2022-06

þÿ An Investigation of Teachers Self-regulation in Secondary School Science Teaching and School Factors: Self-efficacy Belief as Mediator

Mekuriaw, Mengistnew

BAHIR DAR UNIVERSITY

College of Educational and Behavioral Sciences Department of Psychology

An Investigation of Teachers' Self-regulation in Secondary School Science Teaching and School Factors: Self-efficacy Belief as Mediator

By

MekuriawMengistnew

June,2014/ 2022

BahirDar

BAHIR DAR UNIVERSITY

College of Education and Behavioral Sciences

Department of Psychology

An Investigation of Teachers' Self-regulation in Secondary School Science Teaching and School Factors: Self-efficacy Belief as Mediator

A Dissertation Submitted to

College of Educational and Behavioral Sciences Department of Psychology at Bahir Dar University, in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Educational Psychology

By

Mekuriaw Mengistnew

Principal Advisor: Dr Amare Sahile (Asso.Prof.)

Co-Advisor: Dr Dawit Asrat (Asso.Prof.)

June, 2014/2022

Bahir Dar

Declaration

This is to certify that the thesis entitled "Investigation of Teachers' Self-regulation in Secondary School Science Teaching and School Factors: Self-efficacy Belief as Mediator, in the case of South Gondar Zone", submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Educational psychology of Department of Psychology, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been received during the course of this investigation have been duly acknowledged.

Mekuriaw Mengistnew _____ _____ _____

Name of the candidate Date Place

Bahir Dar University

College of Educational and Behavioral Sciences

Department of Psychology

Approval of Dissertation for Defense

I hereby certify that I have supervised, read, and evaluated this thesis/dissertation titled "Investigation of Teachers' Self-regulation in Secondary School Science Teaching and School Factors: Self-efficacy Belief as Mediator" by Mekuriaw Mengistnew prepared under my guidance. I recommend the thesis/dissertation be submitted for oral defense (mock-viva and viva voce).

Amare Sahile (Dr,Asso.prof) _____ _____

Advisor's name Signature Date

Dawit Asrat (Dr, Asso.Prof.) ---------- ----------

_____ _____ _____

Department Head Signature Date -

Examiner's Approval Form

Bahir Dar University

College of Educational and Behavioral Sciences Department of Psychology

Approval of Dissertation for Defense Result

We hereby certify that we have examined this dissertation/thesis entitled "Teachers' Self-regulation in Secondary School Science Teaching and school factors: Self-efficacy Belief as Mediator" by Mekuriaw Mengistnew. We recommend that _____ is approved for the degree of "Doctor of philosophy in Educational Psychology"

Board of Examiners

_____	_____	_____
External examiner's name	Signature	Date
_____	_____	_____
Internal examiner's name	Signature	Date
_____	_____	_____

Chair person's name _____Signature----------

Acknowledgments

The long journey that I travelled could not have been completed without the support of several people whom I need to pass special thanks.

First and foremost, I am very much grateful to my dissertation advisors, Dr Amare Sahile and Dr.Dawit Asrat for their continuous, unreserved encouragement, guidance and advice they gave me throughout this study. It was an honor to work with them.

I would also like to express my deepest gratitude to so many people who contributed ideas and materials for the completion of this study. Particularly, I want to thank Dr. Melese Negash for his continuous information and guidance in the publication of the article, and for my colleague a PhD candidate Yihun Getachew for his unreserved sharing of knowledge and experience especially on structural equation modeling analysis. I would also like to extend my gratitude to my esteemed friend, Ato Dejen Alebel for his moral support to start and complete my PhD dissertation.

I also express my appreciation and thanks to my friends Dr Aemiro Asmamaw and Mr. Netsanet Bayleyegn for their material support and encouragement during my study time.

I would also like to extend my gratitude to my brothers, Ato Assefa Wuletaw, Ato Habtie Alemnew, Ato Beza Yaregal, and Ato Sete Shumye who gave me their time and effort during data collection process; and those teachers who

volunteered to be part of the study and spent an invaluable time with me deserve special thanks.

Finally, I would not have realized my dream of PhD study without the emotional support and unwavering love I received from my wife w/o Mulu Habtie who also shouldered the management of my family.

I am also grateful to my children for their understanding, patience and tolerance for not complaining about time I should have spent with them. Last but not least, many thanks go to Debere Tabor University management teams for their hospitality and financial support provided me during data collection.

Abstract

The purpose of this study was to investigate science teachers' self-regulated teaching practice in secondary schools and the relationship between school factors and self-regulation using teaching self-efficacy belief as mediator in South Gondar zone. An explanatory sequential mixed method with co-relational survey design was applied. The participants were 302 science teachers (chemistry, biology and physics) from the total 63 secondary schools only 9 were selected using random sampling method. The 302 participants were selected using comprehensive sampling. Descriptive statistics, t-test (both one sample and independent), multiple regressions and structural equation modeling were used for quantitative data analysis; thematic transcription and interpretations analysis were used for qualitative data. The quantitative results indicate that teachers of the study area reported as they are implementing self-regulated science teaching. The interview analysis result also confirms that teachers perceived as they are implementing self-regulated teaching with low conceptual understanding and knowledge of self-regulation. The descriptive statistics explained that teachers implement preparatory phase of self-regulation more than performance and reflection phases. But, the qualitative result shows somewhat differently in which half of the participant's lack planning and selecting strategies from preparatory phase and implementing performance and reflection phases better than preparatory phase. The multiple regression analysis result shows that teachers' gender and teaching experience were not found significant predictor of self-regulated teaching; however, the independent sample test and qualitative data identify that female teachers are more effective than their male counter parts in their self-regulated science teaching. Moreover the structural equation model analysis result informs that among school factors, only professional learning community practice (PLC) was found to have a significant positive effect on self-regulated teaching both directly and indirectly. Science teaching efficacy belief plays its meditational role in the relation between PLC and SRT but not for science teaching resource availability (STRA) and SRT. Other researchers who are concerned on the issue are recommended to conduct an experimental research and its effect on students' outcome to show its significant impact on teachers' teaching effectiveness and to conduct an instrument validation study. Self-regulated teaching concept would bring teaching quality of teachers if incorporated in their training system. Results' implications are indicated in chapter 5.

Key words; Self-regulated teaching, teachers' self-regulation, science teaching resources, professional learning, science teaching efficacy belief

Table of contents

Contents

Declaration....1

Approval of Dissertation for Defense....2

Examiner's Approval Form....3

Acknowledgments....3

Abstract....6

Table of contents....7

List of Tables....10

List of Figures....11

Abbreviation and Acronyms....12

CHAPTER 1: Introduction....13

1.1 Background of the Study....13

1.2 Statement of the problem....22

1.3Objectives of the Study....31

1.3.1 General Objective of the Study....31

1.3.2. Specific Objectives....31

1.4 Research Questions....32

1.5.1 Theoretical Frame work....33

1.6 Significance of the Study....37

1.7 Scope of the study....39

1.8Operational Definitions of Terms....39

Chapter 2: Review of Related Literature....41

2.1The Importance of Teachers' Self-regulation in Secondary Schools Science Teaching....41

2.2Dimensions of SR....47

2.3 Factors Affecting the Implementations of Teaching with self-regulation....54

2.3.1 School Climate as Affecting Factors for the Implementation of Teachers' Self-regulated Teaching....55

2.3.1AThe Influence of Science Teaching Resource Materials Availability on Teachers' Teaching Self-efficacy Belief to Implement Self-regulated Teaching 57
2.3.1 B Teachers' Professional Learning Community practice as Affecting Factors to Teach with Self-regulation.....62
2.3.2 Teacher Personal Factors Affecting the Implementation of Teaching with Self-regulation.....69
2.3.2A Science Teachers' Self-efficacy Belief and Self-regulatory Instruction use 69
2.3.2 B Years of Teaching Experience and Self-regulated Teaching 77
2.4 Challenges of Implementing Self-Regulated Teaching (Teaching With Self-Regulation) .79

CHAPTER3: ResearchMethodology 82
3.1 Philosophical Base of the Study 83
3.2 Design of the Study 84
3.3 Research Approach 84
3.4 The Study Area 86
3.6 Sample Size and Sampling Technique.....87
3.7 Participants 90
3.8 Data Gathering Instruments 92
3.8.1 Questionnaire 92
3.8.1A Teachers' Self-regulation Scale 93
3.8.1B Teachers' Teaching Self-efficacy Belief Scale 94
3.8.1 C Science Teaching Resource Availability Scale 96
3.8.1D Professional Learning Community engagement scale.....97
3.8.2A Interview 98
3.8.2 BClassroom Observation.....99
3.8.2 CDocument Review 100
3.9 Pilot Test 100
3.10 Data Collection and Analysis Methods.....102
3.10.1 Data Collection.....102
3.10.2 Ethical Consideration 102
3.10.3Data Analysis 103

CHAPTER 4:Data Analysis and Results.....105
4.1 Preliminary analysis.....105

A/ Quantitative data results....114
B/Qualitative data analysis....131
CHAPTER 5: Discussion and Implication....145
5.1Discussion....145
5.2 Implication....158
CHAPTER 6: Conclusion, Limitation and Recommendations....159
6.1 Conclusion....159
6.2 Limitations of the study....161
6.3 Recommendations....162
References....163
Appendix A: Self-regulated teaching Scale....21
Appendix B: professional learning community practice scale....26
Appendix C: Science teaching self-efficacy Belief scale....29
Appendix D: Science teaching resource availability measurement scale....31
Appendix E: Interview questions....33
Appendix F: Classroom Observation Check list....34
Appendix G: Document Analysis check list....35

List of Tables

Table 1 Summarized Zimmerman's (2000) model of SR Phases and components 52
Table 2 Summary of the methods.....82
Table 3 Sample size based on desired accuracy 88
Table 4 Number of schools and science teachers by Woreda.....89
Table 5Rotated Component Metrics for SRT Data.....108
Table 6 Rotated component matrix for STRA items 110
Table 7 Rotated component matrix of PLC.....111
Table 8 Rotated component matrix for SEB 112
Table 9 Frequencies of participant's responses, mean, median, mode and standard deviation of sample items of self-regulation.....113
Table 10 One-Sample Test of mean difference between observed mean and test value 114
Table 11Descriptive statistics.....115
Table 12 Standardized multiple regression model coefficients for gender &experience as predictors.....116
Table 13 Independent sample test of gender difference in SRTS.....117
Table 14 Standardized and unstandardized estimates of initial model 124
Table 15 Standardized and unstandardized estimates of a modified model.....126
Table 16 Goodness of fit indices of models (N=302).....126

List of Figures

Figure 1Theoretical framework 33
Figure 2 Conceptual Frame work 35
Figure 3 An Overview of the Explanatory Sequential Mixed Method Design 83
Figure 4 Bar graphs of participants by years of experience, subject they teach and by their gender 91
Figure 5 Study procedure 104
Figure 6 Hypothetical Research Model.....118
Figure 7 Specified Models.....119
Figure 8 Modified SEM model.....127

Abbreviation and Acronyms

AMOS=Analysis of movement structure

CFA= Confirmatory factor analysis

EFA=Exploratory factor analysis

PLC= professional learning community

SEB= Self-efficacy belief

SEM=Structural equation modeling

SR-Self-regulation

SRIS =Self-regulated instructional strategy

SRL= Self-regulated learning

SRT=Self-regulated teaching

STEB=Science teaching efficacy belief

STEBI- Science teaching efficacy belief instrument

STRA= Science teaching resource availabilit

CHAPTER 1: Introduction

The purpose of this study was to investigate the practice of science teachers' self-regulated teaching behavior in their classroom. Besides this, the study examined the effects of science resources availability, teachers' knowledge and experience sharing dialogue practice and their teaching efficacy belief to apply the self-regulated teaching of teachers. To substantiate the study, survey and qualitative data were collected using instruments from secondary school science teachers. The instruments were adapted and piloted for validation purpose. Descriptive statistics-tests, regression, structural equation modeling and path analysis methods were employed. To substantiate the study, other researchers' study results, theories and practices were reviewed. The document is organized based on the university's dissertation and thesis guideline and APA 7th edition writing style.

1.1 Background of the Study

Nowadays quality of education is becoming a pressing issue in Ethiopia and stakeholders' complain is still remained un resolved. Different study results especially on students' science learning and achievement showed that it is not to the expected level. For example,Negassa(2014) identified that the teaching-learning process of science education in Ethiopian schools failed to meet the requirements of the country's expectation. Berhe (2021) also identified that the country did not secure relevant and quality science education until the mid of 2000 years. One of the contributing factors is attributed to teachers' teaching ineffectiveness. Because, teachers are assumed to have major role on students' learning and achievement and take the lion share of the effective teaching-learning process. For example, as Arega(2016 cited in Jiru, 2020), indicated that serious challenge to quality was associated with negative behavior and attributes of teachers, such as low levels of academic qualification, lack of dedication and commitment and lack of pedagogical skills.

Though it is difficult to judge the instructional strategy teachers use in their classroom as good or bad, teaching with self-regulation (teachers' self-regulation) has emerged as a central concept in psychology that shows how each teacher becomes effective by organizing and regulating their cognitive, motivational, affective and behavioral components in their classroom (Bembenutty, 2006). Therefore, teachers' self-regulation is being conceived as a new innovative teaching approach nowadays and can be effective when teachers recognize their limitation, and ineffectiveness and become ready to change their teaching approach to correct their limitations (Bakkenes, Vermunt, & Wubbels, 2010).

Therefore, teaching with self-regulation is an attribute of teachers which enables them to direct and lead the process of teaching or attaining learning goals independently and responsibly rather than planning haphazardly and conducting classroom teaching under the control of other bodies. Because, Self-regulated teaching (SRT) develops teachers' awareness and reflection on what they know, their attitudes towards teaching and what the task demands of them. Otherwise teachers with low or no self-regulation skills fail to manage their emotion, thoughts, behaviors and resources(Balki & Duru, 2016). Research on self-regulation has also recognized the individual's capacity to monitor and modify their behavior, cognition and affect, and their environment where they are working to achieve an intended goal. Self-regulated teaching strategy is adapted from the analogy of students' self-regulated learning developed by Zimmerman(2000).This is because of that students' self-regulated learning set a stage for teachers' self-regulation as an essential strategy for effective teaching(Randi, 2004).

Teachers' self-regulated teaching refers to self-generated thoughts, feelings, and actions that individual teachers need to assess and equip themselves to improve their teaching-learning effectiveness to attain their lesson objectives (Zimmerman, 2002).Besides this, teaching with

self-regulation encompasses full attention and concentration on their task, self-awareness about their efficacy belief, motivation and readiness, and introspection, honest self-assessment, openness to change, genuine self-discipline, and acceptance of responsibility for their instructional effectiveness and students' learning and achievement(Nilson& Zimmerman2013).

Hence, self-regulated teaching approach always enable teachers to check how they proactively making a task analysis and self-awareness or investigating the motivational belief, intrinsic motivation to conduct the lesson; design a plan or learning goals, considering students' characteristics, selecting strategies to conduct the lesson, asking the confidence level they feel to teach the lesson effectively and assessing resources and classroom conditions ahead before entering to the class. And this is called according to Zimmerman (2000), *forethought phase or preparatory phase*. The second phase in teachers' self-regulation is called *performance or volitional phase*. During this phase, teachers deliver the lesson by self-monitoring, observing the self, recording activities, managing emotion, self-instructing (learning from the activities) and conducting self-judgments how the lesson is going on. And the third phase of teachers' self-regulation is called *self-reflection and self-reaction phase*. During this phase, teachers at the end of their lesson evaluate their success, making judgments on their teaching-learning process whether it needs changes or stay on track, and reflecting on what worked and what could be improved the next time, accepting feedback from self and students etc. for improving teaching-learning process. And this activity is cyclical but not a one shoot task.

Teaching with Self-regulation decreases the unjustifiable reason for delay of academic tasks or procrastination, and decreases the probability of occurring ineffective teaching-learning process. Because being self-regulated increases commitment, intrinsic motivation, responsibility and investing more time for their academic task (Iwamoto, Hargis, Bordner, & Chandler, 2017) and

provide a learning opportunity to improve effectiveness. Similarly, Capa-Aydin et al. (2009) confirmed that Self-regulated teachers evaluate instructional effectiveness based on comparison either with their previous performance, or with the standard they believe or the school set, or with students' feedback given to them, or with reference to their model. If so, it is possible to raise questions like; Do Ethiopian science teachers have such attributes?

In relation to the area, some researchers conducted a study on teachers' self-regulatory teaching and its effectiveness; for example teachers' self-regulation as learners conducted by Bembenutty(2006); Corrigan and Taylor(2004); Capa-Aydin et al.(2009); and with in-service teachers self-regulation by Toussi, Boori, and Ghanizadeh (2011);Lombaerts and Engles (2009);Peeters, Backer, Reina, Kindekens,Buffel,and Lombaerts (2014); and Arrastia (2015) showed its impact on instructional effectiveness and students' learning and achievement. However, enough research is not exhausted in the area as self-regulated learning.

Hence, the purpose of this study is to examine teachers' self-regulated teaching practice in secondary schools' science classroom teaching and affecting factors via teaching self-efficacy beliefs. Because it is assumed that teaching with self-regulation maximizes teachers' effectiveness and students' learning and achievement and decrease the blame- game on the teacher's side; besides, it gives an insight or awareness for the concerned bodies from the dissemination and recommendation provided so that it may be taken and practiced as an alternative teaching approach to minimize quality problem.

However, though SR skill makes teachers more effective, it may not be effective due to internal and external factors to teachers. Teacher factors including their capacity, experiences and belief were found stronger influence of teachers' recognition of SR(Lombaerts, De Backer, Engels, van Braak, &Athanasou, 2009). The ineffectiveness of instructional strategies specifically self-

regulated teaching can be attributed to the inefficiency of either the personal factors (affect, and cognitive), or the social factors (lack of models, or support) and or lack of supportive and enabling environments. In line with this, De Smul, Heirweg, Devos, and Keer(2018);Spruce and Bol(2014);Delfino, Dettori, and Persico (2010);Perry, Hutchinson, and Thauberger(2008); and Randi (2004),their independent study identified that teachers are not competent enough to implement SR; the concept is implicit to teachers; there is misalignment between teacher's *belief, knowledge and practice*.

Hence, among teachers' personal factors, teachers' teaching self-efficacy belief is an integral and predictive component of SR and was planned to be investigated in this study. Because, the level of one's self-efficacy belief determines the extent and type of the behavior to be performed (Bandura, 1997). According to Tschannen-Moran, Hoy, and Hoy (1998 as cited in Arrastia ,2015), defined it as "teachers' teaching efficacy is the teacher's belief in his or her capability to organize and execute course of action required to successfully accomplish a specific teaching task in a particular context" (p. 233). Self-efficacy is a motivational belief that determines one's level of engagement and perseverance in a given task and can be affected by the level of conducive and supportive environment to predict a behavior. It is the extent to which a teacher believes he/she has the capacity to affect students' performance. Teachers with a high teaching self-efficacy belief are more open to new ideas and to practice new instructional strategies for the betterment of their students and are collaborative and persistent whenever they face difficult tasks and obstacles. Teacher efficacy is one of the important determinants of their instructional choice (SHI, 2014).

Studies also confirmed how teaching self-efficacy affects or has positive relationship with the implementation of self-regulated teaching (SRT). For example, a study conducted by

Chatzistamatiou, Dermitzaki, and Bagiatis(2014) shows that teachers' self-regulation in mathematics was predicted by their teaching self-efficacy beliefs(SEB). Bembenutty(2007) also identified that teachers with high sense of teaching efficacy reported high academic sense of intrinsic interest, task value, and management of resources. Capa-Aydin, et al. (2009) confirmed the presence of positive correlation between efficacy variables and self-regulation variables. Whereas Toussi et al. (2011) did not find a significant impact of SEB as a mediating role on the relationship between SR and locus of control.

From the external factors, the presence of professional learning community practice(PLC) in the school and the adequacy of science teaching resources availability (human and material resources were assumed to affect teachers' self-regulated teaching. Blitz defined PLC as teams of educators (most commonly teachers) who meet regularly (often but not always during scheduled school time) to develop lesson plans, examine student work, monitor student progress, assess the effectiveness of instruction, and identify their professional learning needs.

In line with this, Rosenholtz (1989) for example identified that the discussion made on teaching quality, maintaining that teachers who felt supported in their own ongoing learning and classroom practice were more committed and effective than those who did not. Different studies also showed how the level of professional learning community practice in the school related to the enhancement of teachers' self-efficacy belief for effective teaching. For example, Heaton(2013);Cowley and Meehan (2001); Chong and Kong(2012)and Rosenholtz(1989) examined the presence of significant positive correlation between the engagement of teachers in professional learning community practice and teachers' teaching self-efficacy belief to apply self-regulatory teaching approach. Parise and Spillane (2010 as cited in Lee, Llosa, Jiang, O'Connor, and Haas,2016) indicated that teachers' reports of learning opportunities through both

formal professional development (e.g., number of professional development sessions) and on-the-job opportunities to learn (e.g., collaborative discussion, peer observation, feedback) were significantly related to reported changes in instructional practices. However, they reported that teachers' perceptions of schools' organizational conditions, including professional learning community (e.g., teacher trust, collective responsibility) and principals' communication of instructional goals with teachers were not significantly related to their reported changes in instructional practices. So, this study was aimed to see what relationship it would have in Ethiopian context.

Another factor external to teachers that the researcher assumed to affect their self-efficacy to apply self-regulatory teaching in science subjects is the availability and adequacy of science teaching resources (STRA) in the schools. As to the researcher's experience, if there are adequate chemicals, apparatus, equipment, source of electricity, water, trained lab technicians, references, text books, curricula and furniture particularly for the three subjects(Chemistry, Biology and Physics), the teaching self-efficacy of teachers is assumed to be enhanced so that they can apply teaching with self-regulation. Studies also confirmed the presence of a relationship between this construct and teachers' self-efficacy. For example, Martin (2017) studied the correlation between resource availability and efficiency of school, and the findings indicated that there is a significant relationship between the availability of resources and the efficiency of the school system. Another study conducted by Andersen, Dragsted, Evans, and Sørensen (2004) identified that the presence of environmental factors like science kits, science equipment and technology increases science teachers' self-efficacy belief, in turn self-regulated instructional strategy practice. Teaching science with the absence of laboratory materials is meaningless.

This study was also intended to investigate whether self-regulated teaching, is related to teachers' back ground characteristics. Concerning self-regulated teaching and gender relationship, different studies show different results. Research results indicate that female teachers are behind male teachers in their science effective teaching, especially at advanced grades, they feel less competent than males in science(El-emadi, Said, & Friesen, 2019) in their study of 'teaching style differences between male and female science teachers'. Whereas, Islahi and Nasreen (2013) identified as there is no significant difference among male and female teachers in their effective teaching. Although there is no clear cut that shows the difference between female and male teachers' teaching effectiveness, Islahi and Nasreen, (2013) showed that female teachers use collaborative learning approach, nurturing, caring, empathy, easy to communicate with their students, use student centered teaching approach and use linear relationship with their students. According to Kovács(2019), difference in gender is the use of diverse teaching methods, following teaching novelties and participation in high-standard further education, are specifically more interconnected with women. In line with this, Studenska (2011) indicated that in their learning process, women generally report that they use self-regulatory strategies more intensively than men. Whereas, Ghonsooly and Ghanizadeh (2011); Partovi and Tafazoli (2016) identified that there was no relationship between teachers' self-regulation practice and teachers' gender. On the other hand, male teachers are authoritative, follow structured classroom, use lecture method, participate students by asking questions. So, study conducted on the relationship between self-regulated teaching practice and gender in Ethiopian context is scarce; so, investigating this relationship was also one of the objectives of this study.

Years of teaching experience are also expected to have an impact on teachers' use of self-regulated teaching approach which was another objective of this study. It is the skill and

knowledge gained by the practitioners by learning through practice. It is believed that the more the experience teachers gain in their teaching, the more effective s/he will be. This is because self-efficacy is an excellent predictor of behavior(Lekhu, 2013)which is gained through successful experience, observing their model, and gaining encouragement and support from others to implement self-regulated teaching. Many studies were conducted to identify the relationship between teaching experience and self-efficacy belief and self-regulation. For example, Berger, Girardet, Vaudroz, and Crahay (2018) studied the relationship between teaching experience, teachers' beliefs, and self-reported classroom management practices, and the result showed that there is a positive relationship between self-efficacy and teaching experience. Ghanizadeh (2011) also investigated the relationship between self-regulation and teaching experience and found significant correlation between teachers' self-regulation, their teaching experience and their age; Bringman and Lee (2008) study's result suggested that teaching experience was significantly related to competence in conducting developmental classroom lessons. Similarly, Ghonsooly and Ghanizadeh, (2011)identified a significant relationships between teachers' self-regulation, their teaching experience and age.

In opposition to the above studies, Partovi and Tafazoli (2016) identified no significant relationships between teachers' self- regulation and their experiences. Arrastia (2015) also identified that there was no correlation between teachers' teaching experience, their qualification, and the grade level they teach with their self-regulation in Casler(2006) un published validating study. On the other hand, studies conducted by Lombaerts, Engels, and Van Braak ,2010; De Smul, Heirweg, Van Keer, Devos, and Vandevelde, 2018; Vandevelde et al., 2012; and Pazhoman and Sarkhosh(2019) identified that there is no significant relationship between teaching experience and teachers' self-regulation practice and also has no relationship

with teacher internal and external efficacy. So, in this study, the relationship between teachers' teaching experience and their self-regulation practice was also investigated as part of the objectives.

However, studies that show the relationship between science teaching resource availability, professional learning community practice and self-regulation teaching using teachers 'self-efficacy belief as a mediating variable and background characteristics in one study is very limited as far as the researcher's knowledge is concerned. The concept, the practice and its effect (self-regulated teaching) is not yet investigated in Ethiopia even around the world is limited. To strengthen this, Van Eekelen, Boshuizen and Vermunt(2005) confirmed that teachers' own self-regulation strategies as practiced in their educational settings did not received enough attention.

Therefore, these scarcities of research studies on the area, the newness of the concept self-regulated teaching and its effectiveness, and theories of SRL shown by researchers motivated the researcher to examine the practice of self-regulatory teaching practice in secondary school science subjects and affecting factors by shifting from self-regulated learning to self-regulated teaching in Ethiopian context. Besides this, the researcher believed that the concept and the study result would have its own benefit by inspiring other researchers and concerned bodies to do more on the area so as to increase teachers' teaching effectiveness by large.

1.2 Statement of the problem

It is evident that quality education in Ethiopia is below the standards of the policy expectation (Negassa, 2014).The government has been employing different strategies in the education system to improve teachers teaching effectiveness. However, studies suggest that still there is a lack of primary focus and holistic thinking in a sense to effect deeper improvement on the area. The problem is pervasive in secondary school science teaching-learning effectiveness;

for example as to the national learning assessment result, student's achievement in chemistry, physics and biology of grade 10 and 12 national exam(in 2000,2004,2007) is below the country's average(MoE&USAID,2008).Different indicators (efficiency and quality input, assessment results and tests) also confirm that quality of education is not maintained nowadays (The World Bank, 2013).

Moreover, basic education sector analyses report (JAICA & IDCJ, 2012) in Ethiopia identified that teachers do not understand basic subject matters; instructors teach with poor knowledge**,** they have low motivations, they cannot get away from conventional way of teaching, and teachers themselves do not know how to pronounce to teach correctly their own language which may be due to lack of SR skills as one attribute.

In line with this, a descriptive survey study conducted by Sitotaw and Masresha(2019) to examine the challenges of quality education in Ethiopia secondary schools identified that the quality of education is at low level; and incompatible curriculum, inappropriate instructional strategy, teachers' lack of subject matter knowledge and pedagogical skill as part of the challenges. Therefore, if the country needs to have quality education it should consider the teachers' efficiency and capacity to fulfill the country's demand (Ertmer & Newby, 1996). Our school systems need to respond better to this challenging issue.It is reasonable and logical to say that effectiveness of teachers in their classroom teaching can increase the learning and achievement of students and assumed to decrease problems of quality education. Because, effective teachers are the most highly needed school variable that have an impact on students learning and achievement (Roseman, 2018).

The impacts will continue on the need to prepare next generation for new careers which becomes more challenging especially on science subjects in Ethiopia. Similarly, it persists as a

challenge for instructors to provide high quality education, trigger students' enthusiasm and most challenging of all is to ensure effective teaching(Amleh, Abou El-Soud, & Kamel, 2010).

However, the challenge is to find new ways and strategies to stimulate and motivate the creative abilities of today's generation different from the traditional one (Abiy, 2017). It is argued that teaching with self-regulation in classroom enhances teachers' effectiveness and student's achievement. According to Klusmann, Kunter, Trautwein, Lüdtke, and Baumert,(2008a &Kunter et al., 2013 as cited in Mattern and Bauer,2014), teacher self-regulation has been shown positively predict the quality of their instruction. In addition to this, there are studies that show the effectiveness of teaching with self-regulation. For example, Toussi et al. (2011); Gol and Royaei (2013) and Michalsky (2012) studied the relationship between teachers' SR and their teaching effectiveness, and or job performance; and their independent analyses findings indicate a positive significant relationship with their teaching effectiveness and students' achievement.

In addition to this, embedding self-regulated instruction within classroom teaching also supports student's strategic learning activities(Özy, Õuõ, & Yetkin, 2011);Zimmerman(1989); and Ley and Young(1998). It also increases teachers' positive affective dimension and professional competence. Besides these, when students are taught using self-regulated instruction, they also develop their own SR skill in their learning and can make them more fruitful in their achievement.

The focus of this study is to examine teachers' self-regulated teaching practice in their classroom as teachers' teaching attributes and affecting factors. Because, "… to improve any educational system, the most important factor to be kept in mind is to improve the quality of teachers along with the standard of teaching.''(Ahmed, 2013,P.1).

However, taking the complexity of teaching into account, being self-regulated may not be easy for teachers. Several factors might interfere with self-regulatory processes(Uzuntiryaki-Kondakcia et al., 2016). And research results show that it can be affected by internal characteristics and external factors to teachers. For example, a survey study conducted in Belgium to investigate the relationship between teachers' characteristics, contextual factors and the recognition of SRL(self-regulated learning) identified that the recognition of SRL is mostly linked to *personal teacher characteristics*(Lombaerts, Engels, & Van Braak, 2010).Implying that teacher capabilities, educational experiences, and beliefs were found to have a stronger influence than external contextual factors. Besides this, a review conducted by Moos and Ringdal (2012) also explained that teachers who are not competent in self-regulating of their own learning and/or do not hold personal beliefs that students can engage in SRL are less likely to be a model for the development of these capabilities in their classroom. In addition to this, Ghonsooly and Ghanizadeh (2011); Toussi and Ghanizadeh(2012)identified that internal and controllable attributions positively predict teachers' self-regulatory skills.

Moreover, Delfino, Dettori, &Persico (2010; Perry et al., 2008; Pintrich, 2002; Randi, 2004 as indicated in Peeters, DeBacker, et al., 2014)show that teachers' SR knowledge by itself is new to teachers. The lack of knowledge on SR skills and self-efficacy to effectively implement in their actual classroom is an aversive barrier to be a model for their students. Similarly, a descriptive and content analysis of qualitative study conducted by Eker and İnce (2018) to investigate teachers' opinion on use of self-regulated instructional strategies at Science and Art center in Turkey by interviewing 24 teachers showed that teachers are not competent enough about self-regulated instructional strategies. To strengthen this, a study conducted by Spruce and Bol (2014) to examine elementary and middle school teachers' belief, knowledge and practice

identified that there is a gap in their *goal setting and self-evaluation phases* of SR and misalignment between the three constructs (belief, knowledge and practice). Maggioni and Parkinson (2008, as indicated in Zimmerman & Schunk, 2011) also contend that there also exists a disconnect between teachers' beliefs and their pedagogical practices.

Hence, in addition to belief, knowledge and practical limitations of teachers on self-regulation, teaching self-efficacy belief was assumed to have an impact on teachers' SRTas teachers' personal factors and was investigated in this study. So, different studies' result show the presence of significant positive relationship between teachers' teaching self-efficacy and self-regulation. Instructional environment, professional knowledge and pedagogical skills and own self-efficacy beliefs are essential for SR instruction implementations (Lombaerts et al., 2009). Moreover, according to self-efficacy theory, teachers who have high self- efficacy in their knowledge and belief are motivated to implement new and innovative instructional strategy in their classroom(Bandura, 1997). Teaching efficacy may differ among individuals and with different contexts. For example, a review conducted by Deehan (2017) also showed that pre-service elementary teachers had overwhelmingly negative science teaching efficacy, hence low SR implementations. Whereas Moos and Ringdal (2012) reviewed Tillema's (1999) study conducted to investigate whether there is potential diff erence between pre-service teachers and teacher educators on the meaning and implementation of SRL in the classroom shows somewhat surprisingly the teacher educators were found to have a less positive attitude towards SRL and lower expectations about their competencies related to self-regulation. But what factors for negative efficacy and low SR practice is not identified in the above study.

However, teachers with high self-efficacy in their science teaching are highly motivated, enthusiastic, more committed and more likely stayed in their teaching profession, and egger to adapt and experiment new instructional innovations to meet the needs of students (Chan, 2007).

Therefore, though theories and some studies identified a positive relationship between teaching self-efficacy and self-regulation, there is inconsistent results in its practical application. For instance, Chatzistamtious et al. (2014) examined the relationship between self-regulatory mathematics teaching and motivation, affect and professional commitment. The path analysis result shows that teachers' self-regulatory teaching is predicted by their teaching efficacy belief. Bebmnuatty (2007) also investigated pre-service teachers' belief and SRL practice; the correlation analysis of 63 teachers' responses reveals that there is a high correlation between motivational belief, willingness to delay gratification, use of self-regulatory learning and their teaching efficacy beliefs. In line with this, studies have shown that teachers' teaching self-efficacy beliefs were significantly correlated with teacher self-regulation (Capa-Aydin, et al. 2009; Ghonsooly& Ghanizadeh,2011).Similarly, Tschannen-Moran and Mcmaster,(2009) in their quasi- experimental study of sources of self-efficacy and its relationship with self-efficacy to implement new teaching strategy identified that efficacy belief for mastery experience predicted the use of new instructional strategy.

