical learning content on the interactive board.

In relating the inquiry process which is an important element in Knowles (1975, p. 18) definition of self-directed learning, the participants to a certain percentage, went through the process that introduced the technology and further testing the concept of self-directed learning. In line with what the aim of this research, the definition of Self-directed learning (Knowles 1975, p. 18) was aided by the organization, which assisted in identifying the problem area, produced relevant materials that will assist the participants in learning about the technology, created a collaborative work environment during the instructional learning process as well as an on-demand collaboration by the instructor. Participants were tasked to take the initiative to personalize the problem and interpret it in their own learning domain (the classroom), with an aim to integrate the technology in learning activities using their own learning strategies and finally evaluate the outcome after using the technology.

A militating factor to participants adapting a self-learning process was the organization of time in line with both their normal school schedule and other affiliated task. Thus, the demand for an interview to investigate other aspects of the learning process was necessary, especially for planning competence development program in relation to the normal school schedule.
6.2 Organizational structure for instructional learning

It was pertinent to understand participants’ reaction towards the planning and delivery of the instructional learning with respect to quality of resources and time allocated for the instruction. In respect to the second research question, organization being a catalyst to fostering self-directed learning, the learning “content and process” (Houle, 1980; p225) of the instructional learning was to equip teachers with specific technological knowledge and according to the interview response on learning process/content, participants were no doubt satisfied. The content was prepared by the instructor through inquiry learning, confirming the statement of Houle (1980, p186) about the necessity of fusion of both instruction and inquiry to prepare and deliver learning for increasing performance. Houle (1980) discussed about performance, as a result of various competence development practices, both formal and informal. The distinction between the sizes of organization matters as this determines how continuous learning is planned and integrated to employee’s routine and schedule. This aspect of tight integration and synergy of competence development program for ICT and the participants work environment, was presented as a time related factor for the instructional learning. The participants complained about the insufficient time for ICT instructional learning and preferred that ICT competence development should be tightly integrated to their schedule, with constant follow-ups to enable monitoring of their progression and usage of the technology. They would prefer that ICT competence development from the organizers perspective, is seen as a strategic and time demanding factor with the elements of feedback, continuity and evaluation being constant.

6.2 Priority given to ICT and non-ICT competence development program

Another factor was the time allocated to participants for inquiry learning, or rather according to their priorities, it will be the time available for inquiry learning for the technology. Practical inquiry (Garrison, et. al, 2001; Svan et al, 2009) takes the learner through stages of continuous iteration and according to Houle (1980), a learning process which builds upon several strategies that shows a continuous trend of different personal and collaborative activities, as well as resting on foundation of instructional learning process, demands time to accomplish. Of course, teachers have other school activities that are simultaneously in motion giving them the choice to place hierarchical preference on what activity to execute within the limited time they have. Although the school head prioritizes the instructional learning for the teachers but the inquiry learning process is owned and directed by the participants. Going by Houle’s (1980 p32) relationship between instructional and inquiry learning where “inquiry may sometimes include episodes of formal instruction”, there should be sufficient time allocated for both instructional and inquiry learning processes and as evident in this research, time was not allocated for participants inquiry process. Although according to the result, participants confirmed that they had time for planning of other activities, time that was not assigned to particular projects or activities and they reconfirmed that part of this time could be used in learning the technology. With this information, it might seem controversial to mention that participants choose not to prioritize the inquiry learning process because it was not particularly categorized by the school head as an established standard with continuity and evaluation.
7. Discussion
This thesis took its course in trying to improve the use of ICT in learning, by utilizing the concept of inquiry based learning as a strategy for teachers, to lay more emphasis on ICT learning process and become self-directed learners. It was also important to involve the organization (in this case the educational department) in trying to aid the learning process and act as catalyst for the entire learning process. This fact was established in line with the strategies adapted by the organization in identifying and defining the problems that needed to be solved. A series of process were in place, first by the organization, to plan for the competence development program/course within the identified area (in this case the use of interactive board) using inquiry learning process and subsequently delivering the solution through an instructional learning process. Furthermore, the teachers received instructional learning with its content, classified as new problem areas to them and subsequently uses inquiry learning process to personalize and achieve learning, whereby the result will bring about improved use of the interactive board in the classroom.

With this explanation, a reconfirmation of the processes was necessary to enable a connection to relevant empirical studies of respective concepts used within this study (instructional and inquiry learning) as well as to present a construct of how the research questions were answered.

a) How can inquiry-based learning support teacher’s self-directedness in motivating and learning ICT in educational institution?

Vividly, it could be seen on the results in section 5.2, dedicated for participants’ inquiry process that during the period of the instructional learning process, participants’ awareness about using the technology might have increased. On the other hand, the most concerned aspect was to use inquiry based learning, which according to the “process for self/collaborative learning” (section 4.3.1), is a representation for inquiry learning process as well as guidelines for participants’ to achieve self-directedness. Participants were unable to follow this guidelines, which included, among others, collaboration with colleagues and the researcher, learning to use the technology on their personal computers, searching for answers through available research materials and planning class activity with the technology integrated. The class activity to be planned is seen as a product of all other learning stages, to be directed solely/collaboratively by the participant to provided knowledge (technical and pedagogical). Therefore, within the context of this research and going by the definition of self-direct learning (Knowles, 1975, p. 18), inquiry based learning could not support self-directed learning of ICT. An issue identified as a militating factor is “time” and this is discussed in section 7.1.

b) In what way can organizations serve as catalyst for self-directed learning/learners?