To the contrary of the above findings, Eker and İnce, (2018) investigated the opinion of teachers' use of SRS at science and art centers. Their qualitative descriptive and content analysis identified that teachers are not competent enough about SRS, motivation and meta-cognition were the most deficiency. In addition to this, De Smul, Heirweg, Devos and Keer(2018);Spruce and Bol(2014);Delfino, Dettori, and Persico (2010);Perry, Hutchinson, and Thauberger(2008); and Randi (2004)their independent study identified that teachers are not competent enough to

implement SR; the concept is new or implicit to teachers, there is misalignment between teacher's belief, knowledge and practice.

Bandura(1997) identified mastery experience, vicarious experience that is, looking others how they perform SR teaching and recognized; support and encouragement from peers and administrator; and emotional and psychological stability when faced with difficult tasks as source of teachers' self-efficacy. In addition to this, the relationship between teachers' teaching experience and gender as personal factors were investigated in this study and different studies showed different results of relationship they have with the dependent variable (SRT).

Though there are a number of factors that can impede teachers' effectiveness, the researcher of this study was interested to investigate the effects of professional learning community practice, and science teaching resource material availability (environmental factors) on TSR (teachers' self-regulation) practice directly and indirectly. This is due to that, the resourcefulness of school environment, and the collaborative and learning characteristics of staff can affect the efficacy of teachers to use self-regulation as a teaching strategy. Therefore, professional learning community variable (shared and supportive leadership, and supportive Conditions) and engagement of teachers in experience and knowledge sharing contributes to the development of teachers' self-efficacy and instructional effectiveness(Heaton, 2013; De Smul, Heirweg, Van Keer, Devos & Vandevelde, 2018). In addition to these, a survey study conducted by Cockpim and Somprach (2019) showed that learning leadership practice contributes high percentage (96%) to the variance of teacher professional development and were significantly affecting teachers' teaching behavior at significant level of .01 and .05 respectively. Similarly, administrative support from and a positive collaborative culture with in schools or supportive working environment encourages teachers to have self-efficacy to teach with new instructional approach(Lau, 2013).

Similarly, Somprach, Tang, and Popoonsak(2017) explored the role of supportive leadership styles of school principals in encouraging teachers' participation in professional learning community to 731 teachers in basic education in Northeastern of Thailand. Their findings indicated that learning, transformational, collaborative, and invitational leadership styles are the four significant predictors for promoting teachers' participation in professional learning community.

Whereas studies conducted by Cowley and Meehan (2001) identified that elementary teachers showed high level of internal SEB and high sense of PLC than high school teachers; and Heaton(2013) also examined the presence of significant positive correlation between professional learning community and teachers' teaching self-efficacy belief. To the contrary, a study conducted by Nolan(2009) showed a *negative* correlation between teachers' SEB and PLC. Another study conducted by Sweigart (2012) in Southern Mississippi university shows no significant difference in teachers' SEB between those who participated and non-participated in PLC. The findings of these two studies deviate from the theoretical assumption indicating that when teachers engage in continuous knowledge and experience staff forums concerning how to improve their instructional effectiveness increases their teaching self-efficacy belief. However, this relationship was not yet investigated in Ethiopian context and was planned to examine.

On the other hand, the presence of appropriate and sufficient teaching resources was assumed as affecting factors of teachers' SRT in this study. For example, Martine (2017) studied the correlation between resource availability and efficiency of school and the findings indicated that there is a significant relationship between the availability of resources and the efficiency of the school system that also indicate teachers' effectiveness. Implying that teachers can be motivated and be efficacious to implement their instruction with new instructional strategy like self-

regulated where there are sufficient resources. Another study conducted by Andersen, Dragsted, Evans., and Sørensen(2004) identified that the presence of environmental factors like science kits, science equipment and technology increases science teachers' self-efficacy belief to implement innovative instructional strategies. Sunger (2007)also identified that pre-service elementary and secondary school teachers show moderately positive epistemological belief, self-efficacy belief and attitude towards science teaching and are assumed to use new instructional strategy in their classroom.

Therefore, it is time to raise a question like: Do science teachers have knowledge and practice of self-regulated teaching? What factors affect them to do so?

Examining such relationships may lead to better understanding of how teachers spontaneously employ or not specific self- regulatory strategies and practices with regard to instruction and which factors might be critical. Because, self-regulators experience a sense of ownership over the goals and process of their tasks (Sitzmann & Ely, 2011).However, even though many research studies are conducted on the relationship between self-efficacy and SRI implementation, between SEB and PLC, SEB& STRA, separately, but research conducted on the relationship between the four variables (PLC, STRA, and SR,) in one study using teachers' teaching self-efficacy belief as a mediator is very limited or scarce. Moreover, it is observed that there are inconsistent results on the relationship between SEB & PLC, and the mediating role of self-efficacy beliefs; besides, it was not much researched yet on self-regulated teaching science subjects. Specifically, this topic is not yet exploited in Ethiopian context. In addition to this, the intention of the researcher was to find the level of practice, and to create an insight on other researchers and educational experts to deal more on the area to broaden it in order to show its contribution in lowering quality problems.

1.3Objectives of the Study

1.3.1 General Objective of the Study

The general objective of this study was to investigate the level of the implementation of self-regulated teaching practice in secondary school science teaching followed by assessing the relationship with the assumed affecting factors. This is because of that teachers are expected to set learning objectives of their lesson and select strategies how to implement the lesson, what type of strategy they invest, how they are assessing their self-awareness, execute and monitor and control accordingly and evaluate their instruction by themselves by regulating their own activity/instruction rather than assessed by external bodies.

1.3.2. Specific Objectives

Based on the proposed conceptual model, the study was intended:

1. To investigate the status of teachers' self-regulated teaching practice in south Gondar zone secondary schools science teaching

1.1. To examine which phases of self-regulation teachers implement more.

1.2 To investigate the relationship between teachers' gender and years of teaching experience variables with self-regulated teaching.

1.3 To investigate the difference between male and female teachers in their self-regulated teaching practice.

2. To examine how the hypothesized model fits to the sample data

3. To identify the effects of school factors on self-regulated teaching via teachers' self-efficacy belief.

4. To investigate the effects of professional learning community, science teaching resources and teaching self-efficacy belief on self-regulated teaching behavior of teachers

.5. To investigate how teachers are implementing self-regulated teaching in their classroom.

6. To explore the challenges of self-regulated teaching

1.4 Research Questions

The following research questions ware proposed to achieve the above objectives

1. What is the status of implementing teachers' self-regulation /teaching with self-regulation in secondary school science teaching?

   1.1 Which phase/s of SR is/are mostly applied by teachers in their classroom teaching?

   1.2 Do teachers' gender and year of teaching experience significantly predict teachers' self-regulation practice?

   1.3. Is there a significant difference between male and female teachers in implementing Self-regulated teaching?

2. Does the hypothesized model fit to the sample data?
3. Is there a significant relationship between school related variables (resource availability and professional learning community) and teachers' personal factor (self-efficacy belief)?

4. Do the three variables (teaching resource availability, professional learning community, and self-efficacy belief) independently affect the implementations of teachers' self-regulated teaching? If so, which one of them contributes the highest variance of SR implementation?

5. Do professional learning community practice and science teaching resource availability exogenous variables have an indirect effect on self-regulated teaching?

6. How do teachers implement self-regulated teaching in their science classroom?

7. What are the challenges of implementing teaching with self-regulation?

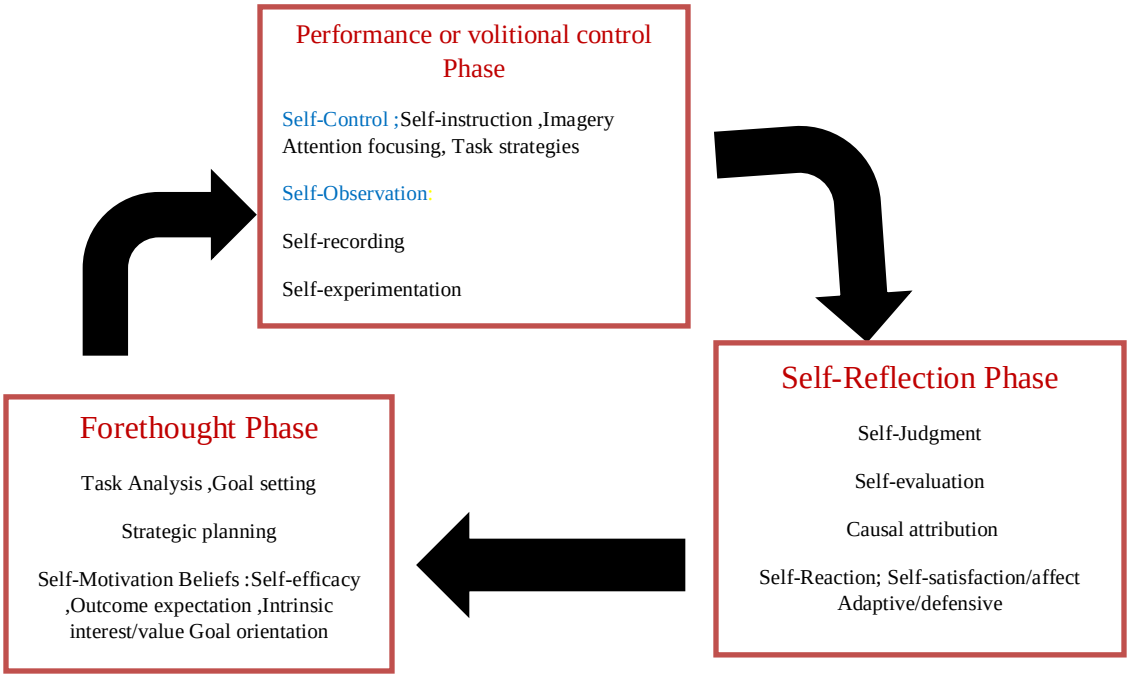
1.5 Conceptual and Theoretical Frame work of Self-regulation

1.5.1 Theoretical Frame work

The following theoretical framework was adopted from Zimmerman (2000) self-regulated learning model

Figure 1

Theoretical framework



Source: *Zimmerman (2000) cyclical model*

The reason why Zimmerman's (2000) model was selected as a theoretical model is that it is the first self-regulation learning model emerged from social cognitive theory of Bandura; conceptually, it is assumed that cognition is the result of the interaction of the self with the social

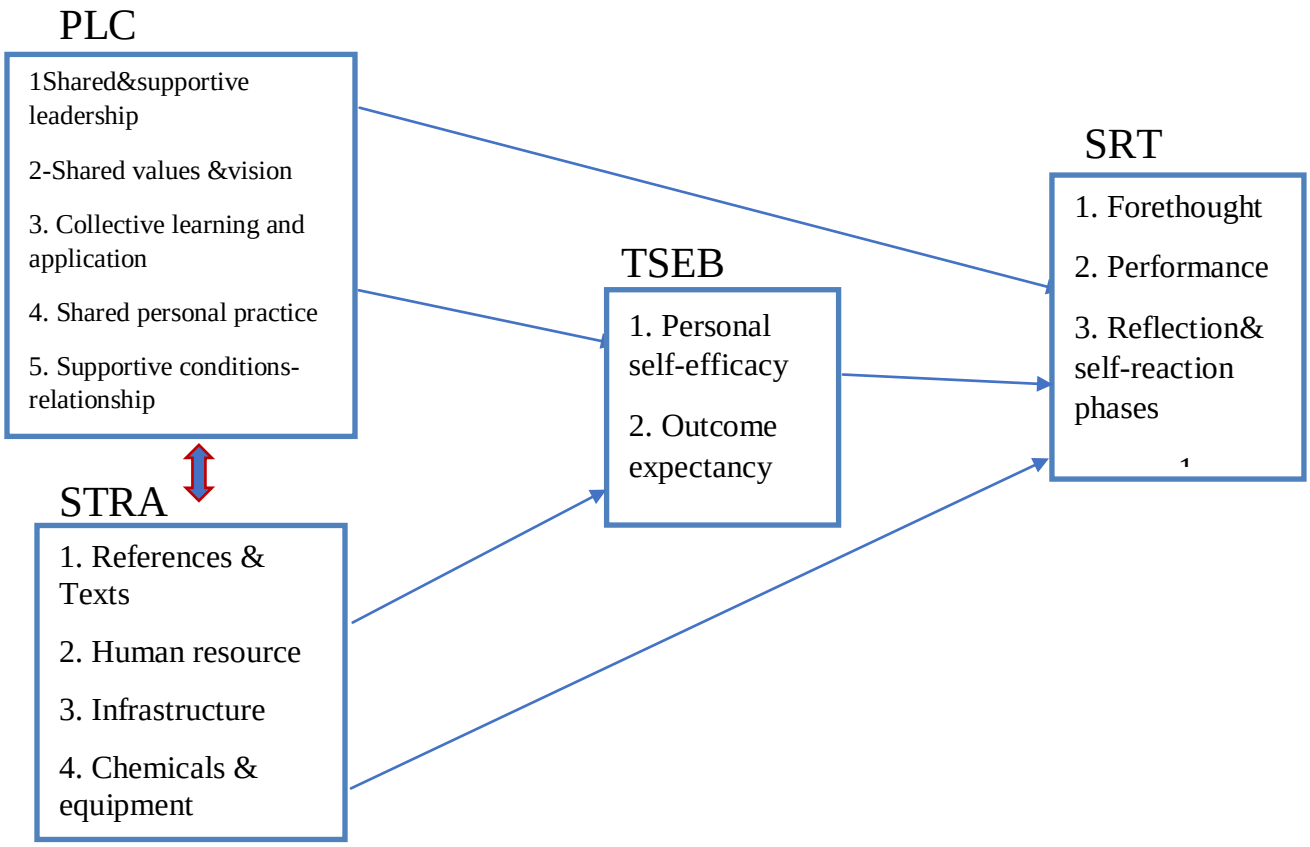
environment (individuals acquire knowledge by observing others and social interaction). Besides this, it is a comprehensive cyclical model that shows how one phase can be an input for the next phase and also affects one another. Moreover, most researchers used this model as their theoretical framework to examine teachers' implementations of self-regulation instruction (eg. Chatzistamatiou et al.,2014; Capa-Aydin et al.,2009;Peeters et al.,2014; and Lau,2013). Uzuntiryaki-Kondakcia,Demirdöğen,Akın,Tarkin,andAydın-Günbatarc(2016) also highlighted that teacher self-regulation (TSR) model based on Zimmerman's model shows that all phases are dependent on each other. For example, teachers' effective performance in class is related to their effective strategic planning.And in this model, it is suggested that self-regulated teachers and students are constantly trying to assess, control, monitor, and regulate the teaching-learning context by attempting to change it, using various strategies that may lead to success, or adapting to it (Pintrich, 2000 as indicated in DiBenedetto,2018). This theoretical model is a base for drawing conceptual model which shows the relationship of independent variables with the SR outcome variable.

1.5.2 Conceptual Frame work

The conceptual frame work is the logical or causal relationship drafted between the study variables based on theories and research evidences by which the researcher believed and proposed to be the study's play field.

Figure 2

Conceptual Frame work



From conceptual frame work in figure 2, the interaction between the person with social and environmental factors can affect teachers' self-regulatory behavior. STRA= indicates Science teaching resources availability which include (References and text materials, supportive human resources, conducive infrastructure like water, electric city, laboratory rooms for each science and chemicals and equipment) which assumed to enhance teachers' capacity and efficacy for effective classroom instruction; whereas PLC=High-performing schools promote collaborative problem solving and supportive professional communities and exchanges among all staff. Teachers collaborate to remove barriers to teach effectively and communicate regularly with

each other about effective teaching and learning strategies. Presence and engagement of teachers in professional learning community in school includes (Shared and supportive leadership, shared values &vision, collective learning and application, shared personal practice and supportive conditions-relationship) is assumed to increase teaching efficacy of teachers so that they can apply innovative instructional strategy in their classrooms.

STEB= is science teaching efficacy belief (mastery goal expectancy or personal teaching efficacy & outcome expectancy which focuses on students' achievement or outcomes) is assumed to be affected by the independent variables(school factors) to apply SRT.

TSR= is teachers' self-regulated teaching which contains (forethought phase, performance or volitional phase and self-evaluation and self-reaction phase) by involving the wholeness of the self to the betterment of instructional skills continuously and become a model for his/her students. A conceptual framework proposed for this study was to organize and conceptualize linkages among science teaching resource availability constructs, and professional learning community that affect teachers' science teaching efficacy belief to apply self-regulated instructional strategy. In this model as observed above, the implementation of new instructional strategy (SR) by teachers depends on their judgment of own capability to implement this strategy in science teaching and their efficacy belief is affected by the supportive environments. It is researched that teachers' self-efficacy can be affected by different factors; (eg. Bandura, 1997, indicated that the source of efficacy beliefs are mastery experience, vicarious experience, encouragement and recognition given, and by teachers' own affective and physiological conditions). So, rich teaching resources and the presence of supportive learning environments in the school context as components of the sources of efficacy belief, which was assumed to affect

teachers' self-efficacy belief of implementing self-regulated instruction and it is a logical and reasonable relationship as shown in the diagram.

Theoretically, the resourcefulness of the school specifically for science subjects like laboratory facilities, and feedback and the dialogue and sharing experience made among and between teachers and school principals can influence teachers' self-efficacy of implementing self-regulated instructional strategy and other innovative strategies towards their teaching positively or negatively. So, teachers' self-efficacy was expected to serve as a mediator between school factors and implementation of SRTS (self-regulated teaching strategy) and at the same time it can be a predictor of the behavior (using self-regulated instructional strategy in this context).

1.6 Significance of the Study

Since this study was assumed the first of its kind in Ethiopia, the researcher believed that it would have multidimensional importance in the education endeavor. Particularly the findings of this study may have:

A/Theoretical implication: self-regulation is emanated from social cognitive theory of Albert Bandura (1977) which depicts generally how individuals observe, judge and evaluate their tasks in relation to the environment where the task is performed. And based on this theory, Zimmerman (2000) developed self-regulated learning theory and many models are developed and researches are conducted in relation to it and showed that it is more effective for students' learning and achievement in different continents especially in Middle East and USA. But, in terms of self-regulated teaching, it is not yet exhausted much instead the self-regulated learning theory and models are adapted to teaching.

So, this study result was expected to contribute for those educators, researchers and scholars to focus on the issue to develop theory of *self-regulated teaching/instructional strategy* separately or by integrating with self-regulated learning.

B/for policy makers and curriculum developers; Understanding the importance of self-regulation, how teachers are self-directed and exert their maximum effort to maximize their students' learning and achievement, policy makers and curricula experts may use it based on the study recommendations, and dissemination of the study results to revise and inculcate it in the educational documents as one alternate innovative instructional strategy to improve quality of teaching just like student-centered teaching strategy and others so that students and teachers may benefit from it.

C/ for teacher training institutions: to install the SRIS in their training approach so that prospect teachers will develop SR skills and knowledge and will apply in their instruction.

D/ for other researchers; to study the effect of SRl(self-regulated instruction) on teachers' teaching approach and students' achievement in Ethiopian context and on other subjects also. It may also give an insight for school principals and other stake holders to fill the gaps in using self-regulated instruction. Furthermore, it is assumed to benefit other researchers to conduct intervention-based research on the gap that is identified and recommended. Moreover, it may help for students, if it will be implemented in schools to enhance their learning and achievement and to develop their own skills of SRL, because the ultimate goal of improving instruction is enhancing students' learning and achievement.

E/ Practical implication; it will have an impact on improving teachers' teaching effectiveness by continuously observing, judging and evaluating their own teaching there by it enhances quality

of students learning and professional development based on their insight and inspiration from the research questionnaires, publication results and other opportunities they get.

1.7 Scope of the study

This study was geographically determined to secondary schools found in Amhara region of south Gondar zone. This was intentionally selected due to the reason that I have worked in the selected zone particularly in Debre Tabor University which gave me the opportunity to let me know staff members of some of the schools in the study area which would make the data collection process easy. Besides this, the university helped me in accessing different resources for my data collection and compensates my resource limitations. Moreover, the study was delimited to gather data only from grade 9-12 science (chemistry, Biology and Physics) teachers. This is because of that I have worked as chemistry teachers in high schools and as principals so that it helped me in developing conceptual framework and to coined research questions and to elaborate the results properly.

1.8Operational Definitions of Terms

Professional learning community(PLC):- in this study implies that secondary school science teachers informal and formal professional dialogue, discussion, experience and knowledge sharing about their teaching-learning process to improve their instructional skills to enhance their teaching efficacy belief for SR.

Science teaching resource availability(STRA):- include the adequacy of human and non- human materials like common and basic equipment, apparatus, chemicals, materials, lab technicians, and infrastructures, references and texts to teach the three subjects(Chemistry, physics and Biology)

Teachers' self-regulated teaching(SRT) is teachers' themselves judge their motivational belief, efficacy to conduct the lesson, planning and selecting strategies/methods, their commitment and consider their students' characteristics before their class; conducting the lesson by observing, controlling and recording their activities and cognition; and evaluating their own success or failure by reflecting and reacting cyclically. It also includes teachers' commitment, motivation, readiness, self-recording, self-instruction and self-reflection and reaction about their instruction

Science teaching self-efficacy belief: - is the belief of teachers about their ability or capacity to teach their science subjects in their classroom effectively using SR.

Chapter 2: Review of Related Literature

Self-regulated learning has been studied by different researchers, but much attention is not given to teachers' self-regulation. However, study results show that there is positive significant relationship between teacher's self-efficacy belief and self-regulation, and there is gap in teachers' knowledge, practice and belief on self-regulation. Under the review literature section, the theoretical importance of teaching with self-regulation for teachers' performance enhancement and students' learning, and the research results made on it is discussed. Besides this, how teachers' self-regulation is related to or affected by self-efficacy of teachers and with other factors external to teachers (professional learning community and resource availability) is discussed. The contribution of these school factors to teachers' self-regulation and self-efficacy and the research evidences supporting the theory were synthesized.

2.1The Importance of Teachers' Self-regulation in Secondary Schools Science Teaching

Bandura and Mischel (1965 and Bembenutty,2007, as indicated in Bembenutty, White, and Velez 2018) explained that the main intention of teaching using self-regulation is to enable students to be guided by themselves, proactive, and competent learners by determining their destination of their activities or goals. They also identify and chose the best way of achieving their goals and take a continuous supervision and control over the process of their activities to confirm whether it is as per the plan or not; They also evaluate the achievement of the intended goals, and reflect whether outcomes are consistent with expectations and standards and delay gratification when alternative choices compete for attention. It is observed that individual self-regulators are motivationally, meta/cognitively and behaviorally active participants in their

activity (Zimmerman, 2000).As self-regulation helps students to take responsibility in their own learning, it is also expected to assist teachers in their own professional development and many researchers also confirmed the effectiveness of teachers in their task when they apply self-regulation as a strategy. From the personal and individual point of view, teachers need self-regulation to understand themselves as teachers and keep up their motivation. In their profession, they need to cope up with diverse population of students, pursue different tasks, goals and in the ever changing complex scenario. They have to constantly nurture their motivation, sense of purpose, commitment, satisfaction and effectiveness; to understand their students' needs, to stimulate their way of thinking and their creativity, and to cope with the variety of situations they face in the classroom and adjust to the ever more frequent curricular revisions(Delfino, Dettori, & Persico, 2010).As a teacher, should know that there is no 'one size fits all' solution, rather planning properly and enacting, checking, monitoring, reflecting and improving whatever instructional strategy they use at the expense of their students' learning satisfaction is essential. Moreover, characterizing self-regulation in both the teaching and learning process is the behavior of teachers (Michalsky, 2012;Pintrich, 2000; and Randi, 2004).Individuals in self-regulation are not subjected to stimulus control as just like behaviorists; rather they exercise cognitive, emotional, and behavioral power over their surroundings (personal agency). It is their intrinsic motivation that gears the behavior towards accomplishment but not external reward that triggers to achieve their goals. So, self-regulation refers to self-generated thoughts, feelings, and actions that individuals use to help themselves attain personal goals (Zimmerman, 2002).

Similarly, self-regulated teaching strategy use is essential for teachers to be determined by their goal, to see themselves how much they are motivated to conduct the instruction, to identify what is there and what is not and how the incomplete or the missing one is corrected by the

other; how they can learn from their practice, and how they can be consistent in their implementation; and to evaluate their own over all activities. In general, to foster self-assessment, self-reflection, teachers are advised to apply SRI in their science teaching. Moreover, Bembenutty et al. (2018) added that self-regulation is not only serve for teachers but also teachers from their self-regulating activities can be both role models and agents of transformation by demonstrating how they exercise influence over their own behavior, cognition, and environment and to their students. They explained the importance of SRI as "Caring teacher educators who focus on immediate and long-term goals, sustain a high level of self-efficacy, and have strong outcome expectancies and provide students with vicarious learning experiences from good modeling" (P.25). Self-regulators are self-directed and take full responsibility for their task and always search better ways for improvement.

In line with this, many researchers' findings indicate that self-regulators are those who strategically apply cognitive, meta-cognitive, resources, and task-specific strategies as well as set achievable goals, plan, self-monitor, reflect, and adapt their approach and tend to out-perform others (Callan,2014).Teaching with SR support can able to guide them through effective preparation, organization, monitoring and evaluation processes (Young & Ley, 2004). SR might help teachers to increase their self-knowledge and maintain their motivation as well. If teachers want to become effective in teaching, they must show in their learning initially. Likewise, they might benefit from SR as well (Dembo, 2001). Because, teachers may compare their teaching performance with diverse criteria; such as their previous teaching performance, from students' feedback and from different teachers' teaching performance.

However, Zimmerman(2002) explained that "Self-regulation is not an inherent trait or skill: it is a set of self-directed processes that enable students to convert mental abilities into positive

academic outcomes.’’(p.54) and does for teachers. Everyone can exercise and develop the skill for regulating and evaluating his own activities. JAICA & IDCJ(2012) and Gordon, Dembo, and Hocevar(2007)added that self- regulated teachers who practice mastery goals become teachers who believe in the importance of SRL use a mastery goal orientation in their classrooms, believe on accommodative classroom condition, and likewise create an environment conducive to SRL development. Self-awareness, self-monitoring, and self-evaluation are critical to effective SR and performance (McCombs, 1989, as cited in Ley & Young, 2001). The core of teacher SR is that they independently lead and direct the process of improving teaching and/or attaining learning goals especially applying critical thinking, problem solving and inquiry-based science teaching approach

In addition to this, it is a design guideline which has been extracted from a synthesis of research on SR components such as monitoring, self-efficacy, and meta-cognition (Shin, 1998). On the other hand, strategy according to Webster definition, is "a careful plan or method; and when blended with instruction", instructional strategies structure instructional theories, principles and methods for direct application in the learning environment. It provides the instructor with a plan for implementation and are considered more prescriptive, yet flexible enough to accommodate the dynamics of any learning environment. The teaching strategy teachers select and use has its own impact on students’ learning and achievement. For instance, a study conducted in one of the public universities of Turkey to identify factors that affect students’ math’s achievement from freshman to senior students so as to design effective strategy identified that *instructional strategies and methods used by teachers* were part of the problems(Saritas & Akdemir, 2009). Similarly, a study conducted in another Turkey’s university showed that the most important predictor of science achievement is “*teaching the topics in a way that may*

arouse the students' curiosity in the teacher dimension''(Tatar, Tosun, Tüysüz, & İlhan, 2016, p.abstract). This implies that the most important factors for students' achievement are teachers and their instructional effectiveness.

The literature on self-regulated instruction (Zimmerman, 2001, 2002; Zimmerman& Schunk, 2001) tell us that the skill and knowledge gained through such type of instruction should also enable students to develop deep, lasting, independent learning strategies to manage a range of activities; cognitive, affective, and even physical that go far beyond teaching. It requires full attention and concentration, self-awareness and introspection, honest self-assessment, openness to change, genuine self-discipline, and acceptance of responsibility and dedication of the profession for educating their students as indicated in(Nilson & Zimmerman, 2013). According to Moore (2014), as professional learning and ethical practice, teachers should engage in ongoing professional learning and use evidences to continuously evaluate his/her practice, the choice of instructional activities on students, school communities adapt the practice to meet the needs of each learner(Loyens, Magda, & Rikers, 2008, and Oyens et al., 2008). Boekaerts(2011) also explained that the purposes of SR are (a) expanding knowledge and skills (b) preventing threat to the self and loss of resources so that one's well-being is kept within reasonable bound and (c) protecting one's commitments by using activities that re-route attention from the well-being pathway to the mastery pathway. It enables teachers to have professional knowledge (subject matter knowledge, pedagogical knowledge and content knowledge), emotional intelligence, to think about their students' learning and achievement. To mention some, empirical evidence that show the effectiveness of self-regulated teaching, Ghanizadeh(2011)conducted a study with 92 EFL teachers to examine the relationship between teachers' self-regulation and their critical thinking. The finding indicates that components of critical thinking (evaluation of arguments and

interpretations) show the highest correlation with self-regulation. Though the theoretical and experimental findings indicate that teaching with self-regulation or teachers' self-regulation is effective, but practically teachers are not competent enough in their classroom(McKendree & Washurn, 2017) and a qualitative study conducted in Helsinki University to examine the practice of teachers from different discipline in applying self-regulation, and the analysis of 73 teachers' responses show that half of the respondents implement external regulation; whereas half of them did self-regulation(Lindblom-ylänne, Nevgi &Trigwell, 2011); level of teachers' knowledge of self-regulation had no statistically significant effect on the teachers' attitudes and personal beliefs in the classroom(Iriogbe-efionayi,2018) rather they implement external management technique. The difference in the implementation may be associated with different factors (external and internal factors to teachers).

Moreover**,** Arrastia (2014) reviewed and summarized study results made by different Iranian researchers and others on teachers' self-regulation as follows:

> An English version of the TSRS (Teacher self-regulation scale) was validated among EFL teachers in Iran (Moafian & Ostovar, 2012) sample of 707 teachers completed the TSRS and an exploratory factor analysis (EFA) concluded that the items mostly loaded on the hypothesized factors. They proceeded to conduct a confirmatory factor analysis (CFA) with the same sample and confirmed the factor structure established by Capa-Aydin et al. (2009). And Ghanizadeh (2011) found a significant relationship between teacher self-regulation and critical thinking in a sample of 92 Iranian EFL teachers. Toussi and Ghanizadeh(2012) found a significant association between self-regulation and an internal locus of control with self-efficacy having no effect on the relationship. In a similar sample of 76 Iranian EFL teachers, the same research group (Toussi,

Boori,&Ghanizadeh, 2011) found teacher self-regulation, especially intrinsic interest, mastery-goal orientation, and emotional control, to be significantly related to teacher effectiveness as measured by a self-reported questionnaire. But other dimensions of self-regulations were not identified. To sum up, teachers' self-regulation has its own contribution in the preparatory phase to analyze their task, to plan and ask about themselves, to perform and control their instruction, their students' understanding in their performance phase, and to reflect on their performance either to stay on it or to modify by delaying gratification

Therefore, in this study it was planned to assess the predictive effect of some external factors like engagement of teachers in professional learning community practice and the availability of science teaching resources in the school, their teaching efficacy belief as a mediator variable between self-regulation and the aforementioned constructs

2.2Dimensions of SR

In Bembenutty et al. (2018) it is indicated that the most widely used self-regulated learning models in education are those developed by Pintrich(2000,2004); Winne(1995, 1996,1997), Boekaerts,(1991); Zimmerman(2000) and others. Self-regulation especially in Zimmerman's model is a cyclical process because these factors (person, behavior, and environment) are interwoven together in its phases by which one phase affects the other and must be monitored. Such monitoring leads to changes in an individual's strategies, cognitions, affects, and behaviors Schunk(2012). According to Schunk & Zimmerman(1998),several instructional models developed self-regulatory skills in a planned serous/sequence of stages or steps whereas other models provide basic principles for teachers with specific tools to guide their instruction.

However, all of these authors view self-regulation of academic learning as an inherently critical activity involving the three phases; *forethought phase, performance or volitional control and self-reflection/self-reaction phase* process.

Zimmerman's(2000) cyclical model is one of the SR models that can be explained by these three phases by which one phase affects the next phase or one phase can be an input for the other phase. This is because self-regulation is not a one-shot activity that stops after finishing one activity; rather it is a continuous learning for further improvement and a life -long process.

According to Nilson and Zimmerman (2013), when self-regulation is discussed in academic arena, it requires the

> …ability to delay gratification, which a considerable literature finds closely associated with self-efficacy beliefs and reassurances, intrinsic motivation, perceived task value, a 'mastery' or 'learning' (versus performance) goal orientation, help seeking, use of proven cognitive learning strategies (rehearsal, elaboration, organization, and meta-cognition), and control of study-related behavior and environment (p.4).

Self-regulation includes resource utilization and management, (time, material, environment), goal identification and setting, result or outcome expectation and cognitive engagement(Ley & Young 2001). In their document, it is indicated that what activity should come first in self-regulated process as a confirmatory factor analysis on data from 100 college students validated managing distractors as a first-order factor contributing to SR, implying that in self-awareness stage the first thing to do is scanning the environment and the self as to which supports, and which hinders the process is mandatory. This is because as they explained, environmental structuring enables teachers/learners to eliminate or decrease distractions/obstacles that affect

teaching/ and to attend learning, an essential first instructional event. Before teachers/ learners can pay attention, they must have an environment that allows, if not encourages, them to focus attention on the learning task at hand.

Volition according to Corno and Kanfer (1993) explained as part of a broader self-regulatory system that involves motivation as well as volition through which individuals develop personal resources that aid in the allocation of time and mental effort toward tasks. Acting "of one's own volition" involves mobilizing these resources and applying them when needed to direct and control efforts towards goal. It is an act of will (Hinton, 2001) that change, resist, modify or protect if any destructor or challenges come against the strategy implementation.

Effective instruction requires creating and maintaining motivating and engaging environments (Ley & Young, 2001). Teachers need to know their students' discipline, learning style and preferences and mood and emotions as part of their instructional environment so that they can adjust or plan to address each student and to make them beneficiaries from the instruction. The scarcity and availability of teaching resources, the self-efficacy belief to conduct the lesson with appropriate knowledge and skill, the level of motivation should also be considered under the self-awareness stage or at the preparatory stage.

The second step that comes next to scanning the instructional environment and the self-efficacy, motivation, commitment and setting goal is appropriately designing, planning and organizing. During this stage instructors should carefully select and sequence activities and strategies and ask the self and talk with the self about the nature of the task, the nature of the goal and ways to lead to the identified goal, the how to increase motivation and commitment to successfully implement the task, the time and other resources needed to conduct the lesson, additional information and knowledge to fill the gap if any, and the type of strategies that carry

the activity towards the intended goal or objective should be carefully designed and planned(Ley &Young,2001; Nilson&Zimmerman,2013). According to Moore(2014), the planning phase of decision making consists of all those decisions that are made prior to instruction. The writer includes decisions regarding relevant curriculum standards, prerequisite skills and knowledge, goals and objectives, homework assignments, what students already can do, appropriate teaching methods and activities, selection of instructional materials, and assessment of goals and objectives as components that should be taken into consideration.

Self-set goals guide to higher expectancies of goal attainment compared with goals set by others. In relation to other components of self-regulated instructional strategies, self-set goals produce *the highest self-efficacy and greatest skill acquisition*, (Schunk, 2012).

Under the second phase of self-regulated instruction strategy use (‘performance or volition phase), teachers are required to enact the activity or start to operate their lesson according to the plan using the selected strategy to arrive at the intended goal or objective. During this phase, teachers need to monitor and control whether the process is going according to the plan or not. Monitoring is an ongoing executive control of mental process that requires executing the activity of self-regulation; it is continuously checking the appropriateness of the strategies how the objective of the lesson is addressed to the intended learners. Similarly, Nilson and Zimmerman, (2013)explained that monitoring is the mental process that observe and make an adjustment on the journey towards the designed goal and provides feedback that may help to maintain or to modify the future action; Maintaining and writing records and monitoring frequency of the performance was one of the five significantly discriminating self-regulating differences between students (Ley & Young, 1998 as cited in Nilson and Zimmerman,2013).

As Shin(1998) summarized from Zimmerman (2002), the metacognitive component under the performance or volitional phase includes executing, observing and recording, re-organizing, self-monitoring, and self-evaluating at various points during the process of instruction. Whereas the motivational component emphasizes high self-efficacy, self-attributions, and intrinsic task interest to deliver the lesson to classroom students. Finally, the behavioral component refers to recording, selecting, structuring, and creating environments that optimize learning. Doing self - monitoring activities during the performance phase/ lesson delivery/ creates higher self-efficacy, skill, and persistence, than with no monitoring (Schunk, 2012). As Nilson and Zimmerman (2013), to do this, they need to raise questions continuously and check by saying:

> Am I sure I know what I am doing? Does my approach to the task make sense? How well are my strategies working? Am I making good progress towards my goal? What changes in approach or strategies should I make, if any? What material is the most important? What content am I having trouble understanding? How does my teaching related to what I already know? How does it relate to my experience or my future? How is my thinking on the topic changed? (p.8)

Arrangements and sequencing of relevant materials and needed resources for the instruction may facilitate learning and the use of cognitive and meta-cognitive strategies. Under this phase, the feeling or emotion of students, the pace of the instruction, and the inclusiveness of the instruction can be monitored and regulated.

The last phase of self-regulated instruction is the evaluation or self-reflection phase. This stage is the final stage by which the outcome is evaluated against previously set standards or models or goals by the implementers themselves. For example, Weinstein (1994) as indicated in (Ley & Young,2013) stated that Self-regulated learners evaluate their strategies used in their learning

process to have a cognition whether it promoted them for further achievement and understanding to their goals against the standard, identify strategy problems, and know how to correct strategies. It is the stage by which the strength and limitations can be identified and the learning curve can be sustained or modified or interrupted. According to Moore(2014), reflective phase decisions are generally made following instruction. They include reflection and analysis of the time spent on various components of the lesson taught, the success of the lesson, and the behaviors that occurred during instruction, the perception of students on the lesson and the level of satisfaction (affective/defensive reaction).

Table 1

Summarized Zimmerman's (2000) Model of SR Phases and Components

Phases	Description of phases	Sample questions
Forethought phase -self awareness -task analysis -assessing the environment --goal determining and setting -Strategy planning -strategy selection -Self-motivation beliefs -Self-efficacy -Outcome expectations -Intrinsic interest/value -Goal orientation	Task analysis, to include goal setting and strategic planning -Self-motivation beliefs, to include self-efficacy beliefs about one's learning, expectations about the personal consequences of instruction, intrinsic interest in the task (perceived value), and goal orientation (a learning orientation being better than a performance orientation	Am I confident enough to conduct the lesson? Is the environment conducive and supportive? Do I have the motivation and commitment?-What is my destination in providing the lesson? What strategy works best? How do I organize the resources? What do I expect from the lesson? What if the learning outcome does not coincide? What type of students do I have? Will the strategy fit to my instruction?
Performance/Volitional Control -self-controlling -monitoring -Self- instruction Self-observation Self-recording	Self-control, to include use of imagery, self-instruction, attention focusing, and application of task strategies -: Self-observation, to include self-recording and self-experimenting (testing alternatives to see what	Does the process as per the plan? -Do the strategies functional? What needs to be added? What about the performance? What do I learn from this? Do I need support?What do I learn from the process?Does it activate the students?How can I resist or defend the obstacle emerged

Self-experimentation	works best	
Self-Reflection phase -outcome evaluation -self-judgment -self-evaluation against the standard or model Self-reaction -Causal attribution -Self-satisfaction/affect Adaptive-defensive	Self-judgment, to include self-evaluation of one's apparent performance against some standard (one's prior performance, another person's performance, or some absolute standard) and one's causal attribution of results (beliefs about locus of control) :- Self-reaction, to include the degree of self-satisfaction, which enhances or undermines further motivation, and adaptive/ defensive adjustments, which lead either to more effective learning strategies next time or to self-image protection,	"How well did I achieve my goal? How well did I master what I set out to teach? How well did I avoid sources of interference and stay on task? What approach or strategy worked well? What didn't work? What do I need to do differently when taking on a similar task? What were the most important points I learned? What am I still having trouble? What do I need to review? What questions do I have that should be answered by an expert? How does what I taught relate to other subjects? How has my thinking on the topic changed?" How much students are satisfied? Did the strategy address all types of learner? What do I learn from the assessment result?

Source ;(Nilson& Zimmerman, 2013)-Expression of the three phases with their sub-components, description, and sample questions

Hence, many study results identified that it has a relationship with teaching effectiveness where it is properly applied in teachers' classroom**.** Moreover, manystudy's results show that, the application of SR in the teaching-learning process increased the effectiveness of their instruction and students' achievement. For example, the findings of Toussi, Boori, and Ghanizadeh (2011) study indicated that there is a significant relationship between EFL teachers' self-regulation and their teaching effectiveness. Partovi and Tafazoli (2016) identified that teacher's self- regulation is a significant indicator of teacher's effectiveness. Toussi,et al. (2011), Gol and Royaei (2013) also highlighted that teachers' use of self-regulatory behaviors would positively influence teacher

practices and performance. On the other hand, researchers and science educators contend that teachers who are unable to implement SRS (self-regulated strategy) in their own learning not only lose their effectiveness but also difficult to see on their students Michalsky (2012). But, van Eekelen, Boshuizn ,and Vermunt (2005) identified different results that show teachers' learning in their teaching is not self-regulated, not planed, reflective and spiral.

2.3 Factors Affecting the Implementations of Teaching with self-regulation

The teaching-learning process in the school can be affected by different factors. Some of the potential factors that are prominent to teachers' activity are school-climate (school related factors), teachers' related factors (internal to the teacher), and curriculum related factors assumed to affect teachers in using self-regulated instructional strategies. These factors strongly affect teachers' classroom instructional activities. Teachers who are satisfied with their jobs usually have a high degree of professional capabilities and feel that they could manage, organize and perform specific tasks and behavior, even in case of failure (Gkolia, Belias, & Koustelios, 2014). Research strengthens the case that "self-regulated teaching is interwoven with a constellation of behavioral practices, values, beliefs, and personal traits, some of which fall under the umbrella of personal character." (Nilson & Zimmerman, 2013, p.4). A study result conducted on 'The role of teachers' self-regulatory capacities in the implementation of self-regulated learning practices, shows that teachers' own self-regulatory competences as a critical determinant of SRL implementation in primary school (Peeters, Backer, Reina, Kindekens, Buffel, & Lombaerts, 2014). Based on this, the following review explains some of the internal and external factors that affect teachers to implement self-regulated instructional strategy use in their classroom.

2.3.1 School Climate as Affecting Factors for the Implementation of Teachers' Self-regulated Teaching

Study concerned with school environment or school climate begins since 1950s (Malinen & Savolainen, 2016). Its recent definition given by Mitchell, Bradshaw, Leaf (2010) is shared beliefs, values and attitudes that can shape the interaction between the school communities' teachers, students and administrators (cited in Malinen&Savolainen,2016). It refers to the Psycho-social context in which teachers are working. According to National School Climate council(NSCC,2007), school climate is defined as patterns of students, parents' and school personnel's experience of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices and organizational structures. It includes expectations that support people feeling socially, emotionally, and physically safe; People are involved and respected.; Students, families and educators work together to develop, live, and contribute to a shared school vision; Educators model and nurture attitudes that emphasize the benefits and satisfaction gained from learning(http://www.schoolclimate.org/climate/).A comprehensive assessment of school climate includes main components of school life such as safety, relationships, teaching and learning, and the environment as well as larger organizational patterns.

In fact, identifying factors related to the school environment has become a research focus among educational practitioners. Another study conducted to investigate the effect of perceived school climate and teacher efficacy in behavior management, on job satisfaction and burn out shows that perceived school climate results a positive effect on teachers' job satisfaction(Malinen & Savolainen, 2016). School policy for teaching and for creating learning environment mainly refer to actions taken by the school to help teachers and other stakeholders

have a clear understanding of what is expected from them (Kyriakides, Creemers, Antoniou, & Demetrioua, 2010).Azevedo and Aleven (2013) in their International Handbook of Metacognition and Learning Technologies recommended providing the opportunity for the development of effective regulatory skills, teaching environments need to be careful not to deprive teachers of the opportunity to engage in self-regulation or monitoring of their own understanding because school context is an influential factor for the classroom instruction. Jonassen(1992, as cited in Tessmer & Richey, 1997) also noted that, *context is everything* to instructional design. A context which is materially rich and socially positive and collaborative school enhances teachers to use different innovative instructional strategies in their teaching. The researchers recommended that learning environments or micro worlds can be designed to facilitate the acquisition of problem solving or self-regulation skills. The current teaching practice that is taken as a teaching culture and their belief also determines the implementation of new strategies. Teachers will not accept an innovative instruction if it conflicts with their preexisting beliefs and conceptions of teaching and learning (Lau, 2013); not all teachers are willing to abandon familiar practices (pressely et al., 1992 cited in Lau). So, teachers should always ask questions like, how, what, and when, where and then like to employ appropriate learning, motivational and volitional teaching strategies.

The qualitative study conducted by Smith, Connoly, and Pryseski (2014) showed that in some of school climate dimensions, there is a positive climate but the personal contact that is very important to school climate, as well as instruction, is necessary to give a room where children feel comfortable taking risks, exposing vulnerability, and building their sense of self were found as a challenge; connection among teachers was also a barrier to professional relationships. Another barrier was the incompatible between individual values, expectations, and

standards related to teaching and professionalism; and lack of vertical planning was seen as reducing the quality of academic programs, lack of collaboration and a shared vision led to uneven expectations of students.

Hence, though school climate encompasses many variables that can contribute for the success of teachers in their teaching strategy use, this study will focus only on some of the elements of the dimensions of the school climate that is believed to be an influencing factor for the effective implementation of self-regulated instructional strategies in science teaching for simplicity by categorizing in to school related, and teacher related factors.

From School related factors, like teaching resource availability and professional learning community are the variables assumed to have an impact on teachers' self-efficacy belief to implement new instructional strategy and planned to be investigated. And from Teacher related factors (teacher personal factors) the teacher internal characteristics like self-efficacy belief of implementing SRI are explained below.

2.3.1AThe Influence of Science Teaching Resource Materials Availability on Teachers' Teaching Self-efficacy Belief to Implement Self-regulated Teaching

The quality of science teaching and learning experience depends on the extent of the adequacy of laboratory facilities in secondary schools and the teacher's effectiveness in the use of laboratory facilities with the aim of facilitating and providing meaningful learning experiences in the learners (Pareek, 2019).The researcher noted that "I would argue that any course in science does not show its excellence until it is related to practical work'' (P.76). Similarly, it is explained that science teaching at the present time seems not appear to promote the development of 21st scientific literacy. Teaching science is enabling students to discover, investigate, prove or disprove theoretical thoughts, solve problems, create new ideas based on their environment, and

the school rather than teaching for rote memorizing. In addition to this, Flick and Lederman (2006) identified abilities that enable students to conduct scientific inquiry through scientific investigation can design and conduct a scientific investigation, use appropriate tools and techniques to gather, analyze, and interpret data; develop descriptions, explanations, predictions, and models using evidence; think critically and logically to make the relationships between evidence and explanation; recognize and analyze alternative explanations and predictions and communicate scientific procedure and explanations. Ajileye (2006) cited in Lekhu (2013) contend that insufficient resources for the teaching and learning of science constitute a major cause of student underachievement. Teachers in resource-poor settings may feel that the context constrains their use of instructional strategies. For example, as to my experience as a science teacher and student, majority of secondary schools do not show the practical activities to confirm or disconfirm the theoretical justification written in their text book; this is due to inaccessibility of resource materials, infrastructure, lack of skill and knowledge. This is due to these, that students developed negative phobia to science subjects which is confirmed by their low achievements in grade 10&12 national exam (according to the national learning assessment result of 2000-2010) in Ethiopia.

So, many studies show that teaching science (Chemistry, Biology and Physics) need to be supported with laboratory chemicals, equipment, classrooms, water, electricity source, trained lab assistant, local materials, technologies and text books and reference materials to create self-confidence both on the teacher and student side. A study conducted by Achimugu (2016) to investigate factors affecting effective implementation of the senior secondary education chemistry curriculum in Kogi State, Nigeria shows that poor motivation of teachers, insufficient funding, lack of adequate time to cover the curriculum, inadequate laboratory and voluminous

nature of chemistry curriculum were among the factors for poor implementation of the curriculum. Similarly, Habtamu (2017); Oli (2014);Ashebir and Bereket (2016) conducted a survey research in North Gondar, in Oromia, Amhara and South Nation and Nationalities of Ethiopia secondary schools respectively to assess quality of science education; and their independent study results show that insufficient teaching and learning resources, lack of well-equipped laboratories, [poor] students' attitude towards science, non-conducive classroom environment, insufficient time for teaching science and large class sizes, lack of commitment and interest of teachers, as factors affecting teaching science subjects. This reason works for the finding of the National Learning Assessment report (World bank,2013) conducted for grade 10 and 12 Biology, Chemistry and Physics from 2000-2010 E.C show (Bio,40.3&55.5; Chem,36.1&49.1; Phy,31.2&36.6) respectively which is almost all below average (50%).Limited equipment, access to a suitable science teaching space, lack of support staff to assist with organized and storing materials, an inadequate science budget, poor access to laboratories, and inadequate equipment are the common limiting factors indicted by teachers (Rennie, Goodrum, & Hackling, 2001). Similarly, a study conducted by Aktam and Acar (2010) in Turkey shows that "Laboratory practices in science teaching" impacts on the development of self-regulation skills during elementary science teaching. To show the importance of science teaching resources, the findings of the study conducted by Martin (2017) in Cameroon secondary schools shows that there is a significant relationship between the availability of resources and the efficiency of the school system. On the other hand, Englehart's (2008 as cited in Deehan, 2017) deep case study approach suggests that inquiry-based curriculum; supportive materials can improve the science teaching efficacy of teachers. Similarly, Sunger (2007 as cited in Deehan, 2017) showed that both elementary teachers and secondary science teachers expressed moderately high STEBs

(science teaching efficacy beliefs). In line with this, study conducted by Lekhu (2013) in the secondary schools of the Free State province of the Republic of South Africa showed high positive science teaching efficacy belief in both Physics and Chemistry subjects. But to the opposite of these, a review conducted by Deehan(2017) on science teaching efficacy belief instrument, used by Tosun (2000) a series of semi-structured interview questions found that 44 pre-service elementary teachers had overwhelmingly negative science teaching efficacy. This indicates that if schools are deprived of teaching resources, teachers will not be motivated to teach their students and may lose their confidence to conduct a lesson with innovative instructional strategy. Actually, professionally committed and dedicated teachers can be seen creating models for their teaching and are effective.

However, Lack of laboratory facility, class size, voluminous curriculum content, poor preparation of science textbooks, inadequate equipment/materials for science teaching, use of inappropriate teaching methods, lack of in-service training, lack of practical activity are contributing factors for the inefficient implementation of science teaching (Uzoechi, 2006; Ugwu ,2008; Ayodele, 2009;Ejidike and Oyelana, 2015 cited in Achimugu,2016) .Blackwood (1961) also investigated that the failure of schools to provide resources prevents science teachers from attaining their professional status they deserve. Science laboratories need trained lab assistant to prepare lab activities before classrooms. Similarly Andersen, Dragsted, Evans., and Sørensen, (2004) found that positive changes in self-efficacy seemed positively related to the occurrence of environmental factors helpful to teaching. But, on the other hand, though the readymade teaching resources are vital, teachers are expected to scan the surrounding and select local materials and use as a teaching material and need not be determined by the manufactured materials only. Black wood (1961) for instance identified that the resources for teaching science are those that

children use in gaining and refining knowledge about the world and said “No particular material, equipment, person, or place is a science resource.” (p.2). Innovative teaching materials that are designed in collaboration with teachers will enhance a mutual process of conceptualization teaching scientific inquiry(Van Rens, Pilot, & Van Der Schee, 2010). In line with this, more supportive verbal persuasion, better laboratory equipment and facilities and a culture of motivation and rewarded effort increase teachers’ efficacy. In addition to this an exploratory study conducted by Corrigan and Taylor (2004) indicted that the self-regulatory environment increases their understanding of activity-based teaching-learning and their teaching confidence. If the school environment is full of sufficient and important teaching resources, science teaching efficacy of teachers, their use of innovative teaching strategy in turn undoubtedly can be increased. All the living and non-living matters of the world where schools are found are the resources for science teaching and learning. The environmental resources are the world where students live in and are the source of concepts of science derived from it. However, according to the researcher, there should be availability of standard measurement instruments and testers for testing and experimenting of the environmental resources. Moreover, availing of important resource for science teaching is improving the creative imagination of the child (Blackwood, 1961).

A study conducted in Caribbean schools by King (1994) showed that out of the reasons for the lack of use of the environment, and the failure to link classroom with real life situation is the existence of inadequately trained and under-qualified teachers as a persistent problem in Caribbean schools and in addition to this, inadequate time, lack of other resources, and insufficient competency are the other factors. Another problem is complete absence of current aspects of technology in science teaching that faces a major challenge in learning how to cope

with the 21st century and its increasing demand of use of technology. The study's findings in most participating schools revealed that there were no separate science laboratories. It was also found that many teachers faced difficulties when conducting science activities due to the large number of students in each class as well as inadequate equipment and materials. Pareek (2019) for example conducted a survey study in India about the availability and facility of science laboratories for teaching science and the findings show that there are no science laboratory practical activities, and these activities did not contribute directly to the measurement of students' academic performance in science. Even though, scanning the surrounding environment and identifying resources for teaching is the role of competent and strategic teachers, the absence of chemicals, equipment and, textbooks and other resources may discourage teachers by decreasing their efficacy to apply self-regulatory instructional strategy in their teaching.

2.3.1 B Teachers' Professional Learning Community practice as Affecting Factors to Teach with Self-regulation

The implementation of SRL promotion cannot be seen as a 'stand-alone topic' that stays within the four corners of a particular classroom rather it should be integrated to the entire school system (Peeters, De Backer et al., 2014). Schools need to deliberately create an environment and structure in which teachers are encouraged to reflect on and take responsibility for their learning and teaching. Teachers in the school system can share, learn and develop their profession from their staff members. According to (Seferoglu, 2004), a good teacher continuously develops his or her career that demands the profession by exploring and evaluating opportunities and possibilities for self-improvement. Well-designed and implemented professional development activities have the potential to positively impact teachers' beliefs about teaching science. SRL

development is supported by collaborative reflection, and dialogue with peers facilitates co-construction of knowledge, revision of conceptual frameworks, the articulation of tacit knowledge, and learning and teaching strategies.

Though it needs the willingness and interest of all staff to participate and share their experiences, school principals are an important figure that can play a great role in facilitating and arranging conducive environment for teachers' professional development. Involving in reflective dialogue is an important characteristic of professional learning communities (PLC's), which refers to the communication and discussions among teachers about important educational issues (De Smul, Heirweg, Devos& Van Keer,2018).

Many researchers give definition for learning communities whenever there is collaboration, cooperation, sharing experience and knowledge among staff members. For example,
Blitz and Schulman (2016) defined PLC as teams of educators (most commonly teachers) who meet regularly (often but not always during scheduled school time) to develop lesson plans, examine student work, monitor student progress, assess the effectiveness of instruction, and identify their professional learning needs. On the same manner Olivier& Hipp(2010) explain learning community as "professional educators working collectively and purposefully to create and sustain a culture of learning for all students and adults" (p. 12); similarly, Sackney and Mitchell(2001) explain a learning community as a community in which teachers reflect and learn collaboratively so that they may respond to the "mysteries, problems, and perplexities of teaching and learning" (p.5); and for continuous improvement by building staff capacity for learning and change (Hord, 1997). Indeed, for teachers, learning to be self-regulated is an essential from both individual and social points of view (Moafian & Ostovar, 2012). Research made by Peters and Sleegers (1996as cited in Lau, 2013) showed that school leaders are usually,

highly engaged with the organizational functioning of the school but do not give attention to develop and disseminate a vision of educational and conceptual support; collaborative knowledge, professional training, enable teachers to share their experience to solve their problems and it is found effective for professional development and change of their cognitions.(Louis, Kruse& Bryk, 2007)identified professional learning community as (1) reflective dialogue, (2) focus on student learning, (3) interaction among teacher colleagues, (4) collaboration, and (5) shared values and norms. Such activities increase teachers' teaching efficacy to apply self-regulated teaching strategy.

The ministry of education in Ethiopia designed different modalities to improve teachers' teaching quality; for example, continuous professional development (CPD), higher diploma program (HDP). The continuous professional developments was an in-school program by which teachers share and learn with each other how to improve their teaching skill and students' learning especially a senior and experienced teacher as mentor. But the program was not effective and teachers were not intrinsically motivated and was not long lasting as to my experience, In addition to this, Fekede (2015) in his case study identified that there is a problem of implementation and lack of leadership skills to design, coordinate and evaluate the program.

Another study was conducted by Arslan (2017) to investigate the predictability of self-efficacy to collective efficacy in preschool teachers of Turkey. The correlation and regression analysis showed that self-efficacy has a positive correlation with collective efficacy and 50% of its variance is contributed by self-efficacy. It can be considered that teachers with high level of professional perceptions are also successful in collective self-efficacy levels. Teachers with a low perception of their profession may avoid working with others; they may also think that they

are inadequate or unsuccessful. Organization's innovative climate has positive impacts on teaching behaviors Chou, Shen, Hsiao, and Shen (2019, cited inChing Mok & Moore, 2019).

Teachers and staff collaborate to remove barriers to student learning and communicate regularly with each other about effective teaching and learning strategies. They have regularly scheduled time to learn from one another (National Education Association, 2003 cited in Hale, Dunn, Filby, Rice,& Van Houten, 2017).

According to Little (1990), professional learning community provides an opportunity for teachers to share ideas about standard-based instruction and assessment. When become collaborate to share knowledge and experience and discuss how to teach a certain content effectively, they are searching for a common understanding of what effective teaching looks like for all children in their school community. The collegial decisions they make are more likely than traditional approaches to offer teachers and staff, the opportunity to learn because their collective focus is always on the outcomes of instruction.

Teachers' perceptions about their professions and collective self-efficacy levels can also be affected by Work environments. An individual may be reluctant to work with other individuals in an environment where his/her professional knowledge is not recognized, is not supported or appreciated, and his opinions and recommendations are not taken into account. In the school environment, it causes feelings of discouragement, insensitivity and insecurity to develop (Goddard &Woolfolk-Hoy, 2000 as cited in Arslan, 2017); there will be lower self-efficacy judgments of the teacher him/herself to practice innovative instructional strategies.

Hence, the school principals play a major role in motivating the feelings among employees which in turn affect teacher's motivation. Factors such as participation in the school

administration, sharing of authority and responsibilities, competition, appreciation and reward, quality of work environment, educational opportunities and career development play a role in the motivation of teachers(Börü, 2018). The communication skills of the school principals are also important in terms of teacher motivation. Teachers' communication is not only important for school administrators but also important for colleagues' motivation in schools. In short, intra-school relations are important for the morale of teachers(Börü, 2018). The organizations which have collaborative dialog, sharing experience and caring and effective teamwork are less likely to leave the school because everyone acts towards the same goal. Moreover, in an effective teamwork, difficult tasks such as leadership are carried out alternatively.

Similarly, a survey study result conducted by Cockpim and Somprach (2019) shows that learning leadership was correlatively explained 95.50 percent which is a tip to the variance of teacher professional development and learning leadership factors namely creativity and team learning were significantly affecting teachers' teaching behavior. In the same manner, administrative support from and a positive collaborative culture with in schools or supportive working environment encourages teachers with new instructional approach (Inos&Quigley,1995; Gerten&Dimino,2001; Pressley&El-Dinary,1997; Richardso&Placier,2001, as indicated in Lau,2013). The researcher also explored the role of teachers and principals as learners and the importance of cooperative and collegial relationships as important aspects of professional community.

According to the study of Thoonen et al. (2011, as cited in Börü, 2018), the school level of security, trustworthiness, incentive, and the level of cooperation and collaboration among staff motivates teachers to improve their teaching activities. Collaboration in the school provides teachers with the opportunity to solve problems together, gaining feedback and information.

Moreover, teachers can develop the habit of using new materials in class, experimenting new things, which reflects current teaching and comprehensiveness of any given class. Collaboration in school provides support to teachers and triggers professional cultures and increases teachers' confidence where there is ambiguity. Tschannen-moran and Mcmaster (2009) identified that professional development format that supported mastery experiences through follow-up coaching had the strongest effect on self-efficacy beliefs for reading instruction as well as for implementation of the new strategy. Whereas Nolan(2009) identified a negative correlation between school professional learning community practice and teachers' efficacy which is an un usual. And Swigert (2012) examined the difference in self-efficacy of teachers who participated in PLC and those who did not to enhance use of innovative instructional strategies. The result of the study reveals that there is no difference among those groups.

Transformative school leadership also influences teacher's motivation, and encourages them to get involved in professional learning activities. Generally, the qualitative study finding conducted by Börü (2018) showed that educational policy, students' motivation to learn, school principal's cooperation and communication, colleague's cooperation are external factors of teacher's motivation to teach effectively. In addition to this, Somprach, Tang,and Popoonsak, (2017) explored the role of essential leadership styles of school principals in encouraging teachers' participation in professional learning community in basic education in Northeastern of Thailand. And their findings indicated that learning, transformational, collaborative, and invitational leadership styles are the four significant predictors for promoting teachers' participation in professional learning community as indicated in (Cockpim & Somprach, 2019).However, there are inconsistent research findings on the relationship between PLC practice and teachers' self-efficacy. So, in this study it is intended to investigate the influence of

professional learning community in schools on the teaching self-efficacy belief of teachers in implementing SRIS. Besides this, Jayawardena et al.(2018) recommended to investigate the effects of professional development on secondary school teachers' practices related to SRI in science with a large sample size. So, under this study the professional learning community practice of teachers in the study area will be examined with respect to the five dimensions of Hords'(1997) professional learning community indicators. The five dimensions are; supportive and shared leadership; collective creativity; shared values and vision; shared personal practices; and supportive conditions for sustaining the learning community. Hord's model places emphasis on reflective dialogue as a vehicle for collective learning. Supportive conditions enable collective learning and shared practice.

According to Hord (1997), the staff should work on the same school goal (for the betterment of students' learning and achievement) and there must be supportive, participatory, and encouraging leadership and school policies and guidelines that trigger the staff towards their common goals. In such a model, school leader along with teachers should question, investigate, and seek solutions for school improvement. All staff grow professionally and learn to work together to reach shared goals. There must be continuous and periodic system that all staff come together and share, learn experiences so as to improve their instructional effectiveness. Professional learning communities engage school staff at all levels in processes that collectively seek new knowledge and ways of applying that knowledge to their work. So, these supportive conditions, sharing and learning environment, working for the same goal and supportive leadership conditions are assumed to increase the efficacy of teachers to apply self-regulatory teaching approach. However, the above studies do not examine the relationship between the three variables at a time(PLC, TSEB and SRT); hence, the aim of this study was to check the

inconsistent results shown by other studies in Ethiopian school science teachers and their teaching efficacy belief affected by PLC and how much it predicts the teaching efficacy of teachers to apply self-regulated teaching.

2.3.2 Teacher Personal Factors Affecting the Implementation of Teaching with Self-regulation

Many research results identified that teachers' own personal characteristics are the main influential factors of effective teaching Moore (2014). This is due to that characteristics which are internal and controllable are the most important determinant factors that can enhance or diminish their effectiveness in their instruction. Accordingly, teachers need to be efficacious, creative, motivated and knowledgeable to set the teaching goals, to plan their actions and to organize instruction and teaching material, to monitor students' understanding, to identify and resolve misconceptions and also, they have to monitor their instructional activities and efforts (Chatzistamatiou et al., 2014).

2.3.2A Science Teachers' Self-efficacy Belief and Self-regulatory Instruction use

Research showed that motivational and affective factors, such as teachers' self-efficacy beliefs, the value they attribute to a domain, the feelings of enjoyment when dealing with a task and the emotional commitment to a job, can be predictors of the person's strategic behavior towards teaching-learning (Chatzistamatiou et al., 2014). Self- efficacy beliefs are linked both to persistence of goal structures and to the dynamism of goal processes and achievement. Moreover, self-regulation holds the self-efficacy strategies in that it plays a crucial role in the exercise of personal agency by influencing the thought, affect, motivation, and action(Bandura, 1997).

It seems clear that much of SRL is synonymous with enhancing student teacher self-efficacy and positive attitudinal change and as such is a viable means of developing student teachers' confidence in their ability to teach primary science and technology. Tillema and Kremer-Hayon's(2002 as cited in Corrigan and Taylor, 2004) claim that SRL might serve as a spring board for increasing teacher confidence. Inquiry teaching promotes self-regulation in two ways. One is to stimulate students' active engagement in the learning process by using cognitive learning strategies and the other is meta-cognitive strategies used to monitor their understanding.

Bandura(1997) defines self-efficacy as the beliefs that determine how people feel, think, motivate themselves and behave accordingly, and is also related to beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Similarly, Bandura(1977) and Tschannen-Moran, Hoy, and Hoy(1998) indicated that teacher self-efficacy refers to the belief of one's abilities to bring about valued outcomes of engagement. And in line with this, Tschannen-Moran, Hoy, and Hoy (1998, as cited in Arrastia ,2015) "teacher efficacy is the teacher's belief in his or her capability to organize and execute course of action required to successfully accomplish a specific teaching task in a particular context" (p. 233). Similarly, Dellinger, Bobbett, Olivier, and Ellett (2008)explained that "teacher self-efficacy beliefs can be defined as a teacher's individual beliefs in his/her capabilities to perform specific teaching tasks at a specified level of quality in a specified situation" (p.753). They added that it is a better predictor of behavior or actions. To strengthen this, Chan (2007) also added that a high degree of self-efficacy is necessary to engage in self-control of behaviors, actions, and thoughts or self-regulated learning. Bandura (1997) indicated that teacher self-efficacy includes their efficacy in applying effective instructional strategy, maintaining classroom discipline that establish conducive learning environment (classroom management),

and their efficacy on subject matter knowledge. According to Tschannen-Moran and Hoy(2001), teachers' self-efficacy beliefs affects teachers' attitudes towards helping their students, their level of satisfaction, and their desire to motivate students. The self-efficacy belief especially teaching efficacy of teachers is the internal feeling that they have the capacity to deliver their lesson effectively with enduring power and motive. This can be due to that when teachers feel that they have enough subject matter knowledge, content knowledge, pedagogical skill, and capacity to address the needs of all learners, supportive and conducive environment. Social cognitive theory explains that, self-regulators develop their own capability to regulate their activity(instruction), situations and extend their beliefs in their competencies by accumulating successful experiences to perform the given tasks by interacting with other people in their environment (Shin, 1998). It is believed that Self-efficacy affects an individual choice, effort to invest and persist on the task. And it is considered as the basic and essential component of SR. Self-efficacy is known as a context-specific construct that cannot be generalized to all contexts (Bandura, 1997). This implies that the teacher efficacy can be different for different subjects, place or even contents. Therefore, self-efficacy judgment and its generality are inevitably bound by task-related variables as well as by personal and contextual factors. It affects the process of goal setting, planning and regulation of strategy use.