The outcome of the first research question automatically reflects upon the second research question. In this case, disconnecting the bond between the individual and organizational perspectives will help present answers whether the organizations is as a catalyst for self-directed learning.
Using action research, where the researcher is an “insider” and represents the organization in planning and delivering competence development programs on ICT, made the action research process one that supported self-directed learning. “Insider” in this case is a researcher who is a 100% part of the organization and apply action research to change a process grounded by organizational policies and routines (Williamson, 2002). This could be seen right from the identification of the problem area, where organization and respective school head identified problem areas. With further inquiry and planning, the researcher identified processes that could be useful to participants and mapped out strategies to execute the process. Normally, the process for self/collaborative learning has not been thoroughly looked into in previous ICT competence development programs, likewise the organization has not been eager to thoroughly examine how teachers fare after each instructional learning process. It could then be ascertained that the action research process, provided systematic procedure that supported participants to learn the new technology and apply it in classrooms, therefore it can be confirmed that the organization through the researcher is a catalyst to support self-directed learning. For this fact to be 100% established from both perspectives (teachers/participants and organization), the individual learner need to take responsibility for self-directedness, making the organization partly responsible for the entire learning process.

7.1 Research result and self-directed learning
It could be ascertained that the research question could not be entirely answered, rather an exploration of self-directed learning using the practical inquiry, gave an understanding of participants work environment/schedule, in relation to learning. The definition of self-directed learning according to Knowles (1975) was applied within the research as a context specific and simple process that could easily be followed by participants in the research. It was understood that the concept might be new to them but the process is relatively similar to most structured competence development programs for improving pedagogy, organized by the Swedish department of education, with relationship to previous research focused on the adult as a learner (Daily and Landis, 2014; Smith, 1982; Smith & Haverkamp, 1977; Sharan, 2001) as well as improving collaborative learning through the use of various collaborative technology (Shawn, 2013; deNoyelles et. al, 2014). While the research process had the characteristics of inquiry based learning for self-directedness, the factor of time in respect to other school duties carried out by the participants, was a problem. Hence, an improvement on the participant’s knowledge of integrating the technology (interactive board) in classroom subjects, was not fully achieved. The issue of “time” within this research and in organization at large, is an issue of controversial interest and affiliation to budget and salaries, limiting the motivational percentage of teachers or workers, with an argument related to compensation while using their private time as official working hours.

Moreover, several research has been done within educational institution and with teachers in order to understand “time” as an important aspect both for learning and administrative duties for teachers, as well as a factor for change. Collinson (2001) explained “time” as a complex and dynamic factor that should not be treated as a uniform and/or linear concept, due to working environment faced by teachers. Likewise, that the time allocated for instructional learning as might be seen in this research is not the “time” needed for organizational learning (Shaw and Perkins, 1992, p. 175). Therefore, for participants within this research to learn how to use the
technology, time needed to be dedicated for their learning process. On the contrary, while trying to ensure progression in individual and organizational learning within schools, teachers experience tough work situation, stress and work load due to increase task (Schumacher and Hill, 1991) while experiencing “reduced personal accomplishment” (Maslach and Jackson, 1986; Maslach et. al, 1996). This means that the clamor for time within any task (for inquiry learning as an example) must be matched with the appropriate strategy for time management, which Collinson’s (2001) article explained, that most proposed time strategy found within scientific publications/articles falls with the category of “freed-up time; rescheduled or restructured time; common time; better use of time; and purchased time”. With this consideration, it can be assumed that time allocation and management for inquiry learning as an example is a general phenomenon experienced by teachers. This means that if this research is carried out in another research environment/school within the municipality or with different participants, under the same conditions as explained in the method section, the chances of arriving at the same result is predictable. However, teachers that are interested in change and as well motivated to using ICT, often invest their private time for learning.

Although motivation was not a concept within this study due to the fact that the policy/guidelines in the Swedish learning plan for elementary schools (läroplan för grundskola, 2011, pp 14) made it compulsory that “workers in school should co-operate to develop a good learning environment to support students” (original text: samverkan för att göra skolan till en god miljö för utveckling och lärande). But result showed that one out of the four teachers was to some extent if compared to others, motivated to apply the self-directed learning process to integrate the technology with students. A synonymous word for motivation is ‘interest’, which as has been observed by the researcher within the organization in respect to ICT for learning, have created a distinction between teachers that are self-directed in learning new ICT and those that are cautious of their official work schedule. Therefore, the margin between digitally competent and less digitally competent teachers will continuously increase if the issue of “time” as explained above is not evenly distributed to accommodate self-directed learning for all teachers. Therefore, it could be agreed that during planning for competence development, time management should be considered by the educational department as well as the head of schools for the realization of an effective learning process. Not just time, but also a structural and uniform process to support self-directed learning on ICT, just like the simple process for self/collaborative learning used within this research. The structure can be seen as a roadmap/guidelines for teachers to have an idea of the action to take after a competence development program, likewise when collaboration is necessary, it gives a sense of direction for self-directed learning. The uniformity of the process guarantees a learning progression irrespective of the level of motivation or the difference in the level of ICT competence between teachers.