Therefore, teacher efficacy has been found to be one of the important variables consistently related to positive teaching behavior and student outcomes (Arigbabu & Oludipe, 2010). In addition to being a model for the students, the teacher plays an important role in preparing the necessary tools and materials, in organizing the environment, transferring knowledge and following up the results and outcomes(Arslan, 2017).When seen in relation to the external factors, its contribution in affecting teachers' use of new instructional strategies can take a major

role. For example, a study conducted by Lombaert et al. (2009) indicated that teacher capabilities, educational experiences, and beliefs were found to have a stronger influence than external contextual factors on teachers' recognitions of SR instruction. In addition to this instructional environment, professional knowledge and pedagogical skills and own self-efficacy beliefs are essential for SR instruction implementations. Teachers' beliefs and current instructional practices are also important determinants of their willingness to change. But not all teachers are observed willing to abandon the use of their usual practice; whereas those who were volunteer eventually integrate new instructional teaching strategies(Pressley et al., 1992).Another study conducted by Al-Awidi and Alghazo (2012) to examine the effect of teaching experience on pre-service science teachers efficacy to integrate technology in their instruction shows that mastery experience and vicarious experiences as the most influential sources of teachers' self-efficacy. Support from colleague teachers and administrators are also an important determinant source of teaching self-efficacy

Teachers' efficacy becomes an important construct in teacher education. According to Bandura (1997), self-efficacy beliefs motivate people toward specific actions in all aspects of their lives, and therefore have predictive value. The two dimensions of self-efficacy: personal self-efficacy and outcome expectancy are very important towards the implementation of a task. Researchers claimed that teachers with positive self-efficacy beliefs regarding their teaching abilities are more likely to use strategies for achieving their own objectives and for supporting their students' learning or instruction (Chatzistamatiou et al., 2014).They added that in the school context, where the teaching- learning process occurs, teachers' self-efficacy is teachers' belief in their ability to organize and execute the courses of action required to successfully accomplish a teaching task in a particular context. Similarly, high self-efficacy is also linked to other positive

teacher behaviors, such as wanting children to be autonomous learners, and selecting instructional strategies.

In the investigation of general, collective and domain-specific teacher self-efficacy among Chines teachers showed that classroom characteristics also affect teachers' persistence and resilience of their capacity (Chan, 2007). Those with high levels of efficacy tend to do their own performance monitoring and assessment in order to improve, rather than relying only on external supervisory practices. Moreover, high levels of self-efficacy was found to influence abilities to regulate and assess responses and handle volatile situations, and to adjust to a new organizational environment (Chan, 2007; Chatzistamatiou, et al.,2014). Chan also added that teachers with high self-efficacy are highly motivated, enthusiastic, more committed and more likely stayed in their teaching, and keener to adapt and experiment new instructional strategies to meet the needs of students. In Bandura's (1997) study, the result indicated that teachers were more confident in teaching students and counseling and in guiding but less confident in classroom management and making students to be engaged. Teachers' professional efficacy as being the primary motivator in their work; therefore, it is believed that teachers' self-efficacy contributes positively to teachers' change in level of motivation.

The findings of the study conducted by Mohamadi and Asadzadeh (2012) on testing the mediating role of teachers' self-efficacy beliefs in the relationship between sources of efficacy information and student's achievement showed that teachers' self-efficacy had a meditational role between sources of teachers' self-efficacy and student's achievement. Moreover it is indicated that teacher self-efficacy is a stronger predictor of instructional quality(Künsting, Neuber, & Lipowsky, 2016)

However, according to Bandura (1997), teachers' sense of efficacy is affected by the positive or negative experiences individuals have. Implying that if teachers have good previous performance of their teaching task, they will have a high efficacy belief of their future performance on the same task and the reverse is true. Bandura's research (1997) indicated that the perception on the concept of self-efficacy can be measured by a significant number of sources, like mastery experiences(teachers' subject matter and pedagogical content knowledge and their previous successful experience increase their self-efficacy to implement new instructional strategy), vicarious experiences(observing how others are doing the same task successfully and how much they are acknowledged), social persuasion (pears, leaders & other staff's support and encouragement and recognition) and physiological and emotional states(the belief they have, the intrinsic motivation and how much they manage their anxiety whenever they get failure). In addition to this, regarding the importance of the level of the source of self-efficacy, Tschannen-Moran and Mcmaster (2009) also highlighted that "it was predicted that as the richness of the sources of self-efficacy increased, there would be an increase in teacher self-efficacy and that the level of implementation of the new reading strategy would consequently increase.''(p.233). However, knowledge and skill of subject matter and instructional strategy have been identified as significant source of teachers' instructional self-efficacy variables. The amount of professional development undertaken by teachers is also significantly related to teachers reported self-efficacy.

In line with this, a study conducted by Heaton (2013) showed that teacher self-efficacy and shared and supportive leadership within a school appear to be closely linked. In addition to this, the finding indicates that a significant relationship exists between the leadership approach of the administration and the teacher self-efficacy of the educators on staff. Similarly, Hoerr (1996 as

cited in Heaton, 2013), shared and supportive leadership in the school, provide an opportunity for teachers and lead to enhance their performance and seen as "all playing on the same team and working toward the same goal: a better school" (p.68). The researcher added that the learning community as focused on their professional learning outcomes had higher levels of teacher self-efficacy than participants who viewed the purpose as a means of sharing or socializing.

Teachers' self-efficacy is an important dimension that impact on students learning and achievement. But fundamental gaps in science content knowledge serve as barriers to the development of science teaching efficacy in pre-service teachers. Serin and Bayraktar (2014) studied the relationship between pre-service teachers' beliefs about locus of control and their science teaching efficacy beliefs; the result showed that participants with internal locus of control beliefs had higher science teaching efficacy than their counterparts with external locus of control beliefs(Deehan 2017).This efficacy belief enable teachers to exert their maximum effort for further knowledge and skill to increase their effectiveness and students' learning satisfaction In line with this, as indicated in (Chatzistamatiou et al., 2014), teachers with higher levels of self-efficacy beliefs are more likely to learn and use new approaches and strategies for teaching, set attainable goals, use management techniques that enhance student autonomy and persist in face of student failure. This is due to that teachers' beliefs, attitudes and positive affect towards teaching directly influence their instructional behaviors and teaching effectiveness and they impact on how well teachers take on any new initiative. So, teachers lacking the beliefs to activate students' SRL might be a barrier to actual SRL implementation (Peeters et al., 2014).

Similarly, Chatzistamatiou et al., (2014) in their study of self-regulatory teaching in mathematics, the path analysis result indicated that teachers' motivational beliefs, affect and professional commitment directly predicted their use of self-regulatory instructional strategies. In

line with this, a quantitative study self-report result conducted by De Smul, Heirweg, Devos and Van Keer (2018) and Bembenutty and Chen (2005 as indicated in Bembenutty et al., 2018) showed that teachers' personal factors (belief and self-efficacy) have showed a strong relationship with teachers' effectiveness and self-efficacy to implement SRS and found additional support for these associations between teachers' beliefs and self-regulatory skills. Hence, if teachers are internally motivated, have subject matter knowledge, and have positive value and attitude to the teaching profession, they can exert their maximum effort to apply different instructional strategies to improve their students' learning and achievement.

Generally, internal and controllable attributions positively predict teachers' self-regulatory skills (Ghonsooly & Ghanizadeh,2011).If teachers believe that their failure or success is due to their own, it is clear that they can strive to amend and satisfy their intention to wards their goal. However, surprisingly, even teachers who have been provided with effective professional development experiences have not transformed their beliefs to reflect a more standard-based, constructivist instructional focus towards science teaching (Johnson, 2009; Lumpe, Haney, & Czerniak, 2000).Anyways, teachers should be more knowledgeable about the content of the subject, equipped with pedagogical content knowledge and skill and feel being supported to be efficacious to exercise new innovative instructional strategies. Self-efficacy belief influences choice, effort, perseverance, resiliency, stress and anxiety on one's task (Bembenutty et al., 2018).

However, the above studies indicate the sources of self-efficacy and the relationship between self-efficacy and self-regulated teaching, but it does not clearly show how school factors contribute to teachers teaching self-efficacy belief to apply innovative teaching strategies Therefore, this study was intended to investigate how the professional learning community and

availability of science teaching resource material(school factors) mediated by self-efficacy belief of teachers to implement self-regulatory approach in their science teaching.

Moreover, since self-efficacy is context specific implying that it varies from task to task, and from person to person, and from place to place, in this study it is planned to investigate how self-efficacy belief of Ethiopian teachers affect their use of self-regulatory instructional strategies in their science teaching. In addition to this, since there are inconsistent results about teacher's efficacy on science teaching, it is planned to examine the science teaching efficacy of Ethiopian secondary school teachers as a mediator between school factors and self-regulated teaching strategy use.

2.3.2 B Years of Teaching Experience and Self-regulated Teaching

It is believed that the more the teachers become experienced, the more is the subject matter knowledge s/he will have, the more they will have pedagogical skill and the more the belief they will have to implement innovative instructional strategy. So, it is expected to have positive relationship between teachers teaching experience and their use of self-regulated teaching. Dewey(1938/1963 as cited in Schmidt, 2010) for example indicated that each experience can be shaped by prior experience and also shapes the future experience. This implies that the previous successful experience pays a way for effective current and future experience of an individual. In line with this, Bandura (1977) explained that one of the sources of self-efficacy is one's previous successful experience called 'mastery experience'. The successful previous performance encourages teachers to be motivated and committed for a better performance by applying innovative instructional strategies. For example the study findings of Chao and Chou(2017)showed that teachers' gender, class setting, and teaching experience were factors affecting the extent towhich teachers delivered instruction to promote self-determination/self-

regulation. In addition to this, Velthuis, Fisser, and Pieters (2014) identified that subject-matter knowledge and science teaching experience in primary schools both contributed to higher levels of personal self-efficacy for science teaching. But Berger et al.(2018) identified that teaching experience was positively related to self-efficacy and beliefs in constructivism but did not impact practices. In opposition to the above studies, Partovi and Tafazoli (2016) identified a positive relationship between the teachers' reflective practices and their self-regulation but no significant relationships between teachers' self- regulation and their experiences. In addition to this Pazhoman and Sarkhosh (2019), Arrastia (2015) identified that there was no correlation between teachers' teaching experience, their qualification, and the grade level they teach with their self-regulation in Casllers'(2005) un published validating study. On the other hand, studies conducted by Lombaerts, Engels, and Van Braak (2010); De Smul et al., (2018); and Pazhoman and Sarkhosh (2019) identified that there is no significant relationship between teaching experience and teachers' self-regulation practice and also has no relationship with teacher internal and external efficacy. However, Kini and Podolsky (2016) in their review of 30 research studies showed that students' achievement and teachers' teaching effectiveness are related with teachers' years of teaching experience.

So, this study was aimed to see whether there is significant relationship between teachers' years of teaching experience with self-regulated teaching or not in Ethiopian context.

2.3.2 C Teachers' Gender and Self-Regulated Teaching

One of the purposes of this study is to examine the relationship between teachers' gender and self-regulated teaching. So the following research findings show what this relationship looks like. For instance, according to Kovács's (2019)study result, difference in gender is characterized by use of diverse teaching methods, following teaching novelties and participation in high-

standard further education, are predominantly closely connected with women. The researcher added that this can be caused by several factors. For instance, some of the male teachers stick more to the usual teaching methods while female teachers have a more positive attitude towards professional development, use new teaching methods, create caring relationship, and allow collaborative learning. Ghonsooly and Ghanizadeh(2011) also identified that significant correlations were found between teachers' self-regulation, their teaching experience and their age but no significant correlations with gender. Similarly, the study of Arigbabu and Oludipe (2010) identified that there is no significant gender difference on the two dimensions of self-efficacy beliefs. However Female teachers exhibited higher levels of implementation with respect to self-determination instruction (Chao & Chou, 2017). So, this study tried to examine if there is significant gender difference on implementing self-regulated teaching in Ethiopian context; because there is no research conducted on the area so far.

2.4 Challenges of Implementing Self-Regulated Teaching (Teaching With Self-Regulation)

Teacher's use of innovative instructional strategy like SR may be affected by different factors external and internal to teachers. Basically, lack of knowledge, experience and lack of positive belief on the concept may be determinant challenges to apply it to their classroom teaching. For example, De Smul et al (2018) explained:

> The present challenge for teachers is to focus on two things: teaching subject matter and teaching how to learn the ideas and practices of this subject matter. The latter requires teachers to acquire new knowledge about how to do this, which makes teaching SRL a distinct way of thinking and teaching, next to teaching subject matter. In this respect, teachers can develop a certain degree of self-efficacy in teaching mathematics, but do not

> achieve this degree of self-efficacy in teaching students how to effectively learn the subject matter itself (p.217).

They indicated that teachers' beliefs and teacher self-efficacy are strongly related to SRL implementation. Teachers have limited knowledge and experience about self-regulated instruction use(Dignath-van Ewijk & Van Der Werf, 2012). They added that the basic determinant component for teachers' use of innovative instructional strategy is their belief, because it is believed that teacher beliefs are stronger predictors for teachers' behavior than their knowledge they gained. Peeters et al.(2013)'s extensive review also confirmed that teachers' own self-regulatory competences are critical determinant of SRL implementation in primary schools. Lack of knowledge, skills and self-efficacy to effectively activate and guide young children's SRL is crucial barrier to actual SRL classroom realizations (Kremer- Hayon&Tillema, 1999; Perry, Hutchinson, &Thauberger, 2008; Perry &Vandekamp, 2000; Wehmeyer, Agran, & Hughes, 2000 as cited in Peeter et al., 2013). Another challenge is that teachers may lack knowledge and experience during their training time and lack of PLC in their school. In line with this, Lombaerts, Engels, and Van Braak (2010) also identified that the recognition of SRL is mostly linked to personal teacher characteristics, lack of supportive conditions in the school, and lack of availability of school resources and technologies may also challenge the use of self-regulated teaching.

Summary

In the review literature above, the researcher tried to identify the relationship among the study variables of different previous studies. Hence, the results show that there are inconsistent results specifically, in the relationship between PLC and teaching efficacy belief variables, the relationship between gender and self-regulation, teaching experience and self-regulation, and

there is no study that shows the relationship among the four variables (STRA, PLC, TSEB & SRT) in one study. Therefore, this study was aimed to investigate this relationship in Ethiopian secondary school science teachers teaching practice and found a result according to the hypothesized frame work mostly but not fully.

CHAPTER3: Research Methodology

This chapter deals about the design of the study, the sample size, sample selection strategy, data gathering instruments and the analysis methods applied. Table 2 shows the summary of chapter three as follows.

Table 2

Summary of the methods used

Research objectives	Data source/s	Analysis method used
1. Investigate the status of the practice of teachers' self-regulated teaching in the study area.	Teachers' self-report , interviewed data, document analysis and observation	One sample t-test, and qualitative description and transcription and interpretation of interviewed data
2. Examine which phases of self-regulation teachers implement more	Teachers' self-report data, and interviewed data	Descriptive statistics and interpretation, transcription of qualitative data
3. Investigate the relationship between teachers' background variables with self-regulated teaching.	Self-report data(teachers' gender, and teaching experience and self-regulated teaching practice data	Standard Regression
4. Identify which school factor/s affect the implementation of self-regulatory teaching practice via teachers' self-efficacy more.	Self-report data(using SR, PLC, STRA and STSEB)questionnaire	Structural equation modeling with Path analysis
5.Investigate how teachers' personal factors (SEB) mediate school factors and implementation of SRTS	Self-report data(using SR, PLC, STRA and STSEB)questionnaires	Structural equation modeling with Path analysis
6.Investigate the relationship between professional learning community, science teaching resources and teaching self-efficacy belief variables	Self-report data(using PLC, STRA and STSEB)questionnaires	Structural equation modeling with path analysis
7.Examine how the hypothesized model fits to the sample data	Self-report data(using SR, PLC, STRA and STSEB)questionnaires	Structural equation modeling using Chi-square and alternative fit statistics
8. Investigate how teachers are implementing self-regulated	Qualitative data(using interview, classroom observation,anddocument	Qualitative transcription, and interpretation

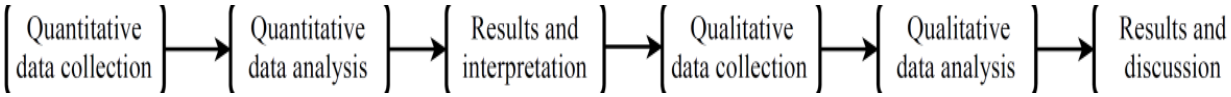
teaching in their classroom.	analysis)	
9. Explore the challenges of self-regulated teaching	Qualitative data obtained using interview	Qualitative transcription, and interpretation

Note. This table shows data sources and analysis methods for each research objectives as an executive summary

In addition to this, figure 3 shows the sequence ofthe implementations of the methods

Figure 3

An Overview of the Explanatory Sequential Mixed Method Design



(source; Wipulanusat et al.,2020)

3.1 Philosophical Base of the Study

Any research has its own philosophical point of view that gives the researcher a guide line to go through and arrive at his goal. Hence, constructivism, post positivism, pragmatism and transformative are the common world views that researchers depend on as a philosophy.

Hence, the researcher was planned to be guided by the paradigm of ***pragmatism world view***. This is because it embraces plurality of methods. As a research paradigm, pragmatism is based on the proposition that researchers should use the philosophical and/or methodological approach that works best for the particular research problem that is being investigated. Similarly, Kaushik and Walsh (2019) define the term as "paradigm was used to discuss the shared generalizations, beliefs, and values of a community of specialists regarding the nature of reality and knowledge "(P.4). "Worldview," as a synonym for paradigm is described as "a way of thinking about and making sense of the complexities of the real world. It is often associated with mixed-methods or

multiple-methods. This world view (pragmatism) embraces the two extremes (quantitative and qualitative) and offers a flexible and more reflexive approach to research design. Hence the reason that the researcher was used this paradigm is to examine mainly the practice of teachers' self-regulation in their secondary school science teaching followed by identifying the relationship between independent and dependent variables based on the theoretical justification (self-regulation theory, self -efficacy theory) and empirical evidences by taking representative samples from the population. And this was followed by qualitative data which is gathered through classroom observation, interview and document review for triangulation of the quantitative data and for further clarity.

3.2 Design of the Study

The research design proposed to be used for this particular study was *explanatory sequential mixed correlational surveydesign*. This was due to that explanatory research study sets out to explain and account for the quantitative information in this case. Because the researcher's primary interest was to assess or examine the practice of teachers' self-regulation which provides a quantitative or numeric description of trends, relationships of variables, attitudes, or opinions of samples drawn from the population and to find evidence to support or refute an explanation or prediction, it is recommended to use Explanatory research design.

3.3 Research Approach

The method employed for this study was as indicated Explanatory Sequential Mixed method (QUAN-QUAL MEHTODS).

The reason behind selection of mixed method depends on the type or nature of the research problem, the purpose of the research and the types of research questions to be answered in the

study. Hence, the main purpose of this research was to investigate the practice of teachers' self-regulation and the effect of science teaching resource availability (STRA) and the level of teachers' dialogue in knowledge and experience sharing in the school (PLC) on teachers' self-efficacy quantitatively followed by finding other evidences through qualitative data. Hence, the researcher was planned to use quantitative method of data collection first followed by qualitative method. This is because, according to Azorín and Cameron (2014),the main characteristics of mixed methods research is its *methodological dualism*, which frequently results in research that provides broader perspectives than those offered by a single method design. The ultimate goal and intention of using mixed methods or quantitative and qualitative approaches in combination provides a better understanding of research problems and complex phenomena than either approach alone. Creswell (2014) contend that using both qualitative and quantitative data can neutralize the weakness and bias of each form of data arising from each method. Creswell,W. and Creswell (2018) also conveyed that philosophically mixed method study is important in educational and social sciences' research to produce multifaceted data deriving knowledge about the problem.

However, qualitative research persuades through rich description and strategic comparison across cases, thereby overcoming the "abstraction inherent in quantitative studies" and permitting generalization to theory (Yin, 2018). The researcher also contends that qualitative research typically answers research questions that address "how" and "why" whereas quantitative research typically addresses "how often" and "how many". The above reflections give reason or suggestions that a mix of quantitative and qualitative methods can be fruitful for obtaining profoundly new empirical insights. Therefore, the researcher used explanatory sequential design.

When both quantitative and qualitative research methods are used in one study, they must be conducted either sequentially or concurrently. Sequential mixed methods data is analyzed in a particular sequence which strives to explain or expand on the findings of one approach with the other approach, whereas concurrent mixed methods collect and analyze both the quantitative and qualitative data at approximately the same time (Creswell, 2014). He added that in the sequential explanatory design, priority is normally given to the quantitative phase. So, the researcher first collected and analyzed the quantitative data, and then used qualitative methods to gain further explanation and interpretation of the quantitative results obtained in the first phase.

3.4 The Study Area

South Gondar zone was proposed to be the study area which is one of the administrative Zones of the Amhara region. It is sub-divided in to 15 administrative Woredas which contains sixty three secondary schools. The reason why the researcher intended to select the zone to be the study area is that I was working in Debre Tabor University found in the study area for about four years and I had the opportunity to know some of the teachers found in the schools during my staying time. This helped me in facilitating my study especially during data gathering. Besides this, it was assumed to create convenience and reduces my resources' cost, especially finance, labor and time.

In South Gondar Zone, there are 15 administrative Woredas; from 63 schools, there are 1186 science teachers working in the 63 schools. Hence, teachers working in 9 schools (around 14.3% of the total schools) were included in the study in order to make the study manageable.

3.6 Sample Size and Sampling Technique

The subjects of the study area planned to be involved in the investigation process were science teachers of governmental secondary schools (from grade 9-12) found in South Gondar zone. The number of secondary schools (grade 9-12) found in the zone according to the Zonal education bureau report was 63. Determining and selecting representative sample of a study may predict the acceptability of the research result. Many researchers agree that if the sampling fraction, the proportion of the population in the sample, is greater than about 10 per cent, then the relative size of the sample does begin to have an effect. For example, Kline(2005) suggested that 10 to 20 participants per estimated parameter would result in a sufficient sample. Factor analysis (EFA, CFA) and SEM- structural equation modeling analysis methods usually demand large sample size, because the size of the sample affects the precision and reliability of the result obtained (Kyriazos,2018). But to be more accurate and to minimize errors of estimation, the sample size that was involved in the study was determined by the confidence level and margin of error. Hence, the confidence level of this study was determined to be 95% with the marginal error of 5%. Therefore, the total population of the study was 1186 and the sample size determined for this population based on the aforementioned confidence level and margin of error was 278. To compensate the wastage of the responses (response rate) 16% (44) of 278 were added and totally 278+44=322 samples were determined to be involved in the study. Table 3' shows the sample size proposed to be taken from the listed population based on confidence interval and margin of error (5%,3% or 1%)

Table 3

Sample Size Based on Desired Accuracy

	Variance of the population P=50%					
	Confidence level=95%			Confidence level=99%		
Population Size	Margin of error			Margin of error		
	5	3	1	5	3	1
50	44samples	48samples	50 samples	46 samples	49samples	50 samples
75	63	70	74	67 ,,	72	75
100	79	91	99	87 ,,	95	99
150	108	132	148	122 ,,	139	149
200	132	168	196	154 ,,	180	198
250	151	203	244	181 ,,	220	246
300	168	234	291	206 ,,	258	295
400	196	291	384	249 ,,	328	391
500	217	340	475	285	393	485
1000	278	516	906	398	647	943
1500	306	624	1297	459	825	1375

Note: Source-Gill et al., 2010 as cited inTaherdoost (2017) shows sample size taken based on 0.05 margin of error for population size of 1000-1500

The sampling technique applied here was simple random sampling method followed by comprehensive sampling technique. The number of schools found in the zone was selected randomly using lottery method based on their lists. After selecting the schools randomly, all

science (Biology, Chemistry, and Physics) teachers found in the randomly selected schools were included in the study using comprehensive sampling method.

Table 4

Number of schools and science teachers by Woreda

Name of the Woreda	Number of schools found in the woredas by level			Total number of science teachers in the woreda
	9-10	9-12	11-12	
Meketawa	1	1	-	13
Este	5	4	-	122
Dera	1	4	-	129
Fogera	3	2	-	68
Libo	3	1	1	97
Ebinat	2	3	-	80
Andabet	1	2	-	69
Woreta	-	1	-	54
Debre Tabor	1	2	1	113
Farta	1	2	-	69
GunaBegemdir	-	2		47
Lay Gayint	5	1	1	124
TachGayint	3	1	-	78
Sedie Muja	1	1	-	37
Simada	3	3	-	86
Total	30	30	3	1186

The schools where the study was conducted were TatekLesira, NefasMewcha secondary, and preparatory schools, DagmawiTewodros secondary school and preparatory schools, Addis

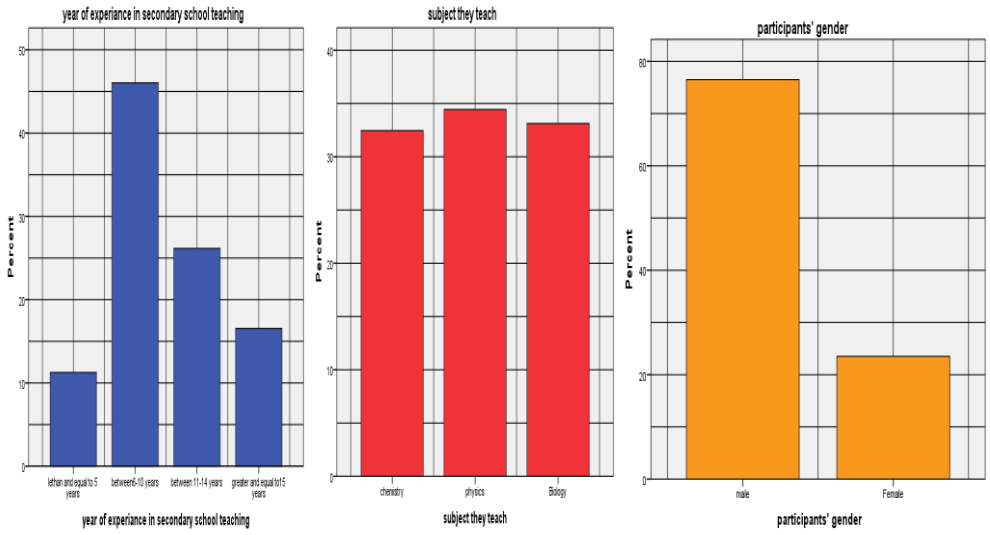
Zemen secondary school, MekaneYesus secondary and preparatory school, AfereWanat secondary school, and ArbGebya secondary school.

3.7 Participants

The total numbers of secondary schools as indicated above were 63 with 1186 teachers and from these, nine secondary schools (14.3%) of the total population were selected using simple random sampling method (lottery method). And all teachers (322) from those randomly selected schools were taken using comprehensive sampling method. Only 302 out of 322 participants completed and returned the questionnaire. From the participant teachers (98=32.5% were Chemistry, 100(33.1%) were Biology and 104(34.4%) were Physics); and among these, 71(23.5%) were females and 231(76.5%) were males; of the 302 teachers, 74.5% were first degree holders and the other 25.5% were masters. Teachers were also categorized in to 4 groups based on their teaching experience career structure (teachers from 0 to 5 teaching year experience are called 'beginners and junior teachers') and were made to be in group one; from 6-10 teaching experience are called 'Teacher and Senior teachers') were made group two; from 11–14-years teaching experience are called Associate lead teachers were made to be group three; and the fourth group are those who have 15 years and above teaching experience called 'Lead teachers according to (MoE,1994). Hence, majority of the participants (46%) have 6-10 years teaching experience,26.2% have 11-14 years of experience; 16.5% of them 15 years and above; and 11.3% have below 5 years of experience in secondary school science teaching were participated in the study.

Figure 4

Bar graphs of participants by years of experience, subject they teach and by their gender



Note. The figure 4 represents participants by their year of teaching experience, the subject they teach and by their gender from left to right respectively.

The participants of qualitative data were those teachers from two schools who are found at Debre Tabor city (Tewodros 2nd secondary school and Tewodros 2nd preparatory schools) who were participated in the self-report questionnaire data and were selected for the interview using convenient sampling method. From the three subjects, those who were volunteers for the interview and classroom observation, two teachers (one male and one female) were selected using purposeful sampling method to triangulate the result obtained through questionnaire. Therefore, a total of 11 teachers (5 females and 6 Males) whose teaching experience ranges from 17-29 years were participated in the interview and classroom observation. Concerning the educational background (Master, Females=2, Males=4; BSC, Females=3,& Males=2); however, there were no female teachers from Physics department of the preparatory school. Before the interview was conducted, teachers were informed about the purpose of the study and the

confidentiality of the information they give. They were also informed that the interview they give would be recorded with video recorder; classroom observation and document analysis were conducted before interview. So, the interview and classroom observation were conducted with full participants' consent.

3.8 Data Gathering Instruments

In this study both qualitative and quantitative data were collected. The quantitative data was collected using self-report questionnaire whereas the qualitative data was gathered using observation, document analysis and interview instruments.

3.8.1 Questionnaire

The advantages of self-reports or questionnaires are obvious that the respondents are not disturbed during their daily activities and questionnaires are easy to administer in largescale testing. The disadvantages, however, may be that teachers are not able to accurately recollect what they have done (Veenman, 2011) due to interferences, laps of time and their mood. However, the researcher preferred and used self -report questionnaire as one data gathering instrument. Moreover, the processing of the self-report data (especially questionnaires) is also less labor-intensive and cost-effective. However, self-report instruments have their strong and flawed points, and many researchers recommended using a combination of measurement methods may minimize the errors. This is for triangulating data sources as a means for seeking convergence across qualitative and quantitative methods (Creswell, W.& Creswell, 2018). Hence, four types of questionnaires, for teachers' self-regulation, professional learning community practice, resource availability and for teaching self-efficacy belief of teachers with a 5 Lickert scale were adapted and used

3.8.1A Teachers' Self-regulation Scale

Teacher's self-regulation scale instrument was first developed and applied in Turkey pre-service teachers and since then it is widely being applicable in the Middle East countries (mostly in Iran and Iraq) and USA. The instrument identified and extracted9 dimensions of self-regulation (Goal setting, self-instruction, mastery goal orientation, emotional control, self-evaluation, Help seeking, internal interest, performance goal orientation and Self-reaction from Capa-Aydine et al. (2009). But Arrastia(2014) conducted a validation study with US teachers and found the 'Self-reaction 'subscale not internally consistent. However, the total internal consistency of the instrument (the estimates of Cronbah's alpha were similar to those reported by Capa-Aydine et al. (2009) which ranges from .62 to .86 (Arrastia, 2014). Though the overall reliability of the scale was not determined from Capa-Aydine et al. (2009) study, it is found to be strong in Arrastia's study which is(ω=*.90)*.

So, the researcher adapted this instrument to measure teachers' self-regulation practice of Ethiopian secondary school science teachers in their science teaching which was validated by Capa-Aydin et al., 2009; and Arrastia, 2014). The number of items was 40 distributed to the 9 dimensions of self-regulation. However, this instrument was adapted after subjected for pilot test and the number of items became reduced to 37 with 9 dimensions.

This instrument was applied in U.S secondary school in-service teachers by Arastia (2014) for validation, by using structural equation modeling, confirmatory factor analysis, and path analysis as analysis methods; however, it was found that the models did not fit the data.

Hence the researcher of this study was decided and adapted these scales by reducing the number of items whose reliability is low; by restating, rewording and understandable by the

teachers for this study to measure in-service teacher's self-regulation practice with together their teaching self-efficacy scale, professional learning community and science teaching resource availability that were assumed to affect teacher's self-regulation. This scale (teachers' self-regulation) was used to give an answer for research question number 1-8. The questionnaire consisted of 37 items, 9 dimensions with 5 Lickert scale ranging from strongly Dis-agree to Strongly Agree (Strongly Disagree=1,Disagree=2, uncertain=3,Agree=4,and Strongly Agree=5).The language used to prepare all the questionnaires was English language; because currently teachers are teaching their subjects using English and it is believed that they can understand it easily.

3.8.1B Teachers' Teaching Self-efficacy Belief Scale

Bandura identified two dimensions of self-efficacy: personal self-efficacy and outcome expectancy. Personal self-efficacy is the "belief in one's capabilities to organize and execute the courses of action required in producing a given attainments, whereas outcome expectancy is a judgment of the likely consequence such performances will produce" (Bandura, 1997, p.3). Self-efficacy is an important predictor of the behavior to be observed. So, teacher self-efficacy belief in this study focuses particularly on the teaching efficacy belief of secondary school science teachers to implement self-regulated instructional strategy in their classroom.

Though Tschannen-Moran and Hoy(2001) which was called Ohio Teacher Sense of Efficacy Scale, developed measurement instrument in short form, containing 12 items and long form containing 25 items, still serving in measuring teachers teaching self-efficacy for different subjects. But, to be specific, for science teaching efficacy belief, the researcher adapted and used 'science teaching efficacy belief instrument A' developed by Riggs and Enochs, (1990) and was validated in different teaching settings. This is because the STEBI -A's level of specificity

appears to have allowed to contribute for understanding of teachers' beliefs about science teaching and learning across the globe(Riggs & Enochs, 1990). The instrument was consisted of 25 items used to measure the Personal Science Teaching Efficacy Belief scale, and Science teaching outcome expectancy scale. The item analysis result revealed for the Personal Science teaching Efficacy Belief scale, a reliability of an alpha of 0.91 was achieved and the Science Teaching Outcome Expectancy scale produced an alpha of 0.76 from(Riggs & Enochs, 1990) . This measurement scale was developed to measure the efficacy belief of elementary science teachers and adapted for secondary school science teachers for this study. In this study, the efficacy of teachers was assumed to be influenced by the extent of science teaching resource availability in the school environment and the contribution of schools' professional learning community to implement teaching with self-regulation. This scale was assumed to measure the science teaching efficacy belief of teachers to apply self-regulated teaching strategy. And it was intended to answer specifically the research question number 2, 3, and 4.

The number of items for this scale was 25 with two dimensions and after the pilot study, the test result showed the reliability of the instrument an alpha of .67 for PTSE (personal teaching self-efficacy) and .43 for OSE (outcome self-efficacy) respectively. It was modified to be a total of 21 items, 4 items were reduced from the existing items and modifications of phrases and sentences were made after a pilot test. There were 10 negatively stated items and 11 positively stated items The STEBI-A, used 21 items with 5 Likert scale for this study; 13 items applied for Personal Science Teaching Efficacy (PSTE), and the other 8 items were used to address teachers‟ Science Teaching Outcome Expectancy (STOE). For positively written statements, the values for each response were: SA = 5, A = 4, UC = 3, DA = 2, and SD = 1. For the negative responses, the scoring was reversed as: SA = 1, A = 2, U = 3, D = 4, and SD = 5

3.8.1 C Science Teaching Resource Availability Scale

The teaching efficacy of teachers can be affected by different factors; the presence of resourceful and conducive environment is one factor that assumed to decrease or increase the motivation of teachers to implement their task effectively. Especially science teaching should enable students to have critical thinking, problem solving, discovering, inquiry, testing etc. skills. So, the teaching-learning environment should be full of resources both with local and manufactured materials that enable teachers and students to be motivated and efficacious. Hence the researcher believed that the availability of resources for science teaching contributes to the enhancement of teachers' efficacy belief in order to apply self-regulated instruction and intended to measure teachers' view how much it affects their efficacy positively or negatively.

For science teaching resource availability measurement, 22 items with four dimensions (reference and text related issues (5 items), Human resource issues (3 items), infrastructure issues (10 items), and chemicals and equipment (4 items) were developed by the researcher and its validity especially the content and face validity were checked by subject experts. And its reliability was checked after the pilot test and ranges from .32 to .95 in sub-scale wise. The questionnaire was developed to contain common and basic resources that the three subjects need to have as teaching resources. The questionnaires were all with 5Likert scales prepared to allow researchers to gain insights on perceptions, behaviors, feelings and more by asking respondents to self-report their agreements or disagreements based on how they feel, know or behave using the scale. The instrument was prepared to serve for research question number 2 and 3.All the items are positively stated which has 5 Likert scales ranging from strongly agree to strongly disagree

3.8.1D Professional Learning Community engagement scale

Professional learning community as tried to define in the literature part is a planned, continuous dialogue made among teachers in the school intended to share experience and knowledge for the purpose of students' learning and achievement by increasing teachers' teaching self-efficacy and their professional development. To support this, Sai and Siraj, (2015) explained that the interactions made between teacher peers are very essential and very important to make effective the process and outcomes of teaching and learning. As Sai and Siraj (2015) reviewed Rosen Holtz's (1989) work, showed that teachers who learn, work and collaborate by sharing their experience with their peers and shared vision to arrive the intended goals are seen exhibiting enhanced teaching efficacy as a result improved student learning and achievement than those who are working in isolation.

According to the authors, there are three models of PLC;

1/ The Senge (1990) model which comprises of five components; Personal mastery, System thinking, Mental model, Shared model and Team learning.

2/ DuFour's model; this model is proposed during his 2004 work. He identified three big idea models a/ learning but not teaching, b/culture collaboration, and c/ Result focused

3/Hord's model; this model consists of five components; supportive and shared leadership, collective creativity, shared values and vision, shared personal practices, and supportive conditions for sustaining the learning community.

Hence, though the three models share some dimensions in common, the researcher used the third model (Hord's model) to investigate the schools' professional learning community characteristics of the study area. The reason is that it incorporates the school leader's role, the

vision and mission that teachers will have in common and strive to achieve, the interaction and collaboration among staff, and conducive working environment. Therefore, questionnaire containing 52 items developed by Olivier and Hipp (2010) was adapted and made compatible (44 items) with this study before pilot test. The scales were reduced to 44 items by eliminating the items related to students' and parents' involvement. Because the focus of this study was teachers dialogue made to share experience and knowledge. All the 44 items were positively stated and had 5 scales ranging from strongly agree to strongly disagree. This scale was assumed to contribute in increasing teachers' teaching self-efficacy to use self-regulated teaching approach. The respondents answered by giving their agreement or disagreement by saying Strongly Agree, Agree, Uncertain, Strongly Disagree or Disagree about their practice. However, the instrument was subjected for pilot test and also commented by subject experts. Based on the pilot test results and comments, the items were reduced from 44 to 35, and the total item reliability was found to be an alpha of .93 and in subscale wise its reliability ranged from .46 to .89.This instrument was used to give answer for research question number 2 and 3 together with the other independent variables.

3.8.2A Interview

The researcher was planned to apply semi-structured interview approach. Because, this type of approach provides an opportunity for interviewee to get freedom to elicit more information about their self-regulated teaching and other affecting factors. Two schools from Debre Tabor city administration were selected using convenient method from each subject (Physics, Chemistry and Biology) two participants (1 female and 1 male) a total of 11 from the two schools were selected and those teachers who were volunteers to participate in the interview and classroom observation were participated in the study as data source. Though interview is

good and more important for qualitative data gathering, it has its disadvantages. It is expensive and time consuming; it can be exposed for researcher bias, and needs skilled interviewer.

However, the researcher of this study used it to get data from interviewee. In the interview section, more of the questions were focused on teachers' practice of self-regulated teaching (self-regulated instructional application) in their teaching and the challenging factors.

So, in this research, the interview method was designed to minimize the gap and to provide an opportunity for participants to uncover what they encounter. The interview was conducted by the researcher himself using sound recorder (or mobile) by selecting appropriate place where there is no disturbance with the consent of participants. In addition to this, note was taken while the interview was going on. Nineteen questions were prepared by translating in to Amharic language and were conducted following classroom observation and document analysis for an average of 35 minutes. The validity and reliability of the data was confirmed by the respondent themselves by making the data to be heard after transcription. The data obtained through interview is analyzed thematically by categorizing in to the three phases (preparatory, performance and self-reaction/reflection phases). The interview questions were mainly focused on teachers' practice of SRT and on the challenges in implementing it.

3.8.2 B Classroom Observation

This data gathering instrument is more valid than self-report data and was applied in teacher's classroom while they are teaching using non participant approach by direct observation. In this observation, checklists were developed to check whether teachers apply their lesson as per their plan in line with self-regulation. The researcher conducted the classroom observation by obtaining consent from teachers as non-participant observer for 40 minutes each

using checklists. The observation was conducted only for one time. The self-regulation activity is mostly focusing on teachers' cognitive, meta-cognitive and motivational aspects, but it was difficult to observe these components because these are phenomena that occur covertly by teachers' mental imagery. So the researcher most probably observed the plan, the strategy they select and use, their reflection, how they use the environment in their classroom using non-participatory observer approach. This instrument was used to find supportive evidence for research question number one by observing their lesson plan use in their classroom using observation check list.

3.8.2 C Document Review

This type of qualitative data is another means of validating the quantitative data obtained through self-report. Hence the lesson plan teachers prepared was observed whether they use it in their actual classroom teaching and how much they effectively prepared it to regulate their teaching (forethought phase) how they selected the strategy, the resources (time and material). Therefore, a check list containing 8 items were developed by the researcher and this data was assumed to support or object the data obtained by self-report for research question number one together with classroom observation and interview data.

3.9 Pilot Test

Pilot test was conducted with science teachers teaching in other schools (from Gondar city) different from the selected samples of the main study. The purpose of this pilot test was to check the validity and reliability of the instruments and the clarity, appropriateness, misconception and other problems related to it and to make corrections wherever necessary**.** Hence, 10% of the sample size (30 participants) of the main study was participated in the pilot

study from schools other than the sample schools for validation of the instruments. A Self-report self-regulated science teaching questionnaire with a 5 Likert scale was developed by Capa-Aydine et al., (2009) and validated by Arrastia (2015), Caslller (2005) and others was adapted for this study. The questionnaire had 40 items and 9 dimensions but for this study the items were made to reduce to 37 after the pilot test based on item reliability value, and those look like ambiguous, not clear. The study was conducted to investigate the effect of professional learning community practices for self-regulation, the availability of science teaching resources and teaching self-efficacy belief of teachers. A self-report questionnaire for professional learning community practice containing 35 items after pilot test were adapted from Olivier and Huffman (2010) as available in Heaton (2013) ; the original instrument contained 52 items, of these, 8 items which were not relevant for this study were intentionally reduced before pilot test. The 44 items were subjected for pilot test. Finally 35 items whose reliability is in the acceptable range(above.45) were used for data gathering purpose of this study. And science teaching resource availability scale containing 25 items was developed by the researcher and subjected for pilot test. However, those whose reliability of the items was in the acceptable range after the pilot test with 22 items were used. The science teaching efficacy belief instrument containing 25 items prepared by others was subjected for plot test. 4 items with low reliability, had ambiguity were reduced after pilot test. The content validity of all the instruments was evaluated by experts from different discipline (eg. From education faculty, and from psychology department) in addition to this, it was evaluated by the researcher advisors for its purposefulness, and adequacy and amendments were made. The total item's reliability of the pilot test result was found to be in the acceptable range (for PLC with Cronbach alpha= .93; for SR=.94; science teaching self-efficacy belief (STEB an alpha of=.66) and for science teaching resource availability,

STRA=.89;).And when evaluated by their dimension, PLC were found from .46 to .89 and that of Heaton's test was from .82 to .92; for SR, it ranged from .58 to .95 but that of Capa-Aydine et al (2009) was from .62 to .86; for STEB it was .46 to .67 but that of Riggs &Enochs(1990) was .92. However, when the subscales' reliability was checked, self-instruction from SRST (self-regulated science teaching) =.57; Supportive conditions and structure subscales of PLC =Alpha .46; chemicals and apparatus sub scale of STRA=Alpha of .32 were detected. Hence, based on these lower reliability results and respondents' feedback, some items were corrected and some were reduced. So, the total number of items used for the main study were made to be PLC=35; STRA=22; and for SRST=37 and that of STSEB were 21 and their total item reliability were improved.

3.10 Data Collection and Analysis Methods

3.10.1 Data Collection

Seven (7) data collectors from the study cites who have had personal relationship were selected for data collection purpose and trained on the purpose of the study, how to respond to the questionnaire and the ethical issues were given to those collectors to aware and inform the participants. The collection process took more than two weeks. After collecting the data, rough check was done and 20 papers were found incomplete and excluded from preliminary analysis. After screening, the data were also coded based on the name of schools where it was collected and entered to the SPSS version 23 by the researcher himself.

3.10.2 Ethical Consideration

Ethical Considerations can be specified as one of the most important parts of the research. Dissertations may even be doomed to failure if this part is missing. Because it is a

concern of human that should be given care and clarity in the first place. Research participants were not subjected to harm in any ways whatsoever. Respect for the dignity of research participants was prioritized. For collecting the data, the purpose of the study was briefed for participants in person and in written forms at the first page of the questionnaires and their full consent was obtained from them prior to data collection. Adequate level of confidentiality of the research data was ensured. Whatever responses they gave, it was and will be confidential.

Any type of communication in relation to the research was done with honesty and transparency. Any type of misleading information, as well as representation of primary data findings in a biased way were made avoided. Acknowledgement of works of other authors used in any part of the dissertation with the use of Harvard/APA/Vancouver referencing system was taken in to consideration. Moreover, support letter from Bahir Dar University and South Gondar Zone Educational office were taken and other formats and standards of the university were taken in to consideration for the purpose of legitimacy. Besides this, participants of the qualitative data were informed about the purpose of the study and their information is taken with their full consent and they signed to show their agreement protocol.

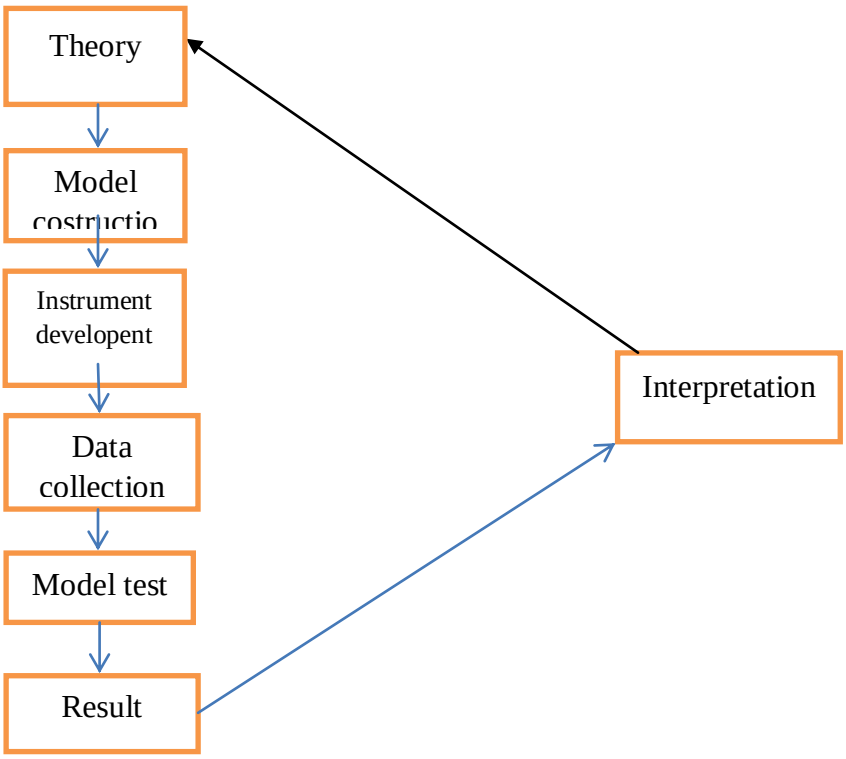
3.10.3Data Analysis

Since the study design was correlational design with survey mixed method and the data obtained through the instruments were analyzed using one sample t-test, independent sample t-test, descriptive statistics, multiple regression, and structural equation modeling to examine the effect of variables, and for the model fit. The reliability of the items in the factors were also checked using internal consistency, Cronbach's alpha during preliminary analysis. Whereas structural equation modeling (SEM)/ in general was used to confirm a prior hypothesis, in contrast to the exploratory nature of factor analysis; moreover, it was assumed to examine

complex associations (Kyriazos, 2018) and is large sample size sensitive. During SEM analysis, statistical power, effect size and a range of model fit indices were detected. Besides this, multivariate assumptions, normality, collinearity, homoscedasticity, and presence of outliers and missing values were checked in the preliminary analysis stage.

Figure 5

Study Procedure



This figure informs how the study went through by starting from self-regulated learning theory concept up to data collection, analysis and then relate to the base (theory).

CHAPTER 4:Data Analysis and Results

4.1 Preliminary analysis

Data obtained from participants were entered to statistical packages for social sciences (SPSS) version 23 and coded and labeled for the purpose of analysis. All the assumption tests required (presence of outliers, univariate and multivariate normality, homogeneity of variance, multi-collinearity of variables), and missing values were checked. The missing values were substituted using imputation (series mean) method and outliers were adjusted by rounding to the next higher value not to lose many cases. Finally, it was checked that there was no serious violation of the assumptions detected. One sample t-test, independent sample test, descriptive statistics, multiple regression analysis methods and structural equation modeling using AMOS software version 23 and path analysis were employed for the analysis.

One sample t-test for comparison of the sample data with the expected population mean; independent sample test (to compare the implementation of SRTS use among males and females teachers) with effect size to compare the extent of the difference; and multiple regression analysis methods (to compute the predictive capacity of gender and teaching experience); and descriptive statistics (to compare the implementation level of phases); Structural equation modeling and path analysis for the effect of independent variables on the outcome variable were employed for the analysis. This is due to as many researchers recommended, a survey study whose continuous data were collected using a 5 Likert scale questionnaires, the analysis methods should be either inferential statistics like Pearson correlation, t-test, ANOVA or descriptive statistics like mean , standard deviation are appropriate (Joshi & Pal, 2015). Besides this, effect size is used to evaluate the extent of SRT (self-regulated teaching) implementation

difference among gender based on Leech, Barrett,and Morgan(2005), which indicated that effect size value in Cohen's d>or = 1, is very large, .8 and above is large;.5 and above is medium and .20 and less than are small.

Therefore, the analysis result is presented in three parts. Part one deal about research question number 1, 1.1, 1.2,1.3 (one sample t-test, descriptive statistics, independent t-test and standard regression) and; part two deals about question number 2, 3, 4 and 5(structural equation modeling) and part three is qualitative transcription, interpretations and description for question number 6,7, and 8.

To make the data manageable for structural equation model analysis, the items were reduced by factor analysis using principal component analysis with Varimax rotation method. The factor analysis result for self-regulated science teaching (SRST) reveals that the items were factored in to 7 components or factors with 23 items Eigen value greater than 1, and the total variance explained for by the factors was found to be 59.00. Principal component analysis with Varimax rotation was used to explore the component structure of the attitudes towards the implementations of self-regulated teaching. Values of KMO(.78) and Bartlet's of test(Chi-square=1253.79; df=210;p<.001) permitted further analysis. Hence, the two tests as indicated above explain the adequacy of the samples for factorability to maximize interpretability and the solution, (the pattern of loadings). The Varimax rotation method was done because of its simplicity and interpretability; and is found to be preferable(Meyers, Gamst, & Guarino, 2006) . Factor1- is named as *performance goal orientation* containing four items with the variance of 11.64% explained for by the factor, and its reliability of an α=.76, Eigen value=4.3; Factor2 called *Mastery goal orientation* containing 4 items with a variance of 11.43% explained for by the factor and reliability of α=.75, Eigen value=2.1 was retained; *Factor 3 called Help seeking*

containing3 items with a variance of 8.85% contributed for by the factor with the reliability value of α=.62 and Eigen value of=1.5 was retained; Factor 4 called *Self-evaluation* containing four items, two items from self-instruction are loaded to this factor with a variance of 8.31%, Eigen value of 1.49 and an α = *.63 was retained. Factor five called 'Intrinsic interest' with* 2 items and a variance of 7.13 % explained for by the factor with reliability of α=.55 and an Eigen value of 1.4 was retained; Factor 6 called' *Goal setting'* containing 2 items with a variance of 6.52% was accounted for by the factor and reliability of α=.49 and an Eigen value of 1.2 was retained; Factor 7 called '*self-reaction'* containing 2 items with a variance of 5.11% contributed for by the factor and reliability of α=.05 and an Eigen value of 1.0 was retained

Table 5

Rotated Component Metrics for SRT Data

	Component						
	1	2	3	4	5	6	7
Goal3						.813	
Goal5						.769	
HS1			.797				
HS2			.696				
II1					.737		
II3					.728		
MGO1		.714					
MGO2		.692					
MGO3		.698					
MGO4		.752					
PGO2	.740						
PGO3	.704						
PGO4	.735						
PGO5	.758						
SE3				.749			
SE4				.625			
SI2				.423			
SI4				.715			
SR3							.796
SR4							.500
HS3			.608		.368		
Note. Eigen.value=	4.3	2.1	1.5	1.49	1.4	1.2	1.0
Variance in% =	11.64	11.43	8.85	8.31	7.13	6.52	5.11
Cronbcah α =	.76	.75	.62	.63	.55	.49	.05

The principal component analysis resulted 7 dimensions which is reduced by two factors from that of Capa-Aydin et al.(2009). In the commonality's matrices, the help seeking item number2 (while preparing for class, I get help from my colleagues) share the highest variance proportion (.745) or accounted for by the component. Whereas from self-instruction item number 4(During instruction, I always adapt my instructional strategies based on students' needs) accounted for by

the component with the lowest variance proportion in commonality (.48). One item from self-instruction (item 4) is retained by self-evaluation factor and item2 from self-instruction is included to the factor self-reaction. This showed that some items are retained not to the expected dimension which needs further confirmatory factor analysis in Ethiopian context.

Similarly, a principal component factor analysis with Varimax rotation was conducted on science teaching resource availability data. An initial analysis reveals with measure of Sampling Adequacy and Bartlett's test of Sphericity (KMO=.89, Bartlett's test of sphericity=2273.758, df=231; Sig=.000) indicating its sampling adequacy for factorability. With iterated Varimax rotation method, 4 factors with a total variance of 60.5 and an Eigen values greater than 1 were retained. Factor 1 called '*Infra structure*' which contains 8 items with a variance of 27. 7% and a reliability of Cronbach α=.85; Factor 2 called '*Reference and texts'* containing two items with a variance of 14.1% and reliability of Cronbach α=.68; Factor 3 called '*chemicals* containing two items one from chemical and equipment and one item from infrastructure with a variance of 11.4% accounted for by the factor and reliability of Cronbach α=.66; and Factor 4 called Chemicals *and equipment* with one item with a variance of 7.3% and with no reliability were retained. However, this factor was eliminated from the SEM analysis because most references recommend that the contribution of factors containing one and two items should be reduced (Schumacker & Lomax, 2016; 2016; Meyers et al., 2006; Hoyle & Isherwood,2013).

Table 6

Rotated component matrix for STRA items

	Component		
	1	2	3
Infra7	0.791		
Infra8	0.788		
Infra6	0.753		
Infra9	0.728		
Infra5	0.672		
Infra4	0.606		
Infra1	0.577		
Infra3	0.519		
RT1		0.85	
RT2		0.82	
RT5		0.57	
CMR_1			0.836
Infra_10			0.822
Variance	27.7	14.1	11.4

Note. the lowest variance explained is by factor (component) 3; only 13 out of 21 items are retained

The same principal component analysis with Varimax rotation was conducted on professional learning community data. The Kaiser-Meyer-Olkin measure of Sampling Adequacy and Bartlett's test of sphericity showed its factorability (KMO=.90, Bartlett's approx.=1930.037, df=153, p<.oo1). Hence, 5 factors with an Eigen value greater than1 and a total variance of 61.9 % were retained. The factors are; *factor 1 called shared values and vision* containing 5 items with a variance of 16.3% and reliability of Cronbachα=.83; *factor 2 called collaborative learning and application* containing 4 items with variance of 13.9% and α=.75; *factor 3 called supportive conditions and structure* containing 3 items with a variance of 12.6% an α=.81; *Factor 4 called 'supportive and shared leadership'* containing 4 items with variance11.6% and α=.67; *Factor 5*

called supportive condition and relationship containing 3 items(one item from shared personal practice) with variance 7.4% and α=.66 was retained.

Table 7

Rotated component matrix of PLC

	Component				
	1	2	3	4	5
SSL2				.579	
SSL4				.733	
SSL5				.619	
SSL7				.626	
SVV1	.645				
SVV2	.740				
SVV3	.715				
SVV4	.618				
SVV5	.751				
CLA5		.670			
CLA6		.672			
CLA7		.737			
CLA8		.763			
SCR4					.58
SPP4					.606
SCR2					.832
SCS3			.817		
SCS4			.817		
SCS5			.755		

Note. Out of 35 only 19 items are retained by the factor

Similarly, principal component factor analysis was conducted with Science Teaching Self-Efficacy Belief self-report data. The Kaiser-Meyer-Olkins measure of Sampling Adequacy and Bartlett's test of Sphericity showed its further factorability (KMO=.79, Bartlett's approx. =2113.642, DF=210, Sig. value=.000). Based on this result, the iterated rotated factor analysis resulted with three factor structure of 13 items with a total variance of 50.4%. *Factor 1 called*

efficacy of mastery goal orientation containing 5 items with a reliability of Cronbachα=.71 and a variance of 24.3 % and Factor 2 called self-efficacy for *outcome expectancy* containing 7 items with reliability of Cronbach α=.59 and a variance of 18.2%. This factor analysis did not factor out or did not delineate clearly as performance or outcome expectancy which contains three items from personal teaching efficacy belief and four items from outcome expectancy. So, this can be named by the majority items and their load as *Outcome Expectancy factor*. But the third factor retains only one item, item number 8, it is excluded from the SEM analysis according to Hoyle (2013), factors with less than 3 items and low reliability value should be excluded. However, this may need confirmatory factor analysis for future research application to clearly identify the measurement structure of the SEM model.

Table 8

Rotated component matrix for SEB

	Component	
	1	2
SEB15	0.74	
SEB2	0.71	
SEB4	0.69	
SEB10	0.66	
SEB16	0.65	
SEB12	0.62	
SEB13	0.61	
SEB20		0.807
SEB21		0.716
SEB18		0.684
SEB3		0.678
SEB11		0.628
SEB19		0.619

Not. Only 13 out of 22 items are retained by the factor

Table 9

Frequencies of Participant's Responses, Mean, Median, Mode and Standard Deviation of Sample Items of Self-Regulation Questionnaire

Sample items per dimensions	M	ME	MO	SD	F
GOAL SETTING					
I identify goals to be achieved by students	4.23	4	4	0.77	151
I decide on the instructional strategy appropriate for the topic	4.19	4	4	0.76	155
HELPSEEKING					
I ask for help from my colleagues	3.82	4	4	1	109
I get help from my colleagues when needed.	4	4	4	0.88	185
INTRINSIC INTEREST					
I like science teaching profession.	4.6	5	5	0.57	197
It makes me happy to see my students learn science.	4.02	5	5	0.65	154
MASTERY GOAL ORIENTATION					
successful science teaching improves students' learning	4.42	5	5	0.66	155
It is important to be a successful teacher	4.43	5	5	0.66	157
PERFORMANCE GOAL ORIENTATION					
Effectively science teaching enables me to get promotion	3.97	4	4	0.95	119
I have to teach effectively to get appreciation from others.	3.58	4	4	1	120
SELF-EVALUATION					
I learned from the mistakes I made in science classes.	4.13	4	4	0.82	149
I try to evaluate whether I have met my lesson goals or not.	4.08	4	4	0.76	154
SELF-INSTRUCTION					
I direct myself to use time effectively	4.38	4	4	0.63	151
I utilize alternative strategies	3.54	4	4	1	141
SELF-REACTION					
I get upset when I am negatively evaluated in my profession.	3.9`	4	4	0.89	165
If I realize that I am not successful in my teaching worries me	3.93	4	4	0.96	154
EMOTIONAL CONTROL					
I stay calm when I faced with a problem while I am teaching.	3.5	4	4	1	137
I do not upset when a problem occurs during my instruction	3.8	4	4	1	139

Note.This table shows the respondents' response pattern and median is 4; the mean of items is above 3.5 and the most frequent is 4

The standard deviation as indicated above is greater than .63 indicating that the responses of respondents are distributed from the mean.

A/ Quantitative data results

Objective#1: What is the status of the implementation of teachers' self-regulation /teaching with self-regulation in secondary school science teaching?

The study was basically intended to examine the level or practice of self-regulated science teaching in the study area. So, to determine the level of practice from the self-report data, the observed mean was compared with the test value of the scale (3, whose value given was uncertain'). Hence, the observed mean score of the factored data is found to be 3.97, SD=.39 which is above the expected mean when a one sample t-test analysis was done. So, the result indicates that there is a positive significant mean difference t (301) =43.70, p=.000 two tailed, with effect size, d= 2 as indicated in table 10. From the mean, it is possible to say that teachers in the study area are being implementing SRST (Self-regulated science teaching) strategy more than a test value of 3. The confidence interval lies between .9 and 1 which indicates as large differences. The effect size also confirms the presence of huge difference which is 2,(Leech, Barrett, & Morgan, 2005) in table 10. But this may not guarantee the frequency of their implementation which needs further investigation.

Table 10

One-Sample Test of Mean Difference Between Observed Mean and Test Value

	Test Value = 3.0					
	t	df	Sig. (2-tailed)	Mean Difference	95% CI	
					Lower	Upper
SRST	43.7	301	.000	0.9702	0.9265	1.0139

*P<.05

Objective # 1.1: Which phase/s of SR is/are mostly teachers applying in their classroom teaching?

This objective is focused on the comparison of the self-regulated phases being implemented by science teachers; the self-report data when analyzed using mean comparison, the descriptive

statistics indicates that teachers reported that they are implementing preparatory phase (phase one or forethought phase) Mean=73.7, SD=7.6(intrinsic interest, mastery goal orientations, performance goal orientations and goal setting) more than the other two phases (phase two or performance phase, M=27.6,SD=3.6(which contains Help seeking, self-instruction, controlling the self) and phase three or self-reaction/self-reflection phases, M=45.3,SD=5.9 which contains self-reaction, emotional control and self-evaluation).

Table 11

Descriptive Statistics

	phase1	phase2	phase3
Mean	73.6	27.5	45.29
N	302	302	302
SD	7.6	3.6	5.9

Note. This shows which phase teachers are implementing morethan the other based on means

Phase one which is forethought phase or preparatory phase (goal setting, mastery goal orientation, performance goal or outcome expectation, Intrinsic interest) were found greater than the other two phases as indicated in table 11 above.

Though the self-report data shows that teachers are implementing all the three phases of self-regulation, the descriptive statistics shows that they are implementing the preparatory phase (goal setting, planning, selecting strategies and awareness of their self-motivation) more than the other two phases which indicates unequal implementation of phases.

Objective#1.2: Do teachers' gender and year of teaching experience significantly predict teachers' self- regulation practice?

To answer the predictive capacity of gender and teaching experience indicated in the question for the implementation of self-regulated science teaching in secondary schools of the

study area, standard or simultaneous multiple regressions analysis method was used. In the analysis procedure, both the two variables (gender and teaching experience were entered and analyzed simultaneously using GLM- General linear model). The multiple regression analysis result is indicated in table 12.

Table 12

Standardizedand unstandrdized Regression Coefficients for Gender and Experience VariablesEntered into the model

	B	Std. Error	Beta	t	sig
(Constant)	140.333	.3.522		39.850	.000
year of experience	.653	.926	.039	.687	.493
Sexof participants	3.751	1.951	.110	1.915	.056

The multiple regressions was conducted to determine the best linear combination of gender, and teaching experience for predicting teachers' self-regulated science teaching in the secondary schools using entered method. But the result indicated the model was **not** found significant F (2,299) = 2.005, p=.136 which is> .005. The combination of the variables does not predict the criterion variable. The model explained 0.7% variance (adjusted R^2 =.007). Besides this the correlation matrices between SR and years of teaching experience is nearly zero or do not have correlation (SRr with sex is=.10, and with experience=.03) which does not coincide with theoretical arguments which argues that when teachers get more and more experienced, they would have a chance of implementing innovative teaching strategies. So, this may need further investigation using longitudinal study or observation method.

Objective #1.3: Is there a significant difference between male and female teachers in the implementation of self-regulated teaching?

To identify the level of self-regulated science teaching among male and female teachers, the independent one sample t-test was conducted and the analysis result showed that there is a significant mean difference (M=3.94, SD=.39, t (300), =2.44, p=.015 two tailed)and females' M=4.07, SD. =.39 in the implementation of self-regulated teaching between male and female science teachers as indicated in table 13. The mean of the male groups are approaching to 4, which is 'agree' and that of females is greater than 4 but lessen 4.5 which is also labeled as 'agree'. However, the effect size is examined using the square root of pooled variance (Brace, Kemp & Snlegar,2009) to show the effect size (Cohen's d) due to sample size differences and found to be *d*= 0.1(10%), which is very small effect size as cited in (Leech, Barrett & Morgan,2005) and the mean difference is 4.067-3.940=.0127 is also small among male and the SD is equal for male and female. However, female teachers show somehow better in their self-regulated teaching strategy use than males.

Table 13

Independent Sample Test of Gender Difference in SRTS

Group Statistics									
Sexof participants	N	Mean	Std. Deviation	Std.Error Mean	F	Sig.	t	df	Sig.(2-tailed)
Male	231	3.940	0.38157	0.02511	0.01	0.91	2.438	300	0.015
Female	71	4.067	0.38631	0.04585					

*P<.05

From table 13,

B/ Part two

2/ Analysis using SEM

To answer research question number 2, 3, 4, and 5 analyses using structural equation modeling by AMoS software version23 was used and the results are procedurally presented below. According to Hoyle (1995 as cited in Weston, 2006), a model is a statistical statement expressed with equations or a diagram about the hypothesized relationships among variables based on theory and research. Hence**, t**he hypothesized theoretical model was designated as

Figure 6

Hypothetical Research Model

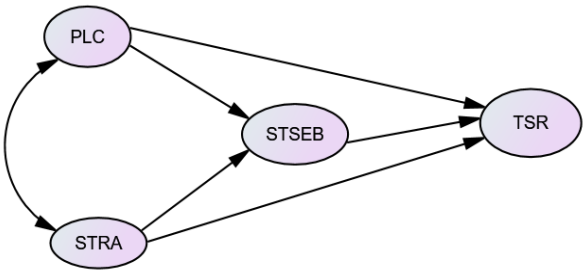


Figure 6 represents the assumption that the professional learning community practice (PLC) construct and science teaching resource availability (STRA) have a causal relationship with teachers' self-regulation (SRT) use via science teaching self-efficacy belief (STSEB).

So, the model used for this analysis was structural equation modeling (analysis of movement structure, AMOS) to show the causal relationship among the variables. The analysis was started

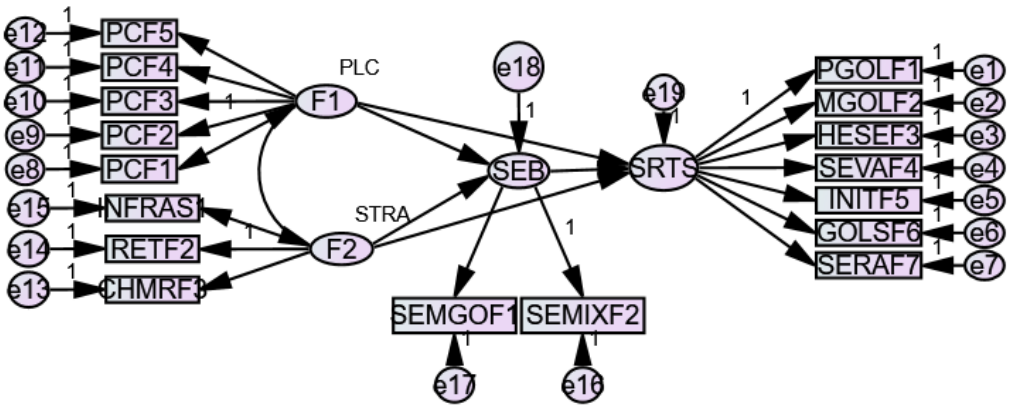
procedurally by model specification, model identification, model estimation and model evaluation.

a/ **Model specification**

This step involves justifying variables' relationships in a hypothesized conceptual path model using theory and previous researches. Model specification is a first step in confirmatory factor analysis, just as it was for multiple regression and path models. Model specification is necessary because many different relations amongst a set of variables can be postulated with many different parameters being estimated(Schumacker & Lomax, 2016). The specification is based on the hypothesized model driven from theory. So, figure 7 represents the specification of the hypothesized model.