7.2 Extending self-directed learning beyond the individual learner
The research also examined how the organization (the educational department and planners of competence development programs) can stimulate teachers to be self-directed in learning new technologies while utilizing predetermined process that supports collaboration and inquiry. Self-directed learning concepts is more focused on the individual learner, taking the initiative and responsibility to learn, but when problem identification becomes a group activity
and responsibility of the organization and its employees, the concept of self-directed learning therefore shifts its axis. A perspective examined was to formally foster learning by making the instructional learning process an extension of the self-directed learning process, thereby shifting part of the self-directed learning responsibility from the individual to the organization. It could not be ascertained at what level the organization contributed to the participant’s self-directed learning in respect to the actual competence development program in review, due to the fact that the process itself was not completed by participants and inadequate to draw a conclusion, but there is a clear fact that a combination of learning process both from the instructor and the participants were accounted for. Moreover, from organizational perspective, the instructor’s context-specific process (see section 5.1) if decided by the organization, can be developed to encompass an inquiry learning process for ICT, having in mind the dynamism in ICT and learners attitude. This means that the organization/instructor need to set down learning process and as well making the process known in advance for the teachers.

7.3 Reflection on research methodology
Action research methodology presented a flexible working environment for researcher and participants especially when it relates to activities and people within the same organization. The flexibility allows for iteration through the research process and altering information or ideas based on the outcome produced by every stage. Participants including the researcher, collaborated and discussed more openly on the investigated topic as a natural phenomenon but in this case the discussion took the instructor closer to participants work environment, their schedules related to time and other duties. It provide a deeper way for the instructor to understand and plan for changes in subsequent competence development programs.

However, Williamson (2002) argued about what the challenges the “insider” undergoes during action research. As an insider, effecting change despite the researcher’s personal motivation and ambition, requires a routine process for approval by superior or collaboration from colleagues which Williamson (2002) addresses as an issue that might be controversial due to organizational policy and has to be reconciled before commencement of the research. This research was approved prior to its commencement and the researcher is responsible to fashion collaborative environments with participants and superiors to effect changes as experienced and documented during the research process, but the issue of organizational policy, ethics and routine might be a difficult issue to reconcile if the changes would be effected. Challenges was also experienced between researcher-participant collaboration, where discussions within the research group might be interpreted as decisions from researcher to participants, an aspect that toils with the collaborative relationship with the research. Apparently, the role of the researcher might appear conflicting to participants, as the researcher is not the head of the school. Katz and Kahn (1978) explained this aspect as a conflict of roles and defines it as “the simultaneous occurrence of two or more role expectations such that compliance with one would make compliance with the other more difficult (p. 204). Action research as a method in this research was unable to handle the issue of “role” between the researcher and the head of school, as perceived by both the researcher and participants.

More so, utilizing action research made the researcher aware of the differences in process between the previous competence development programs within ICT and the one used for this
research. Despite the resemblance of the processes, the awareness about its inclusion took into consideration, issues normally overlooked by the researcher, but the positive side was its utilization as a process for change.
8. Conclusion and future research

The need for teachers to be self-directed in learning about ICT, is as important as all other aspect of pedagogy. A shift has already been made from the industrialization era to that of technology and information system and this support most aspect of the human daily affair. With reference to the educational sector, learning with technology is becoming a standard culture and devices like tablets, interactive boards and computers are within the reach of both students and teacher, yet there still exist difficulty in attaching priority to learning about using specific technology. As such, the reason for this investigation as a means to assist teachers and creating a learning path that consist of both practical and experimental learning.

Organization and leaders of educational institutions (with focus on kindergarten, primary and secondary schools) have a role to plays in assisting teachers in learning about these technologies but most especially, producing digital competent teachers that could personally identify technology deficiencies and seek solution to solving them (Ferrari, 2012). This is when self-directed learning can exhibit its potential but school leaders need to create the avenue for teachers to be digitally competent. As identified in the result of this research, the issue of time allocation to inquiry learning is of utmost importance that is why a further look into the organizational structure of planning competence development program both for instructional and inquiry learning need to be further investigated. Therefore, if the research could be carried out with more participating teachers and time allocation for inquiry learning and a structured process for participant’s practical inquiry, it will be interesting to know if the process can support self-directedness in learning new ICT.

As it is, the process for self/collaborative learning has not been tested and there is no evidence or feasible data to analyze the interaction and relationship of the steps within the process. But it has been observed in this research that time is not dedicated to inquiry learning. As such, an interesting fact will be to know whether the process for self/collaborative learning, a way to support self-directed learning, can function and become useful if time for inquiry learning is not a problem to reckon with.
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