Figure 7

Specified Model


e12
e11
e10
e9
e8
e15
e14
e13
PCF5
PCF4
PCF3
PCF2
PCF1
NFRASF
RETF2
CHMRF3
PLC
F1
STRA
F2
e18
SEB
e19
SRTS
PGOLF1
MGOLF2
HESEF3
SEVAF4
INITF5
GOLSF6
SERAF7
e1
e2
e3
e4
e5
e6
e7
SEMGOF1
SEMIXF2
e17
e16

From figure 7, F1/PLC (professional learning community variable) and F2/STRA (science teaching resource availability) are exogenous or independent or unobserved variables, whereas SEB (science teaching self-efficacy belief) is used as both independent and endogenous variable and SRT use (self-regulated teaching) is endogenous variables or outcome/criterion variable. The SEB construct in this model is both an exogenous and endogenous variable. For PLC exogenous variable, there are 5 factors containing composite items serve as indicators or observed variables with 5 error terms; and the science teaching resource availability (STRA/F2) construct has 3 composite indicators or observed variables and 3 error terms; Whereas the mediating variable (STEB) contains two indicators (personal self-efficacy belief and outcome expectancy beliefs and 2 error terms and one residual error term. The endogenous variable (SRTS) contains 7 indicators, 7 error terms and one residual error term. The indicators or observed variables of the four latent factors are composite factors containing different number of items. For example, in PLC latent variable PCF1(professional learning community factor one) is composed of 5 items, PCF2 is composed of 4 items, PCF3, and PCF5 are each composed of 3 items and PCF4 containing 4 items with a reliability of Cronbach alpha of greater than .66. And the Science Teaching Resource Availability construct consisted of four composite factors with 4 error variances; the INFRAS1(infrastructure factor one) is composed of 8 items, CHMRF3(chemicals and equipment factor three) is composed of 3 items, RETF2(References and texts factor two) composed of 2 items. One factor from SEB mediator variable and from science teaching resource availability each was excluded due to the number of items they retain is one. This is based on the recommendation of Hoyle (2013) which suggests that factors with less than three items and a load of less than .4 should be excluded. The reliability of the factors was found to be greater than .66 and subjected to be included in the analysis. The mediator variable (SEB) Science Teaching

Self-efficacy Belief was assumed to be explained by the two factors with two error variance and one residual. From the two factors, SEMGOF1 (Personal Self efficacy for mastery goal expectancy factor one) is composed of 5 items whereas outcome expectancyi.e., performance expectancy (SEMIXF2) is composed of 7 items and their reliability is above .59. The endogenous self-regulated science teaching (SRTS) variable has 7 factors from which factor one (PGOLF1, performance goal orientation factor one) composed of 4 items whereas the last or the 7^{th} factor is composed of only two items and the other five factors are composed of 3 items each and their reliability coefficient ranges from an alpha of .51 to .76.

From the hypothesized model, there are arrows that show direct effect and indirect effect and one non- defined correlation/ relationship/. The PLC and STRA latent variables were hypothesized to have a direct effect on self-regulated science teaching (SRST) and an indirect effect through the mediating variable (science teaching efficacy belief, STEB). There is also covariance between the exogenous variables (PLC & STRA) connected by a bi-directional headed arrow. The error terms from each indicator explains the difference which is not explained by the indicator which does not fully explain the latent variable. And the residual error term explains the discrepancy of the variance that is not explained by the predictors. Generally, the model consists of two dimensions, the measurement model which explains the relationship between the latent variables and the indicators or observed variables, and the structural model which depicts the relationship among the exogenous latent factors and endogenous variables. From the observed variable the path from STRA unobserved variable to RET (reference and texts factor) is assigned to be fixed not to be estimated; from PLC latent factor PCF1 indicator, from SEB latent variable, SEMGOF2 indictor, and from SRST latent variable POGF1 indicator are fixed parameters to take as a scale temporarily.

B/ Model Identification

To assess whether the proposed model is fit or not, the first thing to do in this stage is identifying the number of distinct values, the number of parameters to be estimated and the degree of freedom. And we have to confirm that the number of free parameters to be estimated must be less than or equal to the number of distinct values in the matrix of *S(*sample). Hence, from the specified model there are 17 indicators or observed variables, 17 error terms, 5 path loadings and there is 1 covariance among two latent variables. Generally, there are 40 parameters to be estimated; the number of distinct values can be calculated by p(p+1)/2, where p= the number of observed variables in the model. Therefore, p=17; 17(17+1)/2= 9*17= 153; hence, the number of distinct sample movements S (153) is greater than the number of free parameters, 40. The degree of freedom = 153-40=113 degrees of freedom. This model is *over-identified* because there are more values in *S* than parameters to be estimated, that is, the degrees of freedom in this model is positive not zero (*just-identified*) or negative (*under-identified*). So, the parameters can be estimated. To estimate the parameters, the default maximum likely hood (ML) method was used; besides its default, ML is robust to moderate violations of the normality assumption (Anderson &Gerbing, 1984, as cited in Weston, 2006)

C/ Model estimation

To conduct the above analyses, both a structural (i.e., path and a measurement) models are designed by the researcher. The structural model refers to the relationships among latent variables, and allows the researcher to determine their degree of effect (calculated as path coefficients). That is, path coefficients were used as measuring the importance of a given path of influence from cause to effect. Each structural equation coefficient was computed while all other

variances were taken into account. Thus, coefficients were calculated simultaneously for all endogenous variables rather than sequentially as in regular multiple regression models.

So, the next step after identification is estimating the parameters using the default maximum likelihood method available to researchers using Amos program (Meyers, Gamst&Guarino, 2005). Based on the results of the estimation, the proposed variance-covariance metric is compared against with the actual or the population metrics using Chi-square value, degrees of freedom, and the p-value. According to Schumacher and Lomax (2016), a non-significance of the chi-square statistic is indicating the model is tested for fit, and other subjective indices. When the chi-square is non-significant, it indicates that the original variance–covariance matrix and the model-implied variance–covariance matrix are similar. This implies that the model is a good representation of the relations amongst the observed variables. Hence, the chi-square statistic of this model is found to be significant.

Though different research results and references recommend to use other alternative fit indexes to evaluate model fit, majority of them recommend to use *Comparative fit indices*, (CFI), *standard root mean residual* (SRMR), and *Root mean squared error approximation* (RMSEA) (O'Rourke& Hatcher,2013; Hoyle,2013; Byrne,2016; Schumacker& Lomax,2016)

Table 14

Standardized and unstandardized estimates of initial model

paths			Beta(st.E)	B(uns.Et)	S.E.	C.R.	P
SEB	<---	PLC	0.417	0.446	0.114	4.404	***
SEB	<---	STRA	0.109	0.982	0.643	1.063	0.288
SRTS	<---	SEB	0.394	0.oo3	0.042	4.439	***
SRTS	<---	PLC	0.371	0.191	0.067	3.194	0.001
SRTS	<---	STRA	0.027	0.22	0.335	0.241	0.81

Note. Beta(st.E)=standardized estimate, B(unst.E)=un standardized estimate, S.E.=standard error, C.R.=critical value(t) and P<or=.05

So, from the table above, the relationships between STRA and SEB, STRA and SRTS are not significant (p>.05).

D/ Model evaluation

This section evaluates the extent to which a hypothesized model fits or adequately describes the sample data. This includes the feasibility of parameter estimates, the appropriateness of the standard errors and statistical significance of the whole model. Hence, the model was found to be significant at X^2=203.038, DF=113, CMIN/DF=1.79 which is below the recommended value <3, and p=.000(<.05) implying that the discrepancy between the sample variance-covariance metrics(S) and the expected population variance-covariance metrics (sigma, ∑) is not close to zero (Byrne,2016). And from the estimates of latent variables and observed (indicator) variables, the *Goal setting indicator of self-regulation* was detected as non-significant and subjected for reduction from the model. Besides this, non-significant path coefficients between STRA to SEB and SRST are detected. However, from the estimated model, there are no negative error values and covariance from the output; the estimated values for the parameters are not too small and not too large even though there is no cut of points (Byrne, 2016; Schermelleh-Engel, Moosbrugger, & Müller, 2003), except the standard estimates for F2 with both SEB and SRST which is not significant.

Guidelines for appropriate fit are a hot topic for debate among statistician resulting uncertainty (Weston, 2006); there is no consensus about what constitutes ‘a good fit’(Schermelleh-Engel et al., 2003). Though, the result of chi-square statistic of the model does not fit the data, the other alternative fit statistics can be considered for the evaluation of the model. For example, standard

root mean residual is the average value across all standard residuals which resulted (SRMR=.055; the comparative fit index compares the model with base line model or null model and found to be CFI=.94 which is also close fit; and the root mean square error approximation is found to be RMSEA=.049 (p=40%) which is less than the cut of point .06 showed good fit. So, generally it is possible to say that the overall alternative fit indices show good fit to the data. However, from the model, the goal setting indicator of SRST (self-regulated science teaching) dependent variable and the path coefficients from STRA to SRST, and from STRA to the mediating variable (SEB) is found to be non-significant. Hence, the non-significant indicator was reduced from the model to find well fit model, by modification from estimation output. The modification is taken by making covariance among error terms of the indicators based on their values which are greater than 10.0 (Weston, 2006; Schumacher & Lomax, 2016; Byrne, 2016). Hence, based on the modification results, the covariance from error term-12 of factor-1(infrastructure) and error term13 from factor-3(chemicals and materials) were formed; which indicated that the two factors can share the indicators in common which seems reasonable in a way that the infrastructure includes the materials also.

Table 15

Standardized and unstandardized estimates of a modified model

Path	St In,E	Beta(st.es)	B(un.est.)	S.E.	C.R.	P
SEB<---	PLC	0.372	0.446	0.123	3.612	***
SEB<---.	STRA	0.17	0.982	0.668	1.47	0.142
SRTS<---	SEB	0.402	0.191	0.043	4.464	***
SRTS<---	PLC .15(TE,.56)	0.386	0.22	0.07	3.132	0.002
SRTS<---	STRA .06(TE.07)	0.001	0.003	0.34	0.01	0.992

**P<.05, TE=total effect

Table 16

Goodness of fit indices of models (N=302)

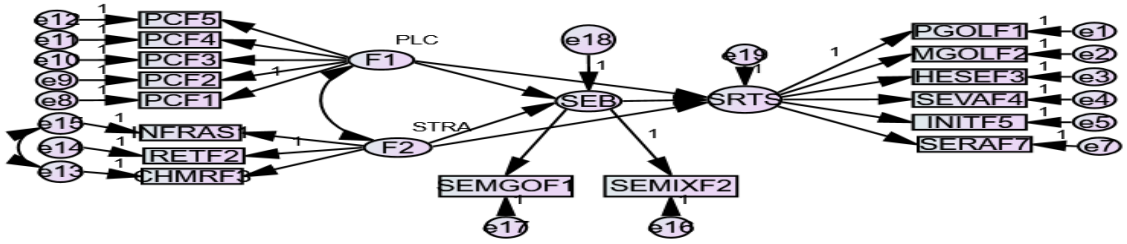
MODEL	Chi square(X^2)	DF	P	CFI	SRMR	RMSEA	CI-90%
Initial model	212.313	113	.000	0.93	0.057	0.054	27%
Revised model	171.547	97	.000	0.94	0.055	0.053	32%

***P<.001

The revised model as indicated in table 16 shows a decrement of chi-square value, and degree of freedom. The modification made on the model is depicted in Figure 8 with correlation and their e

Figure 8

Modified SEM model



Note. From Figure 8 PC –professional learning factor; INFRAS= infrastructure factor; CEMRE=chemical resources and their error terms form covariates

Results of SEM analysis

Objective #2: Does the hypothesised model fit to the data?

From the abovestatistics, the modified model changes the value of allmost all fit indices. The descripancey between the sample variance-covariance and the population variance-covarianc statistics($X^{2)}$ has decreased from 212.313 to 171..547 and the degree of freedom also decreased from 113 to 97, but the P- value remains significant, p=. 000. More over the ratio between chi-square statistics (CMIN) to degree of freedom (DF) =CMIN/DF=1.85 is less than 3 indicating that it fulfills the minimum requirement for the model fit. Besides this, the fit of other alternative model fit indices after modification show almost a good fit (SRMR=.055 which is good fit; CFI=.94, which is close to fit; and RMSEA=.053 with p-value 32% as indicated in the table 16 which is good fit according to Joreskog and Sorbom (1996a as cited in Byrne, 2016) which explained that the P-value for RMSEA should be <. 06. Therefore, based on the alternative fit indices' value, it is to say that the hypothesized model describes well the sample data

Objective#3: Is there a significant relationship between school related variables (resource availability and professional learning community) and teachers' personal factor (self-efficacy belief)?

The study was intended to detect whether the hypothesized model describes or explains the sample data or not and to identify the causal relationship or the effects of exogenous variables with the endogenous variables. The analysis result also shows the relationship between the exogenous, mediating variable and the outcome or endogenous variables. Therefore, the Pearson correlation analysis result shows that there is significant positive relationship between PLC and TSEB;r=.299**, PLC and STRA,r=466**, STRA and TSEB, r=.201**. The SRT outcome variable

has a significant positive correlation with the predictor variables (with PLC, STRA and TSEB, r=.490;.284; & ..358 at p=.01 level respectively). However, the estimates of SEM analysis showed that the Science Teaching Resource Availability construct (STRA) does not have a significant effect on self-regulated teaching construct and science teaching efficacy belief (standardized effect, Beta=.001, Regression weight, B=.003, p=.558 two tailed) and an indirect effect of (Beta=.068, B=.188, p=.277 two-tailed) and a total effect (both direct and indirect) of (Beta=.07, B=.19, P=.46 two tailed). However, the hypothesized causal relationship or the direct, indirect and total effects of STRA on SRST are not statistically significant (p >.05), the confidence interval contains zero. Besides this, its direct effects on the mediating variable (teaching-self-efficacy belief) are Beta=.17, B=.98, p=.403 two tailed; which is not statistically significant (p >.05). Therefore, the availability of science teaching resources for self-regulation was found a non-significant contributor for teachers' self-regulated science teaching practice either through the mediating variable and direct effects. But, professional learning community variable show a positive significant relationship with both self-efficacy belief and self-regulated teaching constructs.

Whereas the professional learning community practice in the schools in the model estimates indicate that it has a significant direct effect (Beta=.39, B=.22, p=.002 two tailed) and a significant indirect effect (Beta=.15, B=.09, p=.001 two tailed) on self-regulated science teaching via the science teaching efficacy belief variable.

The result indicates that there is no significant relationship between science teaching resource school variable and teachers' teaching self-efficacy belief mediating variable; besides this, the result shows that this variable has no a significant effect on teachers' self-regulated teaching both directly and indirectly.

Objective #4: Do the three variables (teaching resource availability, professional learning community, and self-efficacy belief) independently affect the implementations of teachers' self-regulation? If so, which one of them contributes the highest variance of the implementation of SR?

The total (direct and indirect) effect of PLC on SRTS is also found significant (Beta=.54, B= .31, P=.003 two tailed). The total effect that PLC has a variance of (54%) on SRTS use is greater than its direct and indirect effect. The analysis result from the table 15 above reveals that only teachers' self-efficacy belief and professional learning community variables significantly affect the self-regulated teaching variable and the two variables have nearly equal variance; however, teachers' self-efficacy belief variable or the mediating variable has a bit more (40%) than that of the variance explained by PLC(39%).The direct effect of PLC (Beta=,39)on SRT is greater than its indirect effect via teachers' self-efficacy belief(Beta=,15). However, the total effect is better than that of only direct and indirect effects.

Objective # 5: What is the mediating role of SEB in explaining relationships between School related variables and teachers' self-regulated teaching?

The structural equation modeling and path analysis result reveals that the STEB construct played its mediation role on the relationship between professional learning community practice and self-regulated science teaching endogenous variable as expected in the model. The science teaching self-efficacy belief construct which is a mediating variable has a significant effect on self-regulated science teaching variable (Beta=.402, B=.19, p=.002). The significant p-value indicates us that there is no zero in the confidence intervals, whereas, its mediation role does not serve for

the relationship between science teaching resource availability variable and self-regulated teaching variable.

B/Qualitative data analysis

Self-regulated teaching is more than what we normally doing, because it demands teachers to ask and evaluate themselves about their teaching-learning process effectiveness starting from preparatory phase up to the reflection/reaction phase. Hence, the purpose of the study was to get data from those implementers (secondary school science teachers) in addition to the self-report survey data for triangulation purpose.

To make confidentiality of the respondents, a three letter code is assigned for each participant; the first letter represents their names' 1st letter, the second letter represents the subject they teach(C= Chemistry, P=Physics, B= Biology), and the third letter represents the name of the school they teach(S= Tewoderos secondary school, P= preparatory secondary school) and the number is the sequence according to they interviewed.

The researcher observed the classroom as non-participant observer by checking their lesson plan and their visible activities which are related to self-regulated teaching using a checklist.

After the interview, transcription and interpretation were done three times by repeatedly listening the recorded audio in addition to the short note taken. Their response was recorded and transcribed and interpreted thematically by the five themes (the three phases' themes, conceptual understanding theme and one challenges theme). Primarily the interview questions were arranged based on those themes. Therefore, the interviewees' responses were coded and categorized according to conceptual understanding, fore thought phase, Performance phase, Self-reaction/ Self-reflection phase, and Challenges of TSEB themes.

Theme 1 Conceptual understanding

Participants were interviewed how much understanding, experience and knowledge on self-regulated teaching they have. So, 4 out of 11 respondents confirmed that they do have some conceptual knowledge and understanding on self-regulated teaching based on contextual meaning, for example MCP2 said that, "generally I saw it as concentrating and directing the self during preparation and delivering the lesson." Participant WBP4 noted that "self-regulated teaching is having self-efficacy, using teaching aids delivering the lesson to students. '' Whereas interviewee FBP6 explained self-regulated teaching as self-regulated learning by saying "Self-regulated teaching is enabling students to have their own responsibility and commitment for their learning**.**'' And respondent ZPS8 said, "Self-regulated teaching is equipping the self.'' And GPP9 noted that "self-regulated teaching is teaching students by keeping the professional ethics.'' But, other interviewees noted that the concept is new to them; for example, participant HCS8 explained it somewhat deviated from others' definition by saying "I never work on this issue so far.''

Theme2, preparatory Phase of Self-regulated teaching

In this phase teachers are expected to have full preparation (resource identification used for the teaching –learning process, asking about their level of motivation, teaching self-efficacy belief to deliver the lesson effectively, able to plan and setting goals and selecting appropriate strategy for the execution of the plan; how much they consider their students' needs and characteristics.

So, all the 11 participants responded that preparing the self, and evaluating their preparation to provide the lesson is their day to day activities by identifying the resources needed from inside

and outside the school, reading references, browsing from internets, doing activities and asking friends whenever needed.

For example, participant GPP9 said, “I confirm my readiness, I do not say I know the subject before because the profession demands me to always update and upgrade my knowledge of the subject matter and pedagogical skill to teach effectively.’’ In addition to this, they confirmed that they evaluate how much they make ready themselves to deliver the lesson.

Interviewee MBS1 noted that;

> Before entering to the class, I always confirm and have to have deep knowledge and understanding by reading the text and other references, I ask myself how much I understand the concept I am going to teach. I am not influenced by the lack of resources in the laboratory instead I use local materials as teaching aids.

Nearly half of the participants(5) explained and observed preparing and using lesson plan as their roadmap for the delivery of their lesson whereas those of the 6 participants explained as they do not prepare and use lesson plan which is one of the major components of the preparatory phase. For instance, interviewee TCS5 contends that “I prepare myself before entering class and evaluate my preparation against the requirements.’’

> The interviewer paused; you were not seen prepared and use the lesson plan during classroom observation; so how do you say I prepare myself before class without lesson pan?

The interviewee replied:

> Yes actually we do not have lesson plan for these two years; there is no reason why, may be lack of follow up from the school principals; however, with this limitations, we tried to make ready and evaluate our preparation before class.

Interviewee FPS10 andTBP11 explained similarly that during their preparation they do not assess the necessary materials for teaching aids available in and outside the school.

The interviewer asked; why do not you do that?

Participant FPS10 for example reasoned that; "it is due to lack of motivation, limitations of knowledge and skills on how to use and conduct laboratory activities. For this reason we teach students theoretical concepts only."

During preparatory phase, the main activity is to set learning objectives and selecting appropriate strategies used to achieve those learning objectives. So, 5 of the 11 interviewees replied that they usually set their lesson objectives and the strategies used to achieve the already identified lesson objectives; whereas the other 6 participants said, "though we did not prepare lesson plan, with its teaching strategies, we usually use lecturing, oral questioning, giving notes and sometimes practical work. "Besides this, participants confirm that they do not have a habit and knowledge of considering students' characteristics and needs during their preparation time. However, 4 of the interviewees said that they only consider those of slow learners and 4 of them replied that their preparation is the same for all types of students which is 'one size fits all' approach''

Whereas 2 of them confirmed that they consider and follow only those of active/ fast learners. But surprisingly, participant ZPS7 said "I never get such type of learner that needs support.''

To identify whether participants' preparation is for mastery or performance goal orientations, they were asked whether they like and if so why they like the teaching profession. Hence, 6 of them said that they like the teaching profession due to its purpose which is producing competent generation for the country; and 2 of them reasoned that they like the profession due to their model teachers while they were a student. And 2 of the participants stated that they like the profession due to its freedom and free from corruption.

A question for one of the interviewee (ECP3) is raised, you said that it is free from corruption; did not you give free mark for your student/s?

The interviewee replied: "ha ha ha may be I gave.'' Where as one of the participants, MBS1 said "I like the profession because it enables me to update and upgrade myself starting from certificate up to master level. She added that, to tell you frankly, I had a chance to change the profession but I do not want and I will not because I like it very much.''

Theme3. Performance phase

Interviewees' response on the 6 questions related to how they control, record and evaluate their activity, emotion, and use of resources is categorized in to performance or volitional phase. Hence, all the 11 participants noted that they tried to control their resource use (eg. time) their emotion, speed and pitch of sound.

The interviewee MBS1 for example explained that:

> Students' perceptions towards female teachers are not good; they believe that female teachers not capable and not effective, due to this they were disturbing me in the classroom. But, until they know me I was very tolerant and able to manage my emotion.

> Besides this, I control my activities while I am teaching and make a special sign on what should be improved for the next class.

WBP4 noted, "I manage the teaching learning process while I am in class and myself based on the lesson. In addition to this, I ask students to get feedback and I use the 40 minutes effectively.'' EBP3 also said "mostly I tried to control my activities while I am in classroom with some exception due to shortage of time.'' Participant TCS5 added that "I control myself by asking 'am I fast? But I cannot control my sound pitch especially when I was excited by the topic I teach."

Regarding evaluating the self, respondent MBS1 reported that;

> I evaluate and judge myself from students' facial expression; and if I know that I am not effective, I change my methodology besides this, when I am not clear on some issues/topics, mistakes that I made, I usually highlight it with red color in my note book to improve for the next time. I also learn from my mistakes and practice and from others horizontally and vertically to improve my professional knowledge and skill.

The other 10 interviewees replied similarly that they evaluate their activity during classroom teaching mostly from students' facial expression, questions and answers. Participant ECP3 replied, "I ask comments from students to tell me my limitations; if students do not respond for the questions forwarded, I ask myself 'am I not effective?''FBP6 also replied that she evaluate herself by asking 'what is my strong side and weakness?' from students' response for the questions given to them. In line with this, participant GPP9 contend that, "though it is difficult and an unusual evaluating the self, I evaluate myself from students' participation. If students do

not respond to the questions forwarded to them, I recognize that there is a problem of delivery of the lesson.''

Whereas interviewee HCS8 explained differently that; "I do not have a habit of controlling and evaluating myself, but I usually increase the pitch of my sound; I learn from my own classroom practice from students too; and ask help from my friends when ever needed.''

Participant MCP2 said that:

> As a teacher we have to check ourselves and ask students whether they are clear with the lesson and my effectiveness, manage my classroom and me. I also learn from the instruction provided to students and make ready for the next class and from students' feedback. However, I do not ask help from other teachers because, most of them are coming up by upgrading during summer program rather I get help from internet and other references. To challenge the challenges that I face, for example, if students shout suddenly in the classroom, first I tried to analyze the problem and understand by staying calm and find solution for the problem.

During the performance phase, all the 11 interviewees replied that there are limitations while they are in the teaching- learning process, from self-practice and from students' too and believed that it is inevitable with them. Except two of the interviewees, all replied that they ask help from their friends when ever needed to minimize their limitations. But, ECP3 noted, "I do not ask help from anybody however I do when I got personal problem.'' Concerning recording of activities and limitations for improvement, MCP2 contend that "I usually record mentally especially my limitations and try to improve for the next class.'' The other 8 interviewees also added that they record their limitations mostly to improve for the next time as the teaching –learning process is

going on; whereas the other two, HCS8 and GPP9 expressed that they do not record their classroom activities. And TBS11 said, “It is a must, limitation is with us; for example, when students asked me which I do not know, gave me an opportunity to record and read for farther improvement.’’

Self-regulated teachers are expected to be calm, stable and capable of tackling the challenges whenever they face while they are in their classroom. So, interviewees listed different experiences of tackling challenges. Participant FPS10 for example expressed that “when I get students playing with mobile in the classroom, I do not control my emotion and I will let them out of the class though it is wrong.’’ Similarly the other 5 participants replied that they show different negative reactions towards the challenges they face in their classroom. For instance participant TCS5 said, “I become nervous and upset when students disturb me but, I become cool soon.” Participant FBP6 also contends that, “I am nervous however I tried to control my emotion.’’ “When students disturb me, I will not tolerate them and let them out if not I will leave the class.’’ said HCS8. In line with this, interviewee TBS11 added that, “I feel angry and upset when I get a challenge.’’

Whereas, the other 5 participants reported that they do not become disappointed, disturbed and upset when they face challenges while they are in class. For example, ‘’ I would be calm and conscious to analyze the challenge if there is gap with my preparation, I will tell students clearly.’’ Said participant GPP9. Interviewee WBP4 also replied that “I never be offended when I get a challenge, I stay calm and try to tackle it systematically.’’

Theme 4 . Self-reaction/ Self-reflection phase

Interviewees were asked to express their practice and knowledge on how they evaluate their success, students' satisfaction from their teaching, and what they feel when they are successful and unsuccessful in their teaching. So, their views and practice is coded and themed under self-reaction/self-reflection theme. Therefore , all the 11 interviewees replied that at the end of their last minutes of the classroom teaching, they summarize the main points of the lesson, ask questions whether students understand what they learned, and based on students' feedback teachers evaluate their effectiveness. For example, interviewees MBS1 and MCP2 similarly confirmed that they ask students summary questions and take their response as feedback for feed forward; they revise the main points of the daily lesson, and understand their effectiveness from their response and facial expression.

Participant ECP3 replied, "At the end of my lesson class, I summarize the main points of the topic based on the learning objectives, and I evaluate myself from students response. If students do not respond, I repeat the lesson in Amharic language to solve language related problems.'' In the same manner, participant TCS5 reported that, "at my last minutes, I summarize the main points of the lesson by asking questions and I judge my preparation if there is limitation and recognizing that students are not clear, I change my approach and repeat the lesson.''

Participant WBP4, FBP6, ZPS7, HCS8, GPP9, FPS10 and TBS11 expressed similarly that they summarize their lesson by asking questions by their last minutes of classroom teaching and evaluate their effectiveness based on students' response, students' participation, and facial expression. Besides this, all the 11 interviewees confirmed that they feel unhappy, become restless and do not feel comfort when they realize that they are not successful in their teaching and try to check themselves where and what is behind their ineffectiveness. However, they contend that they feel happy and become more motivated for further improvement when they

recognize that they are successful in their teaching. They also said that evaluating students' satisfaction is used as an eye glass to correct their limitations; they also explained that they use students' facial expression as indications of students' satisfaction.

Interviewee MBS1 said,'' students show different characteristics when they are not satisfied by my teaching; for example, they do not standup when I entered to the class. So, at this time I understand that there is a gap in my teaching.'' Interviewee ECP3 replied that "I evaluate students' satisfaction by asking about the learned topics and if they do not respond, I ask myself by saying where is the problem?'' TCS5 replied that;

> I check students' satisfaction by their responses for example, when I say good bye, they respond 'thank you teacher' otherwise they keep quite if they do not satisfied. So, I recognize that I am not effective and make ready myself to plan and revise the lesson as well as my approach.''

Participant FBP6 expressed that, " I ask students whether they are clear or not on the lesson learned and if they respond wrongly, I tried to repeat the lesson again or I arrange an extra time as a makeup.'' Finally interviewee TBS11 said that, "I always see my strength and limitations from students' response and facial expression.''

Another issue is the difference in their self-regulated teaching effectiveness between male and female teachers. Individuals in their profession have different performances even among the same sex. However, there may be average differences among gender in their teaching effectiveness. Hence, the interviewees gave their witness about self-regulated teaching effectiveness between male and female teachers. Hence, except the two, the other 9 interviewees similarly confirmed that females are more effective in their teaching –learning process than male

teachers. For instance, Participant MBS1said, “actually it is difficult to judge, however, though there is individual difference; mostly female teachers are more concerned for their duties though they have additional commitment. But male teachers need to be engaged in extra activities and they do not give emphasis to their original task.’’ Interviewee MCP2 replied; “as to me, females are more concerned, use their time effectively, they give more attention for their teaching than male teachers even when they are in pregnancy.’’

Interviewee WBP4 also replied that “I think females are more effective than male teachers; because, females use their time effectively, they give attention for their preparation, more sensitive and committed and concerned.’’ And participant TCS5- reported that ;” there is difference between male and female teachers in teaching science effectively because female teachers are more concerned, caring, devoted, use their time effectively, than male teachers.’’

Participant FBP6 contend differently that; “As to me it is males that are effective in their teaching; because, females have additional commitment (like home management) and due to this, they do not manage their time, do not prepare effectively due to shortage of time and lack confidence in their teaching.

Interviewees GPP9 and FPS10 replied in the same way as others; “ Generally speaking, females are better than males; because female teachers are more committed, they give more attention for their task, dedicated and devote their maximum effort towards their teaching.’’ TBS11, HCS8, and ZPS7 also gave their opinion in the same way that though it is difficult to conclude, however female teachers are better than males in their teaching effectiveness, they are more committed, give more attention, concentrated and accommodative and loyal to their job.

Theme 5, Challenges of SRT

Participants were interviewed about the challenges in their teaching-learning process that they believe that imped their implementations of self-regulated teaching. Hence, except two of the interviewees, almost all stated that lack of teaching aids, laboratory facilities, and references, lack of professional development opportunities and support and supervision from principals as their major challenges. For example, participant TBS11 expressed that "lack of teaching resources affect my teaching efficacy belief; another challenge is lack of professional training opportunities and experience sharing and limited principals' support.'' " Lack of attention and respect for teachers and the profession, students motivation for learning and lack of science teaching materials are some of the challenges.'' said participant FPS10.

Participant ZPS7 explained a different challenge by saying "my challenge is being female; eg. during menstruation and pregnancy time challenges my efficacy.''

Respondent HCS8 said:

> Lack of laboratory facilities decreases my motivation to teach practically. There is no professional learning practice even in department wise or at school level though we do share among friends informally. There is no strong support and continuous supervision structure and practice from school principals and that is why preparation of lesson plan is ignored.

Participant TCS5 contend that, lack of laboratory materials, equipment, experts that provide support and training, how to teach chemistry, absence of professional knowledge and experience sharing opportunities and practices are challenges of his teaching efficacy belief.

Surprisingly, one of the interviewees (MBS1) explained her confidence that, " there is no anything that affects my teaching efficacy belief though there is no formal professional learning

community practice, we informally share knowledge and experience on the subject we teach; but, there is no visible principals' role in this regard.''

Interviewee MCP2 replied that, " there are many things that affect my teaching efficacy belief, for example students' low motivation to learn, lack of community respect for the teaching profession, shortage of science teaching resources , and lack of opportunities for professional knowledge and experience sharing.''

Results

Objective# 6: How do teachers' implement self-regulated science teaching?

The analysis result indicates that majority of the interviewees confirmed that they lack knowledge and conceptual understanding on SRT and the concept is new to them. However, they agreed that they usually evaluate their preparation including their self-efficacy to deliver the lesson, assess their environments, and set goal/learning objectives (half of them) use different strategy to deliver the lesson in the preparatory phase. But, those from secondary schools were not seen preparing and using their lesson plan which lack the preparatory phase. During the performance phase, teachers of the study area confirmed that they control, observe and judge their activity during their classroom teaching and they learn from their own practice and students' feedback. Moreover, they usually revise their lesson by asking students, they evaluate their effectiveness from students' response and facial expression; their satisfaction enables them to be motivated for further performance and become unhappy or feel discomfort when they recognize that they are not successful in their teaching. Therefore, though more than half of the participant teachers lack conceptual knowledge and understanding on self-regulated teaching, it

seems that they are implementing self-regulated teaching strategy in their classroom teaching mostly the performance and self-reaction/reflection phase.

In comparison between female and male teachers in their teaching effectiveness/ self-regulated teaching, 9 out of the 11 participants confirmed that females are more committed, dedicated, concerned and effective in their teaching than their male counterparts. Whereas male teachers relatively do not give attention, have another extra work, and are not sensitive and committed to their teaching and are not effective as compared to their counter parts. However, the document analysis for half of the participants was not seen supporting their practice.

Objective# 7: What are the challenges of implementing self-regulated teaching?

From the interview, the challenges teachers faced to implement self-regulated teaching are, lack of laboratory facilities and resources, lack of attention and respect for the teaching profession from the society, lack of opportunities for professional development and experience sharing , limitations of principals' support and supervision and lack of students' motivation for learning.

CHAPTER 5: Discussion and Implication

5.1Discussion

The purpose of this study was to investigate the level of self-regulated science teaching in secondary schools; the type of phase/s more implemented; gender difference in implementing SR strategy, and the relationship between SR strategy use with school factors (professional learning community practice and science teaching resource availability), teachers' gender and teaching experience. Because, studies confirmed that self-regulated behavior especially in classroom teaching contributes undeniable change on the teaching-learning quality. The literature on self-regulated instruction (Zimmerman, 2001, 2002; Zimmerman &Schunk, 2001) tell us that the skill and knowledge gained through such type of instruction should also enable students to develop deep, lasting, independent learning strategies to manage a range of activities; cognitive, affective, and even physical that go far beyond teaching. It requires full attention and concentration, self-awareness and introspection, honest self-assessment, openness to change, genuine self-discipline, and acceptance of responsibility and dedication of the profession for educating their students as indicated in (Nilson& Zimmerman, 2013).

Hence, a QUAN-QUAL mixed method study was conducted and a self-report data were collected from 302(71=23.5% females and 231=76.5% males) of nine secondary schools' science teachers (chemistry, Biology and Physics) which were selected using a random sampling method and a qualitative data were collected from 11 science teachers after the quantitative data analysis based on explanatory design to answer research questions. The self-report data on self-regulated science teaching was subjected for principal component factor analysis with iterated Varimax rotation and an Eigen value >1 and seven factors with 23/37 items were retained. The

self-regulated instrument in the study of Capa-Aydine et al. (2009) and Arrastia (2015) was factored into 9 factors; whereas, this study results show 7 components. This may be due to the reduction of items and or context difference (eg nature of subject, teachers, country, etc.). Besides this, the items are not categorized in to its respective dimension for example, Item 4 of self-instruction sub-scale is segregated to or retained by self-evaluation sub-scales and item 2 of self-instruction is retained by self-reaction sub-scale. Similarly the self-efficacy belief instrument also does not split in to its expected categories (mastery goal expectancy and performance goal expectancy. So, it needs a validation study in Ethiopian context to use the instruments again.

From the descriptive statistics analysis result indicated in table 1, more than 50% of the participants rated 4(agree) and strongly agree indicating that they are implementing self-regulated science teaching in their classroom instruction. In addition to this, the means of the items under each sub-scale and the t-test result explain that teachers' implementations of SRTS (self-regulated science teaching strategy) may lead to say more than the expected population means (3.0). This result seems in line with the previous study results' of Capa-Aydine et al. (2009) and Arrastia, (2015).

So, to answer the first question which deals about the level of practice of self-regulated sciences teaching in secondary schools, a one sample t-test was conducted. The result showed that there is mean difference between the expected mean and observed mean (M=3.97, SD=.39, with effect size, d=.2(2o %) which explains the degree of difference between the observed mean and the expected mean. The result indicates that teachers in secondary schools of the study area seem implementing self-regulated science teaching. The qualitative data also confirmed that teachers perceived that they are implementing self-regulated teaching especially, self-awareness, mastery goal and performance goal orientations from preparatory or forethought phase; controlling,

recording, self-instruction, and help seeking dimensions from performance phase; and self-evaluation, self-reflection and reaction based on students' response and facial expression as a feedback. However, the qualitative data indicates that more than half of the participants have limitations of conceptual knowledge and understanding even practical efficiency which may lack confidence to conclude that they are fully implementing self-regulated teaching; because it is difficult to say practical implementation becomes effective without conceptual knowledge and understanding which needs further research.

Teachers who apply innovative strategies in their teaching are ready for their own learning for teaching, because self-regulation helps for learning and teaching. This result is in line with that of Arrastia and Thompson (2014) as indicated in Arrastia's (2015) showed that in-service teachers responded to self-regulated items were high in U.S. but lower when compared with that of the pre-service teachers of the same country. Generally, from the result, it is also possible to say that teachers are using an SR(self-regulation) to achieve their objectives in order to enhance their instructional skill and students' learning (Iwamoto et al., 2017). Similarly, teachers who apply innovative strategies are efficacious, professionally interested and had adaptive strategies towards their performance (Capa-Aydine et al., 2009). Self-regulation is a key issue for teachers. Self-regulatory competency is used to help teachers maintain both their well-being and professional commitment. Gol and Royaei (2013); Toussi, Boori, and Ghanizadeh (2011) also confirmed that there is a strong positive relationship between teachers' self-regulation and their job performance and their effectiveness. But this study result seems better in the implementation of self-regulated science teaching than the study results conducted in other countries which says teachers are not competent enough to implement self-regulated teaching due to lack of motivation and meta-cognitive strategies (Eker& Ince,2018; Peeter et al.,2014); teachers' self-

regulation in higher education are not as self-regulated, planned, reflective, or spiral as some assume; the knowledge they have and their classroom practice is low(van Eekelen, Boshuizn & Vermunt, 2005, and Spruce & Bol,2014). Researchers and science educators contend that teachers who are unable to implement SRS (self-regulated strategy) in their own learning not only lose their effectiveness but also have difficult to see on their students Michalsky (2012). The confidence interval lies between .9 and 1 which indicates as large differences. The effect size also confirms the presence of a huge difference between observed sample mean and expected population mean which is .2,(Leech, Barrett, & Morgan, 2005).However, the qualitative data(interview and classroom observation) failed to support the quantitative result especially the preparatory phase by half of the participants; more over they lack conceptual knowledge and understanding of self-regulation. However, to confirm its consistency and efficiency, conducting an experimental/ intervention and longitudinal research are recommended

Concerning the research question indicated in 1.1 in continuation of the first question, the purpose was to identify which phases or dimensions do teachers implement more in their self-regulated science teaching. To answer this question, the data were categorized under their own respective phases(phase one or preparatory phase which contains, goal setting, performance goal orientation, mastery goal orientations, and intrinsic interest subscales); Phase two or performance phase which contains help seeking and self-instruction with two items, and Phase three or self-reaction phase which contains self-evaluation and self-reaction dimension and emotional control were analyzed with mean comparison and the self-report data descriptive statistics analysis result showed that teachers are observed implementing phase one or the preparatory phase (M=73.7,SD=7.6) better than phase two or performance phase(M=27.6,SD=3.6) by4.0 standard deviation, and phase three or reflective phase(M=45.3,SD=5.9) by 1.7 standard deviation.

According to teachers' self-report data, the Phase two or the performance phase which concerns about the recording, observing and self-instructing of how the teaching-learning process is going on as compared to the planned one is scored the least performance. But, the qualitative data analysis result indicates some limitations or gap in implementing the preparatory phase (for eg. they lack considering of students' needs, lack of identifying learning goals and strategies and planning by half of the participants); however, they confirmed that they are being implementing self-controlling, recording, self-instruction, and help seeking of the performance phase and the self-reflection and self-reaction phase by evaluating themselves from students' satisfaction, response and facial expression.

This result is somehow in line with the correlational analysis result of Ghonsooly and Ghanizadeh (2011) study with 92 Iranian EFL teachers and with Structural equation modeling analysis result of Ghanizadeh and Ghonsooly(2013) of 204 EFL Iranian teachers to some extent and withToussi, Boori and Ghanizadeh (2011) study. Their study identified that intrinsic interest, mastery goal- orientation, and emotional control were the strongest correlates whereas, the current study identified that performance goal orientation, mastery goal orientation and intrinsic interest, controlling, recording, help-seeking, self-instruction and self-evaluation as teachers implementing more. This indicates that teachers seem more likely implementing self-regulated teaching strategy to see their students' learning outcomes obtained from their instruction possibly. Though the level of implementation of the performance phase as compared to the forethought and reflective phases is low in the descriptive result, teachers' self-report data and the qualitative data especially the interview data confirmed that they are evaluating their performance (I learned from the mistakes I made in science classes; At the end of instruction, I try to evaluate whether I have met my lesson goals or not; and I use students' feedback to

improve my instruction; during instruction, I always adapt my instructional strategies based on students ‘feedback).But, their reported data tells that they react differently based on their performance and the result of the evaluation given to them (for example, I get upset when I am negatively evaluated in my profession; If I realize that I am not successful in my teaching worries me).This adaptive and defensive reflective practice may seem that teachers are ready to improve the deficiency they have and to improve students’ learning as justified by the qualitative data; because, the qualitative analyses result shows that teachers become more ready and energetic for better performance when they recognize that they are not successful in their teaching. Moreover, they ask themselves why and what makes them unsuccessful. Besides this, according to Zimmerman’s (2000) model, self-regulation implementation involves the application of the three phases and the nine dimensions cyclically and continuously. But the result of this study showed that teachers are not implementing all phases at equal extent. So, this may give an opportunity for other researchers to investigate the reason for the unequal implementations of phases further using other research approaches.

Moreover, the government and other stakeholders are complaining about the quality of education especially students who have low achievement in science subjects which may not go in line with the self-regulatory practice of teachers of the current study area; because, self-regulators are more effective in their teaching and students’ learning outcomes too.

The second sub-objective indicated in 1.2 was intended to examine the predictive capacity of teachers’ gender and teaching experience teachers have for self-regulated science teaching in secondary schools. To answer this question, a standard or simultaneous multiple regression analysis was used. The result indicated that both gender and teaching experience were not found a significant predictor of SRTS use in science teaching. Moreover surprisingly, the correlation

matrix showed that there was no relationship between teachers' teaching experience and self-regulated science teaching practice which does not go in line with logical assumptions, the researcher's experience and theoretical arguments which argue that when teachers get more and more experienced, they would have a chance of implementing new teaching strategies that enhances teachers' effectiveness and students' achievement as well (Chao & Chou, 2017;.Kini & Podolsky,2016). However, this research result is partially congruent with that of Pazhoman and Sarkhosh(2019), no relationship between self-regulation and teachers' teaching experience: Ghonsooly and Ghanizadeh (2011) which says there is no relationship between teachers self-regulation and gender; but a positive significant relationship with teaching experience; Partovi and Tafalozi(2015) no relationship between gender and self-regulated teaching, but positive relationship with teaching experience;. Some of the findings of the study conducted by Liu, Bi, You, and Chai (2011)in Handan indicated that the status of self-regulated learning behavior of chemistry teachers is the same between male and female teachers, across all school levels but different among teachers' experience, which says young teachers' self-regulated learning behavior is better than old teachers which is contrary to Partovi and Tafazolis' (2015), and (Chao & Chou, 2017) studies' result which is different from the researcher's assumption . The above results indicate that there is inconsistency regarding the correlation between gender, teaching experience and teachers' self-regulation practice. This may be due to differences in the study context which needs further investigation globally.

Regarding research question number 1.3, which was focusing on the investigation of the difference in the implementation of self-regulated science teaching among male and female teachers, the data were subjected for comparison of mean difference using an independent sample t- test. The result of the analysis indicated that there is a statistically significant mean

difference between male and female teachers in their self-regulated science teaching practice. The result shows that females are better than their male counterparts. The interview data analysis result also confirmed the quantitative result that female teachers are more concerned, committed, loyal, effective, and responsible than male teachers in their teaching. This result is in line with that of the unpublished dissertation work of Arrastia (2015), being a teacher of English/Language Arts and a female were significant predictors of higher TSRS responses for eight subscales of self-regulation; with Kovács (2019) indicated that gender difference is the use of diverse teaching methods, using teaching novelties and participation in high-standard further education, are measurably more important for women. Similarly, it is in line with El-Emadi, Said and Friesen(2019),females teachers are more competent in theoretical classes than their counterparts; Throndsen and Turmo(2012) examined that females were observed using somewhat higher levels of mastery goal structure for students and mastery approaches to instruction . This may be caused by several factors. For instance, some of the male teachers stick more to the frontal or direct teaching methods while female teachers have a more positive attitude towards professional development and for the implementation of new teaching methods. The study result of Studenska (2011) is also in line with the current study result in that female teachers generally report that they use self-regulatory strategies more intensively than male teachers in their learning process. However, the current study result is in opposition to many study results which show that no gender difference in the implementation of self-regulated teaching and as there is no relationship between self-regulated teaching and gender (Liu, Bi, You, & Chai ,2011; Partovi&Tafazoli, 2015; Ghonsooly&Ghanizadeh, 2013; and Islahi&Nasreen, 2013) .

The second objective of this study requires examining the nature of relationship among school related variables and teachers' teaching self-efficacy belief variable. Hence, the structural

equation modeling analysis using Amos software version 23 resulted with the modified model that describes well the sample data or the model was found to fit the data. The structural equation modeling analysis result showed that professional learning community exogenous variable (PLC) has a significant positive effect on teachers' science teaching self-efficacy belief. But the science teaching resource availability variable was not found to have a significant effect on teachers' self-regulated teaching criterion variable both directly and indirectly; and it also has no significant effect on teaching self-efficacy belief mediating variable. The study result confirms that when teachers involve in professional dialogue, sharing experience, and talk about their strength and limitations to improve their teaching skill, their teaching efficacy to conduct their self-regulated classroom instruction can also increase. This result is in line with Tschannen-moran and Mcmaster (2009); Thoonen et al. (2011, as cited in Börü ,2018); Börü (2018); (Lau, 2013), which explains that administrative support from and a positive collaborative culture with in schools or supportive working environment encourages teachers with new instructional approach; the role of teachers and principals as learners and the importance of cooperative and collegial relationships as important aspects of professional community. The result is also similar with the result of a mixed and experimental study results with in-service elementary science teachers by Mintazes and Marcum (2013) which stated that the investigation explored changes in personal self-efficacy and outcome expectancy among elementary teachers engaged in PLCs in their demonstration of laboratory's lesson. Especially significant changes favors those participated in the experimental group on all quantitative measures of self-efficacy. Similarly a Longitudinal study of middle grades Chemistry Professional development conducted by Khourey-Bowers and Simonis(2004) showed a significant changes in their personal science teaching self –efficacy and outcome expectancy. The school level of security, trustworthiness,

incentive, and the level of cooperation and collaboration among staff motivates teachers to improve their teaching activities. Moreover, collaboration in the school provides teachers with the opportunity to solve problems together, gaining feedback and information. The study result is also congruent with Heaton (2013); Desmul, et al.(2018);Cowlyand Meehan(2001);Chong and Kong(2012) who identified a positive significant correlation between PLC and teachers' self-efficacy belief. Thus, teachers can develop the habit of encouraging the use of new materials in class, experimenting new things, which reflects current teaching and comprehensiveness of any given class. In addition to this, collaboration in school provides support to teachers and triggers professional cultures and increases teachers' confidence where there is ambiguity. However, the qualitative data indicates that the role of principals in providing support and supervision especially in creating conducive environment for professional learning opportunities is limited. Therefore, school leaders and other education experts should consider the importance of teacher's professional dialogue to share their experience and knowledge in their school system periodically and providing support and supervision.

However, the STRA (science teaching resource availability) construct which was assumed to motivate and increase the teaching efficacy belief of science teachers was not found to have a significant effect on teaching self-efficacy belief of teachers and on SRT. The result is **not in line** with the researcher's expectations and the study results of Martin (2017), there is a correlation between resource availability and school efficiency; Anderson et al. (2004) who identified a significant positive relationship between environmental factors and teachers' self-efficacy belief; Dragsted, Evans and Sorensen(2004) which indicates that Self-efficacy belief is related to resources; But, the qualitative data analysis result indicates that lack of laboratory resources, lack of laboratory facilities and equipment imped teachers' science teaching self-

efficacy belief implying that there is a relationship between science teaching resources and teachers' science teaching efficacy belief which is in line with the above study's' results and with (Rennie et al., 2001) which identified that limited equipment, access to a suitable science teaching space, lack of support staff to assist with organized and storing materials, an inadequate science budget, poor access to laboratories, and inadequate equipment are the common limiting factors indicted by teachers. However, in this study the quantitative analysis result needs further investigation. Because the result showed that science resource availability variable do not have a significant effect on teaching efficacy belief variable of teachers to apply self-regulated teaching which may be due to the absence of adequate resources in the schools.

Concerning objective three; structural equation modeling and path analysis and multiple regression analysis were conducted to determine which exogenous variable significantly predict the endogenous variable(self-regulation) more. Hence, the self-report data when analyzed using structural equation modeling, the path analysis result showed that only PLC and TSEB were found to have a significant effect on teachers' self-regulated teaching strategy use. The PLC exogenous latent variable showed a significant positive effect on teachers' self-regulated teaching endogenous variable both directly and indirectly through the mediating variable(SEB).The result is in line with Zee and Helma(2016); Tschannen-moran and Mcmaster (2009) identified that professional development format that supported mastery experiences through follow-up coaching had the strongest effect on self-efficacy beliefs for reading instruction as well as for implementation of the new strategy. The study result is also in line with Parise and Spillane (2010) as cited in Lee, Llosa, Jiang, O'Connor, and Haas(2016) indicated that teachers' reports of learning opportunities through both formal professional development (e.g., number of professional development sessions) and on-the-job opportunities to learn (e.g.,

collaborative discussion, peer observation, feedback) were significantly related to reported changes in instructional practices. In addition to this, Somprach, Tang, and Popoonsak, (2017) explored the role of essential leadership styles of school principals in encouraging teachers' participation in professional learning community in basic education in Northeastern of Thailand. And their findings indicated that learning, transformational, collaborative, and invitational leadership styles are the four significant predictors for promoting teachers' participation in professional learning community as indicated in (Cockpim & Somprach, 2019). Generally, the qualitative study finding conducted by Börü (2018) showed that educational policy, students' motivation to learn, school principal's cooperation and communication, colleague's cooperation are external factors of teacher's motivation to teach effectively.

But, the result of this study is in opposition to Nolan (2009) who identified a negative correlation between school professional learning community and teachers' efficacy which is an unusual. And Swigert (2012) examined the difference in self-efficacy of teachers who participated in PLC and those who did not to enhance use of innovative instructional strategies. The result of the study reveals that there is no difference among those groups.

The mediating variable (science teaching self-efficacy belief) partially played its mediating role in the relationship between professional learning community practices in the school (PLC) with self-regulated teaching strategy use in secondary schools of the study area. This study result is in line with the study result of Mohamadi and Asadzadeh (2012) on testing the mediating role of teachers' self-efficacy beliefs in the relationship between sources of efficacy information and student's achievement showed that teachers' self-efficacy had meditational role between sources of teachers' self-efficacy and student's achievement. Moreover it is indicated that teacher self-efficacy is a long term predictor of instructional quality(Künsting et al., 2016). In addition to

this, it seems also in line with Capa-Aydine et al. (2009) identified the relationship between self-efficacy belief and self-regulated teaching; Chatzistamtious et al. (2014) showed that teachers' self-regulation in mathematics was predicted by their teaching self-efficacy beliefs; Bembnutty (2007) who identified that teachers with high sense of teaching efficacy reported high academic sense of intrinsic interest, task value, and management of resources. However, the self-report data indicated that the STSEB mediating variable does not play its role in the relationship between science teaching resource availability construct and self-regulated teaching strategy use in secondary schools of the study area. This may be due to lack of adequate science teaching resources as the participants in the interview explained the shortage of resources as their challenges.

As to the challenges of self-regulated teaching, participants of the study identified that limitations of science teaching resources, laboratory facilities, lack of deep conceptual self-regulated teaching knowledge , absence of opportunities for professional development and experience sharing in the school context, low attention and perception of the society for the teaching profession and school principals' limitations of support and supervision as challenges of teachers in their teaching self-efficacy belief and self-regulated teaching. The finding is **not** in line with the study results of Heaton(2013); De Smul, Heirweg, Van Keer, Devos, & Vandevelde(2018) which identified that engagement of teachers in experience and knowledge sharing contributes for the development of teachers' self-efficacy and instructional effectiveness. In addition to these, the result is not similar with a survey study conducted by Cockpim and Somprach (2019) showed that learning leadership practice contributes high percentage (96%) to the variance of teacher professional development and were significantly affecting teachers' teaching behavior at significant level. Similarly, administrative support from and a positive

collaborative culture with in schools or supportive working environment encourages teachers to have self-efficacy to teach with new instructional approach (Lau,2013).In addition to this, Martine's (2017) study showed the correlation between resource availability and efficiency of school. Blackwood (1961) also investigated that the failure of schools to provide resources prevents science teachers from attaining their professional status they deserve.

5.2 Implication

The quality of education in Ethiopia still remains as a challenging issue so far. One of the contributing factors for quality of science education is being attributed to teachers' teaching quality. So, improving the teaching strategy use of teachers is vital. Because, teachers are those who have a role of shaping, cultivating, guiding and showing the unseen for children using attractive, creative, inquiring teaching approach. Therefore, this study result may have an impact on other researchers to be inspired and to work more on the area; for teachers who will have the opportunity of reading the study's result and others' study on the area may be aware of the importance of the SRT strategy to apply on their teaching –learning process. Besides this, the study result may have an impact on students' learning strategy and achievement if teachers are models for the students during their teaching; it will also have an impact on teacher training institutions if they adapt the strategy to their training system to produce self-regulated graduates. Overall, since the concept 'self-regulation' is new in Ethiopian context, it would have an impact on schools teaching learning process and students' achievement. Moreover, those concerned bodies may be clicked to think how to improve teachers' teaching effectiveness.

CHAPTER 6: Conclusion, Limitation and Recommendations

6.1 Conclusion

This study was intended to investigate teachers' self-regulated science teaching in secondary schools of the study area and the relationship between school factors and teachers' self-regulation with teaching self-efficacy belief as a mediator variable. A QUAN-QUAL mixed method (explanatory sequential) method was employed. Four instruments (teacher's self-regulation instrument, teaching self-efficacy belief instrument, science teaching resource availability instrument and professional learning community practice measurement instrument) were adapted for gathering teachers' self-report data from 302 teachers. Besides this, a qualitative data were collected using interview, classroom observation and document analysis instrument from 11 participants which were also participated in self-report questionnaire. The quantitative data were analyzed using t-test, multiple regression, independent sample test, descriptive statistics and structural equation modeling, and principal component (factor) analysis with Varimax rotations.

However, there was no validation work conducted for science teaching resource construct except pilot test and experts' judgments. Besides this, the items in the principal component factor analysis stage of science-teaching efficacy belief construct, self-regulated teaching, in science teaching resource construct were not clearly delineated to their expected factor structures (dimensions) which needs further validation in Ethiopian context using confirmatory factor analysis.

Concerning the main analysis findings, the self-report questionnaire data reveals that there is practice of self-regulated teaching science in the study area. Moreover, the quantitative analysis

result shows that teachers are implementing preparatory phase or phase one more than the other two phases (performance and reflective phases).. It is also observed that teachers are implementing self-regulated teaching with lack of planning during preparatory phase by half of the interviewees which may be associated.However, the qualitative data reveals that majority of the participants lack conceptual knowledge and understanding of self-regulated teaching which may lack confidence to say that they are fully implementing self-regulated science teaching. So, it needs further study.

It was expected that there may be a difference in the implementation of self-regulated teaching among more experienced and low experienced teachers. However, the correlation result indicates that there is **almost no** correlation among teaching experience and self-regulated teaching (.03); besides this teaching experience was not found to be a significant predictor of self-regulated teaching. The reason may be the current school culture which has an influence to have similar teaching approach which teachers accustomed. But the study both the quantitative and qualitative result indicates that female teachers are slightly better in self- regulated teaching strategy use more than their male counter parts. This may support the government strategy which gives more emphasis on the employment of female teachers in all levels. To make it more glorious, detail comparative study may be important by other interested researchers.

Besides this, the structural equation modeling and path analysis result shows that there is significant positive effect on teachers' self-regulation variables and with the mediating teaching self-efficacy belief variable by professional learning community practice in the school. However the finding reveals that there is no significant casual effect/relationship between science teaching resource availability variable and teachers' self-regulation behavior and the mediating variable, teaching self-efficacy belief construct. Hence, from the result it is possible to say that teachers

teaching self-efficacy can be enhanced where there is collaborative environment, sharing of knowledge and experience both formally and informally and where there is supportive condition and structure. However, the non-significant relationship between science teaching resources and SEB and SRT may lead to say that there are no adequate science teaching resources in the study area which is also supported by the qualitative data. So, it may pay the way to recommend concerned bodies in order to have quality science teaching, there must be adequate and relevant teaching resources for all sciences in the school otherwise, it discourages teachers to be motivated to apply new instructional approach.

Therefore, concerned bodies in collaboration with school principals should try to arrange opportunities for teachers to get knowledge and experience sharing and to enable them to use their natural or local resources as science teaching resources.

To sum up, the researcher of this study believe that the study may open the eyes of other researchers and educational experts and teacher training institutions to farther exploit the concept to contribute to the teaching-learning process as an innovative alternative teaching strategy.

6.2 Limitations of the study

Though the study was planned to investigate secondary school science teachers' self-regulatory practice it was also believed that it would gives an insight for different bodies; however it had the following limitations;

1. The study did not include principals and students as supportive evidence for the self-report data obtained from teachers
2. It did not include teachers from other subjects as data sources.

3. The data covered only one zone due to resource limitation especially finance.
4. The researcher's limited knowledge and experience on the concept of structural equation modeling and analysis which may have some gaps in interpretations
5. The participants for qualitative data were only from two schools due to the current country's political conflict happened in the Northern part of it.
6. There was no consistent engagement in the project due to the political condition in the country particularly in the Amhara region.

6.3 Recommendations

The study tried to examine the new teaching strategy practice in the teaching –learning process by then giving information to the concerned bodies to think about it and to implement all over the country if it is recognized**.** So, the study result enables the researcher to recommend the following;

1. The researcher recommends other researchers to validate the instruments in Ethiopian context using confirmatory factor analysis which were developed in other countries. Besides this, other researchers are recommended to conduct an intervention research to see the impacts of self-regulated teaching strategies on teachers' teaching effectiveness and students' learning and achievement.

2.The study result showed that lack of science teaching resources, laboratory facilities, school principals' support and supervision, and lack of experience and knowledge sharing opportunities as affecting factors for their teaching self-efficacy belief; therefore school principals are expected to supervise the teaching –learning process and developing structures that enable teachers to

have knowledge and experience sharing access like CPD, Lesson studies, seminars, workshops and fulfilling science teaching resources.

3.The researcher would like to recommend teacher training institutions to explore self-regulated teaching practices and apply this new strategy in their training system so that the to be teachers will be equipped with to apply in their classroom teaching.

4.The researcher of this study also would like to recommend secondary school science teachers to be aware of that there are a number of local materials in your surroundings if you open your eyes and mind and search to teach students supported by practice and not to be dependent only on manufactured materials.

5. The researcher also would like to recommend other researchers to examine the practice of self-regulated teaching on other subjects and to include students and their achievement as data sources to capitalize its importance.

References

Abiy Zewdu. (2017). Challenges in Ethiopian teacher education pedagogy : Resistance factors to innovative teaching-learning practices. *Africa Journal of Teacher Education*, *6*(1).

Achimugu, L. (2016). Factors affecting the effective implementation of senior secondary education chemistry curriculum in Kogi. *International Journal of Scientific and Research Publications,6*(5), 562–566.

Ahmed, S. (2013). Teacher education in Ethiopia: Growth and development. *African Journal of Teacher Education*, *3*(3), 1–20.

Aktam, H., & Acar, E. (2010). The effect of " laboratory practices in science teaching " course on development of prospective science teachers ' self- regulation skills, *2*, 5549–5553.

https://doi.org/10.1016/j.sbspro.2010.03.905

Al-Awidi, H.M., Alghazo, I. M. (2012). The effect of student teaching experience on preservice elementary teachers ' self-efficacy beliefs for technology integration in the UAE. *Educational Technology Research and Development*, *60*(5), 923–941. https://doi.org/10.1007/sl

Amleh, A., Abou El-Soud, M., & Kamel, S. (2010). Effective teaching of science in an undergraduate course; Knowledge, discipline and dedication yield scientists. *Procedia - Social and Behavioral Sciences*, *9*, 890–902. https://doi.org/10.1016/j.sbspro.2010.12.255

Andersen, A.M., Dragsted, S., Evans., R.H. & Sørensen, H. (2004). The relationship between changes in teachers ' self-efficacy beliefs and the science teaching environment of Danish first-year elementary teachers. *Journal of Science Education*, *15*(1), 25–38.

Arigbabu, A. A., & Oludipe, D. I. (2010). Perceived efficacy beliefs of prospective Nigerian science teachers. *Journal of Science Education and Technology*, *19*(1), 27–31. https://doi.org/10.1007/s

Arrastia, M. C. (2015). The validation of the English language version of the teacher self-regulation. *Unpublished Disertation Work*.

Arslan, E. (2017). Self-efficacy as predictor of collective self-efficacy among preschool teachers in Turkey, *12*(8), 513–517. https://doi.org/10.5897/ERR2017.3222

Azevedo, R.,&Aleven, V. (2013). *International handbook of metacognition and learning technologies*. (Eds, Ed.). New York: springer.

Azorín, J. M., & Cameron, R. (2014). The application of mixed methods in organisational research : A literature review. *The Electronic Journal of Business Research Methods*, *8*(2).

Bakkenes, I., Vermunt, J. D., & Wubbels, T. (2010). Teacher learning in the context of

educational innovation: Learning activities and learning outcomes of experienced teachers. *Learning and Instruction*, *20*(6), 533–548. https://doi.org/10.1016/j.learninstruc.2009.09.001

Balkis, M., Duru, E. (2016). Procrastination , self-regulation failure , academic life satisfaction , and affective well- being : underregulation or misregulation. *Procrastination, Self-Regulation Failure, Academic Life Satisfaction, and Affective Wellbeing: Underregulation or Misregulation Form*, *31*(3), 439–459. https://doi.org/10.1007/s10212-015-0266-5

Bandura.A. (1977). *Social learning theory. Englewood Cliffs, NJ: Prentice Hall*.

Bandura, A. (1997). Guide for constructing self-efficacy scales (pp. 307–337).

Belay Sitotaw and, & Melaku Masresha. (2019). Education quality challenges in Ethiopian secondary schools. *Journal of Education,Society and Behavioral Science*, *31*(2), 1–15. https://doi.org/10.9734/JESBS/2019/v31i230147

Bembenutty, H., White, C. M., & Velez, M. R. (2018). *Developing self-regulation of learning and teaching skills among teacher candidates*. New York: Springer Dordrecht Heidelberg.

Bembenutty, H. (2006). Teachers self-efficacy beliefs , Self-regulation of learning, and academic performance. *Apaper Presented in Anual Meating*, (718), 1–14.

Bembenutty, H. (2007). Preservice teachers ' motivational beliefs and self-regulation of learning. *Online Submition*, (April), 1–11.

Berger, J. L., Girardet, C., Vaudroz, C., & Crahay, M. (2018). Teaching experience, teachers' beliefs, and self-reported classroom management Practices: A coherent network. *SAGE Open*, *8*(1). https://doi.org/10.1177/2158244017754119

Berhe, D. (2021). Challenges of 20th century Ethiopian Science education. *Heliyon*, *7*(6), e07157. https://doi.org/10.1016/j.heliyon.2021.e07157

Blackwood, P. E. (1961). Resource for science teaching. *Elementary School Science Bulletin*, *63*(63), 2–3.

Blitz, C. L., & Schulman, R. (2016). Measurement instruments for assessing the performance of professional learning communities.Washington,DC:Department of education. *National Center for Education and Regional Assistance*.

Boekaerts, M. (2011). Emotions, emotion regulation, and self-regulation of learning. In B. J. Zimmerman & D. H. Schunk (Eds.), Handbook of self-regulation of learning and performance (pp. 408–425). Routledge/Taylor & Francis Group.

Börü, N. (2018). The factors affecting teacher-motivation. *International Journal of Instruction*, *11*(4), 761–776.

Bringman, N., & Lee, S. M. (2008). Middle school counselors ' competence in conducting developmental classroom lessons : Is teaching experience necessary ? *Sage*, *11*(6), 380–385.

Callan, G. L. (2014). Self-regulated learning (SRL) microanalysis for mathematical problem solving : a Comparison of a SRL Event measure , questionnaires , and a teacher rating scale. *Unpublished Disertation Work*, (May).

Capa-Aydin, Y., Sungur, S., & Uzuntiryaki, E. (2009). Teacher self- regulation :Examining a multidimentional construct. *An International Journal of Experimental Educational Psychology*, *29:3*, 345–356. https://doi.org/10.1080/01443410902927825

Casler, E. N. (2006). A comparison of classroom teachers' self-regulation behaviors in relation to effective teacher practices used during instruction. *Dissertation Abstracts International Section A: Humanities and Social Sciences*. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc5&NEWS=N&AN=2006-99015-117

Chan, D. W. (2007). General , collective , and domain-specific teacher self-efficacy among Chinese prospective and in-service teachers in Hong Kong. *Teaching and Teacher Education*, *24*, 1057–1069. https://doi.org/10.1016/j.tate.2007.11.010

Chao, P., & Chou, Y. (2017). Elementary and junior high school teachers ' promotion of self-determination in Taiwan, *10*(9), 141–151. https://doi.org/10.5539/ies.v10n9p141

Chatzistamatiou, M., Dermitzaki, I., & Bagiatis, V. (2014). Self-regulatory teaching in mathematics : Relations to teachers ' motivation , affect and professional commitment. *European Journal of Psychology of Education*, *29*(2), 295–310. Retrieved from https://www.jstor.org/stable/43551155

Ching Mok, M. M., & Moore, P. J. (2019). Teachers & self-efficacy. *An International Journal of Experimental Educational Psychology Psychology*, *39*(1), 1–3. https://doi.org/10.1080/01443410.2019.1567070

Chong, W. H., & Kong, C. A. (2012). Teacher collaborative learning and teacher self-efficacy: The case of lesson study. *Journal of Experimental Education*, *80*(3), 263–283. https://doi.org/10.1080/00220973.2011.596854

Cockpim, J., & Somprach, K. (2019). Learning leadership of school administrators and teaching behavior affecting The effectiveness of teacher professional development : Hierarchical linear model. *The Turkish Online Journal of Educational Technology –*, *18*(2), 52–55.

Corno,L. and Kanfer, R. (1993). The Role of volition in learning and performance. *American Educational Research Association*, *19*(1993), 301–341.

Corrigan, G., & Taylor, N. (2004). An exploratory study of the effect a self-regulated learning environment has on pre-service primary teachers' perceptions of teaching science and technology. *International Journal of Science and Mathematics Education*, *2*, 45–62.

Cowley, K. S., & Meehan, M. L. (2001). Assessing teacher efficacy and professional learning community in 19 Elementary and High Schools. *Paper Presented at the Tenth Annual Meeting of the CREATE National EValuation Institute*, (July 19-21), 25. Retrieved from http://search.proquest.com.ezproxylocal.library.nova.edu/docview/62286648?accountid=6579

Creswell, J. W. (2014). *Research design:Qualitative, quantitative and mixed methods approaches* (4th ed.). UK: Sage publication Ltd.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative and mixed methods approach 5th ed.* (7th ed.). New Dehlli.

De Smul, M., Heirweg, S., Devos, G. &, & Keer, H. V. (2018). School and teacher determinants underlying teachers ' implementation of self-regulated learning in primary education. *Research Papers in Education*, *00*(00), 1–24. https://doi.org/10.1080/02671522.2018.1536888

Deehan, J. (2017). *A review of the science teaching efficacy belief instrument B : Pre-service teachers*. SpringerBriefs in Education. https://doi.org/10.1007/978-3-319-42465-1

Delfino, M., Dettori, G., & Persico, D. (2010). An online course fostering self-regulation of trainee teachers. *Psicothema*, *22*, 299–305.

Dellinger, A. B., Bobbett, J., Olivier, D. F., & Ellett, C. D. (2008). Measuring teachers ' self-efficacy beliefs : Development and use of the TEBS-Self. *Teaching and Teacher Education*, *24*, 751–766. https://doi.org/10.1016/j.tate.2007.02.010

DiBenedetto, M. K. (2018). Connecting self-regulated learning and performance with instruction across high school content areas. In Maria K. DiBenedetto (Ed.), *Connecting self-regulatied learning and performance with instruction across highschool content areas* (pp. 3–26).

USA: Springer International Publishing AG. https://doi.org/10.1007/978-3-319-90928-8

Dignath-van Ewijk, C., & Van Der Werf, G. (2012). What teachers think about self-regulated learning : Investigating teacher beliefs and teacher behavior of enhancing students ' self-regulation. *Hindawi Pblishing Corporation*. https://doi.org/10.1155/2012/741713

Eker, C., & İnce, M. (2018). Teacher opinions on use of self-regulation strategies at science and art centers : Turkey sample. *Universal Journal of Educational Research*, *6*(7), 1486–1496. https://doi.org/10.13189/ujer.2018.060709

El-emadi, A. A., Said, Z., & Friesen, H. L. (2019). Teaching style differences between male and female Science teachers in Qatari schools : Possible impact on student achievement. *EURASIA Journal of Mathemathics, Science and Technology Education*, *15*(12).

Ertmer,P.A.,& Newby, T. J. (1996). The expert learner : Strategic , self-regulated , and reflective. *Instructional Science*, *24*(1), 1–24.

Fekede Tuli, & Tynjälä, P. (2015). Professional learning of teachers in Ethiopia : Challenges and implications for reform. *Australian Journal of Teacher Education*, *40*(5).

Flick, L. B., & Lederman, N. G. (2006). *Scientific inqiry and nture of science: Implication for teaching, learning and teacher education*. (Eds., Ed.). USA.

Ghanizadeh, A. (2011). An investigation into the relationship between self-regulation and critical thinking among Iranian EFL teachers. *Technology of Education*, *5*(3), 213–221.

Ghonsooly, B., & Ghanizadeh, A. (2011). Self-efficacy and self-regulation and their relationship: A study of Iranian EFL teachers. *Language Learning Journal*, *41*(1), 68–84. https://doi.org/10.1080/09571736.2011.625096

Gkolia, A., Belias, D., &, & Koustelios, A. (2014). T eachers's job satisfaction and self-efficacy: Areview. *European Scientific Journal*, *10*(22), 321–342. https://doi.org/10.1111/j.1365-

2117.2008.00357.x

Gol, A. K., & Royaei, N. (2013). EFL teachers ' self-regulation and job performance. *Acaddemy Publisher*, *3*(10), 1855–1861. https://doi.org/10.4304/tpls.3.10.1855-1861

Gordon, S. C., Dembo, M. H., & Hocevar, D. (2007). Do teachers' own learning behaviors influence their classroom goal orientation and control ideology? *Teaching and Teacher Education*, *23*(1), 36–46. https://doi.org/10.1016/J.TATE.2004.08.002

Habtamu Reta. (2017). Quality of science teaching in secondary schools of North Gondar Zone in Ethiopia. *International Journal of Educational Science*, *1122*, 20–35. https://doi.org/10.1080/09751122.2017.1311592

Hale, S., Dunn, L., Filby, N., Rice, J. & Van Houten, L. (2017). Professional learning community (PLC) roadmap. *Regional Centers of Exellence*.

Heaton, M. (2013). An examination of the relationship between professional learning community variables and teacher self-efficacy. *Electronic Theses and Dissertations. 5038.*

Hinton, B. K. (2001). A Critique of Carl Ginet ' s of volition intrinsic theory. *Behavioral & Phillosophy*, *29*, 101–120.

Hord, S. M. (1997). Professional learning communities: Communitiess of Continuous inquiry and improvement. *Southwest Education Devlopment Laboratory*.

Hoyle,R.H., and Isherwood, J.(2013). Reporting results from structural equation modeling analyses in archives of Scientific Psychology. *Archives of Scientific Psychology*, *1*, 14–22. https://doi.org/http://dx.doi.org/ 10.1037/arc000

Iriogbe-efionayi, S. (2018). An examination of earlychildhood teachers' knowledge of self-regulation. *Unpdissertation Workublished*, (May).

Islahi, F., & Nasreen. (2013). Who make effective teachers , men or women ? An Indian

perspective, *1*(4), 285–293. https://doi.org/10.13189/ujer.2013.010402

Iwamoto, D. H., Hargis, J., Bordner, R., & Chandler, P. (2017). Self-regulated learning as a critical attribute for successful teaching and learning. *International Journal for the Scholarship of Teaching and Learning*, *11*(2).

JAICA & IDCJ.(2012). Basic education sector analysis report. *Report*, (August), 1–105. Retrieved from www.jica.go.jp

Jayawardena, P. R., Van Kraayenoord, C. E., & Carroll, A. (2018). Science teachers ' practices : Teaching for self-regulated learning in relation to Pintrich and Zusho ' s (2007) model. *International Journal of Educational Research*, (September), 1–13. https://doi.org/10.1016/j.ijer.2018.09.022

Jiru, C. A. (2020). Outcomes and challenges of the 1994 Ethiopian education and training policy reform. In *Leuven University Press* (pp. 565–590). https://doi.org/10.2307/j.ctv19m65dr.29

Johnson, C. C. (2009). An examination of effective practice: moving toward elimination of achievement gaps in Science. *Journal of Science Teacher Education*, *20*(3), 287–306. https://doi.org/10.1007/sl

Joshi, A., & Pal, D. K. (2015). Likert scale : Explored and explained Likert scale. *ResearchGate*, (January). https://doi.org/10.9734/BJAST/2015/14975

Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for Social Work research. *Social Sciences*, *8*(9). https://doi.org/10.3390/socsci8090255

Khourey-Bowers, C., & Simonis, D. G. (2004). Longitudinal study of middle grades chemistry professional development: Enhancement of personal science teaching self-efficacy and outcome expectancy. *Journal of Science Teacher Education*, *15*(3), 175–195. https://doi.org/10.1023/b:jste.0000047083.14197.b8

King, W. K. (1994). The teaching of science in the Caribbean:Retrospect and prospect. *Peace Research*, *26*(2), 58–73.

Kini, T., & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness?, (June), 64 p. Retrieved from https://learningpolicyinstitute.org/our-work/publications-resources/does-teaching-experience-increase-teacher-effectiveness-review-research

Kline, R. B. (2005). *Principles and practice of structural equation modeling*. *Methodology in the Social Sciences* (2nded ed.). New York London: The Guilford press.

Kovács, E. (2019). The effects of gender on the teachers ' competences and effectiveness. *Glocal Education in Practice*, *17*, 210–215.

Künsting, J., Neuber, V., & Lipowsky, F. (2016). Teacher self-efficacy as a long-term predictor of instructional quality in the classroom. *European Journal of Psychology of Education*, *31*(3), 299–322. https://doi.org/10.1007/S10212-015-0272-7

Kyriakides, L., Creemers, B., Antoniou, P., & Demetrioua, D. (2010). A synthesis of studies searching for school factors : implications for theory and research. *British Educational Research Journal*, *36*(5), 807–830. https://doi.org/10.1080/01411920903165603

Kyriazos, T. A. (2018). Applied Psychometrics: Sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Scientific Research Publishing*, *09*(08), 2207–2230. https://doi.org/10.4236/psych.2018.98126

Lau, K. L. (2013). Chinese language teachers ' perception and implementation of self-regulated learning-based instruction. *Teaching and Teacher Education*, *31*, 56–66. https://doi.org/10.1016/j.tate.2012.12.001

Lee, O., Llosa, L., Jiang, F., O'Connor, C., & Haas, A. (2016). School resources in teaching science to diverse student groups: An intervention's effect on elementary teachers'

perceptions. *Journal of Science Teacher Education*, *27*(7), 769–794. https://doi.org/10.1007/s10972-016-9487-y

Leech, N.L., Barrett, K.C., Morgan, G. A. (2005). *SPSS for intermediate staticstics 2nd ed :Use and Interpretation*. *Journal of Chemical Information and Modeling* (2nd ed.). London: Lawrence Erlbaum Associates.

Lekhu, M. A. (2013). Assessing the teaching efficacy beliefs of science teeachers in seccondary schools in the free state province. *Unpublished Disertation Work*, (December).

Ley, K., & Young, D. B. (2001). Instructional principles for self-regulation. *Educational Technology Research and Developmentevelopment*, *49*(2), 93–103. Retrieved from https://www.jstor.org/stable/30220313 Accessed:

Ley, Kathryn, & Young, D. B. (1998). Self-Regulation Behaviors in Underprepared (Developmental) and Regular Admission College Students. *Contemporary Educational Psychology*, *23*(1), 42–64. https://doi.org/10.1006/ceps.1997.0956

Lindblom-ylänne, S., & Nevgi,A., Trigwell, N. (2011). Regulation of university teaching. *IInstructional Science*, *39*(4), 483–495. https://doi.org/10.1007/sl

Little, W. J. (1990). The Persistence of privacy : autonomy and initiative in teachers ' professional relations. *Teachers College, 91*(4).

Liu, V., Bi, H., You, F., & Chai, x. (2011). A study on middle school chemistry teachers ' self-regulated learning behavior sample from Handan, 277–279.

Lombaerts, K., Engles, N., &Van B. J. (2009). Determinants of teachers ' recognitions of self - regulated learning practices in elementary education. *Tayler & Francis*, *102*(3), 163–173.

Lombaerts,K., Engels, N. & Van Braak, J. (2010). Determinants of teachers' recognitions of self-regulated learning practices in elementary education. *The Journal of Educational Research*,

102(December 2014), 37–41. https://doi.org/10.3200/JOER.102.3.163-174

Lombaerts, K., De Backer, F., Engels, N., & Johan van Braak, J. &Athanasou, J. (2009). Development of the self-regulated learning teacher belief scale Author (s): Linked references are available on JSTOR for this article : Development of the Self-Regulated Learnin. *European Journal of Psychology of Education*, *24*(1), 79–96.

Louis, K. S., Kruse, S. D., & Bryk, A. S. . (2007). Professionalism and community: What is it and why is it important in urban schools: Perspectives on reforming urban schools. *Professionalism and Community: Perspectives on Reforming Urban Schools*.

Loyens, S. M. M., Magda, J., & Rikers, R. M. J. P. (2008). Self-Directed Learning in Problem-Based Learning and its Relationships with Self-Regulated Learning, 411–427. https://doi.org/10.1007/s10648-008-9082-7

Lumpe, A. T., Haney, J. J., & Czerniak, C. M. (2000). Assessing teachers ' beliefs about their science teaching context. *Journal of Research in Science Teaching*, *37*(3), 275–292.

Malinen, O., & Savolainen, H. (2016). The effect of perceived school climate and teacher ef fi cacy in behavior management on job satisfaction and burnout : A longitudinal study. *Teaching and Teacher Education*, *60*, 144–152. https://doi.org/10.1016/j.tate.2016.08.012

Martin, E. N. (2017). Correlation between the availability of resources and efficiency of the School system within the framework of the implementation of Competency-based teaching approaches in Cameroon. *Journal of Education and Practice*, *8*(2), 82–92.

Mattern, J., & Bauer, J. (2014). Does teachers ' cognitive self-regulation increase their occupational well-being ? The structure and role of self-regulation in the teaching context. *Teaching and Teacher Education*, *43*, 58–68. https://doi.org/10.1016/j.tate.2014.05.004

Mckendree, R. B., & Washurn, S. G. (2017). Agriculture teacher awareness and application of

self- regulation strategies. *Journal of Agriculture Education*, *58*(4), 143–159. https://doi.org/https://doi.org/10.5032/jae.2017.04143

Meyers, L. S., Gamst, G., & Guarino, A. J. (2006). *Applied multivariate research design and interpretation*. Sage publication Ltd.

Michalsky, T. (2012). Shaping self-regulation in science teachers ' professional growth : Inquiry skils. *Science Education*. https://doi.org/10.1002/sce.21029

Mintazes, J.J.,Marcum, B. (2013). Enhancing self-efficacy in elementary science teaching with professional learning communities. *Journal of Science Teacher Education*, *24*(7), 1201–1218. Retrieved from https://www.jstor.org/stable/43157073

Moafian, F., & Ostovar, S. (2012). Validation of the english version of the teacher self-regulation scale in an EFL context. *Journal of Scientific Research*, *6*(April 2017). https://doi.org/10.5829/idosi.mejsr.2012.12.5.2478

MoE. (1994). Federal Democratic Republic government of Ethiopia Education and training policy. *Policy*.

Mohamadi, F.S., Asadzadeh, H. (2012). Testing the mediating role of teachers ' self-efficacy beliefs in the relationship between sources of efficacy information and students achievement. *Springer*, *13*, 427–433. https://doi.org/10.1007/s12564-011-9203-8

Moore, K. D. (n.d.). Effective Instructional Strategies.

Moore, K. D. (2014). *Effective instructional strategies: From theory to practice* (fourth). London: Sage publication Ltd.

Moos, D. C., & Ringdal, A. (2012). Self-regulated learning in the classroom : A literature review on the teacher ' s role. *Education Research International*, *2012*. https://doi.org/10.1155/2012/423284

Nilson, L., & Zimmerman, B. J. (2013). *Creating self-regulated learners: Strategies to strengthen students' self-awareness and learning skills*. Stylus Publishing, LLC.

Nolan, D. E. (2009). A study of the relationship of teachers ' self-efficacy and the impact of professional learning community as an organizational structure. *Unpublished Disertation Work*.

Oli Negassa. (2014). Ethiopan students' achievement challenges in science education:Implications to policy formulation. *Online Submition*, *4*(1), 2–18.

Olivier, D. F., & Hipp, K. K. (2010). (2010). Assessing and analyzing schools as professional learning communities. In K. K. Hipp & J. B. Huffman (Eds.), Demystifying professional learning communities: School leadership at its best. Lanham, MD: Rowman & Littlefield., (D), 1–7.

Özy, F., Õuõ, Õ., & Yetkin, E. (2011). The factors that affect the preservice mathematics teachers ' self regulation strategies, *15*, 3543–3549. https://doi.org/10.1016/j.sbspro.2011.04.332

Pareek, R. B. (n.d.). An assessment of availability and utilization of laboratory facilities for teaching science at secondary Level. *Science Education International*, *30*(1), 75–81.

Partovi, N., & Tafazoli, D. (2016). On the r elationship between Iranian EFL teachers ' self-regulation, self-resiliency, gender and teaching experience. *Electronically Available*, 7–25.

Pazhoman, H., & Sarkhosh, M. (2019). The relationship between Iranian english high school teachers ' reflective practices , their self-regulation and teaching experience, *12*(1), 995–1010.

Peeters, J., Backer, F. D., Reina, V. R., Kindekens, A., & Buffel, T. & Lombaerts, K. (2014). The role of teachers ' self-regulatory capacities in the implementation of self-regulated

learning practices. *Science Direct*, *116*, 1963–1970. https://doi.org/10.1016/j.sbspro.2014.01.504

Peeters, J., De Backer, F., Reina, V. R., Kindekens, A., Buffel, T., and, & Lombaerts, K. (2014). The role of teachers' self-regulatory capacities in the implementation of self-regulated learning practices;5th world conference on educational science. *Science Direct*, *116*, 1963–1970. https://doi.org/10.1016/j.sbspro.2014.01.504

Peeters, J., DeBacker, F., Reina, V. R., Kindekens, A., Buffel, T., && Lombaerts, K. (2014). The role of teachers ' self-regulatory capacities in the implementation of self-regulated learning practices. *Procedia - Social and Behavioral Sciences*, *116*, 1963–1970. https://doi.org/10.1016/j.sbspro.2014.01.504

Perry, N. E., Hutchinson, L., & Thauberger, C. (2008). Talking about teaching self-regulated learning: Scaffolding student teachers' development and use of practices that promote self-regulated learning. *International Journal of Educational Research*, *47*(2), 97–108. https://doi.org/10.1016/j.ijer.2007.11.010

Pintrich, P. R. (2000). The Role of Goal Orientation in Self-Regulated Learning. *Handbook of Self-Regulation*, 451–502. https://doi.org/10.1016/B978-012109890-2/50043-3

Pressley, M., El-Dinary, P., Gaskins, I., Schuder, T., Bergman, J. L., Almasi, J., & Brown, R. (1992). Beyond direct explanation: Transactional instruction of reading comprehension strategies. *The Elementary School Journal*, *92*(5), 513–555. https://doi.org/10.1086/461705

Randi, J. (2004). Teachers as self-regulated learners. *Teachers College Record*, *106*(9), 1825–1853. https://doi.org/10.1111/j.1467-9620.2004.00407.x

Rennie, L. J., Goodrum, D., & Hackling, M. (2001). Science teaching and learning in Australian schools : Results of a National study. *Research in Science Education*, *31*, 455–498.

Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teacher ' s science teaching efficacy belief instrument. *Science Education*, *74*(6), 625–637.

Roseman, B. (2018). From policy to practice : Perceptions of effective teaching in Ethiopia. *Education Policies for Global Development*, (July).

Rosenholtz, S. J. (1989). Workplace conditions that affect teacher quality and commitment : Implications for teacher induction programs. *The Elementary School Journal*, *89*(4). https://doi.org/0013-5984/89/8904-0003$01.00

Sackney, L., & Mitchell, C. (2001). Building capacity for a learning community. *Canadian Journal of Educational Administration and Policy*, (19), 1–11.

Sai, X., & Siraj, S. (2015). Professional learning community in education:Literature review. *The Online Journal of Quality in Higher Education*, *2*(2), 65–78.

Saritas, T. Akdemir, O. (2009). Identifying factors affecting the mathematics achievement of students for better instructional design. *International Journal of Instructional Technology and Distance Learning*, (1550–6908), 214–225. https://doi.org/10.1016/j.tate.2018.01.001

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74. Retrieved from http://www.mpr-online.de

Schmidt, M. (2010). Learning from teaching experience : Dewey ' s theory and preservice teachers ' learning article, *58*(2), 131–146. Retrieved from https://www.jstor.org/stable/40666239

Schumacker, R. E., & Lomax, R. G. (2016). *A biggner 's guide to structural equation modeling* (4th ed.). New York,NY10017: Taylor & Francis.

Schunk, D. H., & Zimmerman, B. J. (Eds.). (1998). *Self-regulated learning: From teaching to*

self-reflective practice. Guilford Press. (E, Ed.). New York.

Schunk, D. H. (2012). *Learning theories:An educational perspectives.* (6th ed.). North Carolina: Pearson.

Seferoglu, S. S. (2004). Teacher candidates ' evaluation of their teaching competencies in Turkish. *Hacettepe University Journal of Education*, *26*(May), 131–140. https://doi.org/https://www.researchgate.net/publication/257655993

Serin, K., & Bayraktar, Ş. (2014). Pre-service classroom teachers ' science teaching efficacy beliefs and their Locus of Control Status .conference paper, *3*(March 2014).

SHI, Q. (2014). Relationship between teacher efficacy and self-reported instructional practices : An Examination of Five Asian Countries / Regions Using TIMSS 2011 Data. *Front.Educ.China*, *9*(4), 577–602. https://doi.org/10.3868/s110-003-014-0045-x

Shin, M. (1998). Promoting students ' self-regulation ability : Guidelines for instructional design. *Educational Technology*, *38*(1), 38–44. Retrieved from https://www.jstor.org/stable/44428446 Accessed:

Sitzmann, T., & Ely, K. (2011). A Meta-Analysis of Self-Regulated Learning in Work-Related Training and Educational Attainment: What We Know and Where We Need to Go. *Psychological Bulletin*, *137*(3), 421–442. https://doi.org/10.1037/a0022777

Smith, T. K., Connoly, F., & Pryseski, C. (2014). Positive school climate:What it looks like and how it happens. *Baltimore Education Research Consortium*, (February).

Somprach, K., Tang, N. K., & Popoonsak, P. (2017). The relationship between school leadership and professional learning communities in Thai basic education schools. *Educational Research for Policy and Practice*, *16*(2), 157–175. https://doi.org/10.1007/s10671-016-9206-7

Spruce, R. and, & Bol, L. (2014). Teacher beliefs , knowledge , and practice of self-regulated learning. *Springer*. https://doi.org/10.1007/s11409-014-9124-0

Studenska, A. (2011). Educational level, gender and Foreign Language Learning Self-regulation difficulty. *Procedia - Social and Behavioral Sciences*, *29*, 1349–1358. https://doi.org/10.1016/j.sbspro.2011.11.373

Sunger, M. (2007). An analysis of Efficacy beliefs, epistemological beliefs and attitudes toward science in preservice elementary science teachers and secondary science teachers. *Unpublished Master Thesis*, 149–157. https://doi.org/10.1174/113564009787531226

Sweigart, D. P. (2012). Professional learning communities , self -efficacy , and collaborative learning in the elementary school. *Unpublished Disertation Work*.

Taherdoost, H. (2017). Sampling methods in research methodology ; How to choose a sampling technique in research. *International Journal of Academic Research in Management*, *5*(2). https://doi.org/10.2139/ssrn.3205035

Tatar, E., Tosun, C., Tüysüz, C., & İlhan, N. (2016). Investigation of factors affecting students ' science achievement according to Student Science teachers. *International Journal Instruction*, *9*(2). https://doi.org/10.12973/iji.2016.9211a

Tessmer, M., & Richey, R. C. (1997). The role of context in learning and instructional design. *Educational Technology Research and Development*, *45*(2), 85–115. Retrieved from http://www.jstor.org/stable/30221388

Throndsen, I., & Turmo, A. (2012). Gender differences in teachers' beliefs and primary school children's achievement in mathematics. *Problems of Education in the 21st Century*, *39*, 159–170.

Toussi, M.T, Boori, A.A., Ghanizadeh, A. (2011). The Role of EFL teachers ' self-regulation in

effective teaching. *World Journal of Education*, *1*(2), 39–48. https://doi.org/10.5430/wje.v1n2p39

Toussi, M. T., & Ghanizadeh, A. (2012). A study of EFL teachers ' locus of control and self-regulation and the moderating role of self- efficacy. *Theory and Practic in Language Studies*, *2*(11), 2363–2371. https://doi.org/10.4304/tpls.2.11.2363-2371

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, *17*(7), 783–805. https://doi.org/10.1016/S0742-051X(01)00036-1

Tschannen-Moran, M., Hoy, A. W. &, & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248. https://doi.org/10.3102/00346543068002202

Tschannen-Moran, M., & Mcmaster, P. (2009). Sources of self-efficacy : Four professional development formats and their relationship to self-efficacy and implementation of a new teaching strategy. *The Elementary School Journal*, *110*(2), 228–245.

Tschannen-Moran, Megan, & Mcmaster, P. (2009). An examination of the relationship between professional learning community variables and teacher self-efficacy, *110*(2), 228–245.

Uzuntiryaki-Kondakcia, E., Demirdöğen, B., NurAkın, F. . ., Tarkin, A., & Aydın- Günbatarc, S. (2016). Exploring the complexity of teaching: The interaction between teacher self-regulation and pedagogical content knowledge. *Royal Society of Chemistry*. https://doi.org/10.1039/C6RP00223D

van Eekelen, I.M., Boshuizn , H.P.A & Vermunt, J. D. (2005). Self-regulation in higher Education teacher learning. *Springer*, *50*(3), 447–471. https://doi.org/10.1007/sl0734-004-6362-0

Van Rens, L., Pilot, A., & Van Der Schee, J. (2010). A framework for teaching scientific inquiry in upper secondary school chemistry. *Journal of Research in Science Teaching*, *47*(7), 788–806. https://doi.org/10.1002/tea.20357

Vandevelde, S., Vandenbussche, L., & Van Keer, H. (2012). Stimulating self-regulated learning in primary education: Encouraging versus hampering factors for teachers. *Procedia - Social and Behavioral Sciences*, *69*(Iceepsy), 1562–1571. https://doi.org/10.1016/j.sbspro.2012.12.099

Veenman, M. J. (2011). Alternative assessment of strategy use with self-report instruments: A discussion. *Metacognition and Learning*, *6*(2), 205–211. https://doi.org/10.1007/s11409-011-9080-x

Velthuis, C., Fisser, P., & Pieters, J. (2014). Teacher training and pre-service primary teachers ' self-efficacy for science teaching. *Journal of Science Teacher Education*, *25*(4), 445–464. https://doi.org/10.1007/sl0972-013-9363-y

Yin, R. . (2018). *Case study research and applications:design and methods*. *SAGE* (6th ed.). India.

Young, D. B., & Ley, K. (2004). Effectiveness of POME instructional model. *Research and Teaching in Developmental Education*,*21*(1), 5–13. Retrieved from https://www.jstor.org/stable/42802564 Accessed:

Zimmerman, B.J. & Schunk, D. H. (2001). *Self-regulated learning and academic* (2nded ed.). New York: Routledge. https://doi.org/https://doi.org/10.4324/9781410601032

Zimmerman, B.J. Schunk, D. H. (2011). *Handbook of self-regulation of learning and performance*. (J. A. Shunk, Dale H. & Greene, Ed.) (2nd ed.). New York: Routledge.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal*

of Educational Psychology, *81*(3), 329–339. https://doi.org/10.1037/0022-0663.81.3.329

Zimmerman, B.J. (2000). Becoming a self-regulated learner: Which are the key subprocesses? *Contemporary Educational Psychology, 11(4),4*(11), 307-313.

Zimmerman, B.J. (2002). Becoming a self-regulated learner : An overview. *Theory Into Practice*, *5841*(0040). https://doi.org/10.1207/s15430421tip4102

Zimmerman, Barry J. (2000). Attaining Self-Regulation: A Social Cognitive Perspective. *Handbook of Self-Regulation*, 13–39. https://doi.org/10.1016/B978-012109890-2/50031-7

http//www.education partnership.org

http//www.school climate.org/climate

Appendix A: Self-regulated teaching Scale

Teachers' questionnaire QUESTIONARE CODE----------

Dear respondents; the purpose of this questionnaire is to gather /data/ from teachers about the practice of teaching science using self-regulated instructional strategies (teaching with self-regulation) or how much teachers are cognitively, meta- cognitively and motivationally self-regulatory and reflective in their classroom teaching. To achieve this objective, your honest response to this questionnaire is very much important. Hence the researcher kindly requests your cooperation to fill in the questionnaire for the purpose of fulfilling my dissertation work. The response you give for each question has its own impact on the validity and reliability of the research. Therefore, you are kindly requested to fill the questionnaire by giving your attention and patience.

How to fill the questionnaires

1/The questionnaire has two general parts(A& B); **part ' A'** deals with personal back ground; Whereas **part 'B'** has four sections; the first section is related to teachers' self-regulation practice; the second section is related to the extent of professional learning community (teachers dialogue and experience sharing among each other); the third part is concerned with your perception on the of influence of science teaching resources availability on your teaching efficacy in your school ; and the last part contains teachers' science teaching self- efficacy belief(belief of the capacity to teach effectively)

2/ The questions are a 5 Likert scale ranging from strongly disagree, disagree, uncertain, agree and strongly agree

Remember, strongly disagree has value 1, disagree has value 2; Uncertain has value 3; Agree has value 4; and for strongly agree has value 5

Therefore, you are kindly requested to **circle your choice** in front of each statement under the agreement-disagreement column.

Thank you for your co-operation in advance

- **For any information**

Researcher's name: MekuriawMengistnew

E-mail-mekurish2009@gmail.com .Phone number-09-18-78-91-57

Part A. Personal back ground data:

A/ Name of the school you teach----------

B/Gender: F,☐ M ☐ ; C/ subject you teach----------

D/ Grade you teach----------;

E/ Qualification: Diploma ☐, degree☐; Master ☐,

F/ **Year of experience in secondary schools**: Below 5 years☐;6--10years ☐;11-15 years ☐;16-20 years ☐, above 20 years

Part B.

Section1.

Instruction: This section deals with your self- regulation in your science classroom teaching as a teacher. Please read each statement indicated below and give your genuine responses on the rating scale in the right side of each item. The scale represents SD = Strongly Disagree, D = Disagree, UC=Uncertain, A = Agree, SA = strongly agree.

	Teachers' self-regulation					
	GOAL SETING	SD	D	UC	A	SA
1	While preparing a science lesson, I identify goals to be achieved by students	1	2	3	4	5
2	While preparing a science lesson, I decide on the instructional strategy appropriate for the topic	1	2	3	4	5
3	While preparing a science lesson, I take students' characteristics in to consideration	1	2	3	4	5
4	Before instruction, I decide on how to assess my students.	1	2	3	4	5
5	While preparing science lesson, I take available resources into consideration.	1	2	3	4	5
	HELPSEEKING					
6	I ask for help from my colleagues when I encounter problems that I cannot solve.	1	2	3	4	5

7	While preparing science classes, I get help from my colleagues when needed.	1	2	3	4	5
8	I discuss my positive and negative experiences with my colleagues before and after instruction.	1	2	3	4	5
	INTRINSIC INTEREST					
9	I like science teaching profession.	1	2	3	4	5
10	It makes me happy to see my students learn science.	1	2	3	4	5
11	I am proud of working as a science teacher.	1	2	3	4	5
12	I attend my classroom teaching willingly and actively	1	2	3	4	5
	Mastery Goal Orientation					
13	I believe that successful science teaching improves students' learning	1	2	3	4	5
14	It is important to be a successful teacher in order to satisfy myself professionally	1	2	3	4	5
15	Effectively teaching enables me to develop myself professionally	1	2	3	4	5
16	I believe that effective science teaching helps my students to prepare for a better achievement.	1	2	3	4	5
	Performance Goal Orientation					
17	Effectively science teaching enables me to get promotion	1	2	3	4	5
18	I have to teach effectively to get appreciation from others.	1	2	3	4	5
19	I have to teach effectively to be loved by my students.	1	2	3	4	5
20	I have to teach effectively to strengthen my authority	1	2	3	4	5
21	I have to teach effectively to make school principals happy	1	2	3	4	5
	Self-evaluation					
22	I learned from the mistakes I made in science classes.	1	2	3	4	5
23	At the end of instruction, I try to evaluate whether I have met my lesson goals or not.	1	2	3	4	5

24	I use students' feedback to improve my instruction.	1	2	3	4	5
25	While evaluating myself, I always compare my performance with the previous classes	1	2	3	4	5
	Self-instruction					
26	I direct myself to use time effectively during my science teaching.	1	2	3	4	5
27	If the strategies I have used in my science teaching do not work, I utilize alternative strategies	1	2	3	4	5
28	I pay attention to students' facial expressions during instruction.	1	2	3	4	5
29	During instruction, I always adapt my instructional strategies based on students' needs.	1	2	3	4	5
	Self-reaction					
30	I feel good about myself when everything goes according to the plan of my instruction.	1	2	3	4	5
31	If I am successful in my teaching, encourages me to learn more.	1	2	3	4	5
32	I get upset when I am negatively evaluated in my profession.	1	2	3	4	5
33	If I know that I am not successful in my teaching worries me	1	2	3	4	5
	Emotional Control					
34	I stay calm when I faced with a problem while I am teaching.	1	2	3	4	5
35	When I feel bad in a situation while I am teaching, I try to think positive	1	2	3	4	5
36	I take a deep breath, when I encounter a problem during my science classroom teaching,	1	2	3	4	5
37	I do not upset when a problem occurs during my instruction	1	2	3	4	5

	Total					

Table 2

Appendix B: professional learning community practice scale

Section 2. Teachers' perceptions of professional learning community practices in their school

Instruction; This questionnaire assesses your perceptions about your principals, and staff practices based on the dimensions of a professional learning community (PLC) and related attributes. Read each statement and then use the scale below to select the scale point that best reflects your personal degree of agreement with the statement**. Circle** the appropriate number in the scale provided to the right of each statement. Be certain to select only one response for each statement.SD- stands for strongly disagree; D- stands for disagree; UC- Uncertain; A= Agree; SA= for strongly agree

Key Terms:

Principals = Principal and Vice Principal)

Staff/Staff Members = All teaching staff directly associated with curriculum, instruction, and assessment of student

	Shared and Supportive Leadership	SD	D	UC	A	SA
1	Staff members are consistently involved in discussing and making decisions about teaching-learning issues.	1	2	3	4	5
2	The principals incorporate advice from staff members to make decisions.	1	2	3	4	5
3	Staff members have accessibility to key information.	1	2	3	4	5
4	The principals are positive and addresses areas where support is needed.	1	2	3	4	5
5	Opportunities are provided for staff members to initiate change.	1	2	3	4	5
6	The principals share responsibility for innovative actions.	1	2	3	4	5
7	The principals participate democratically with staff sharing power and authority.	1	2	3	4	5
	Shared Values and Vision					
8	A collaborative process exists for developing a shared sense of values among staff.	1	2	3	4	5
9	Staff members shared values, support norms of behavior	1	2	3	4	5

	that guide decisions about teaching and learning.					
10	Staff members share visions for school improvement that have a focus on student learning.	1	2	3	4	5
11	Decisions are made in alignment with the school's values and vision.	1	2	3	4	5
12	A collaborative process exists for developing a shared vision among staff.	1	2	3	4	5
	Collective Learning and Application					
13	Staff members work together to seek knowledge, skills and experiences to improve instructional skills	1	2	3	4	5
14	Collegial relationships exist among staff members that reflect commitment to school improvement efforts.	1	2	3	4	5
15	Staff members plan and work together to search for solutions to address diverse student needs.	1	2	3	4	5
16	Staff members engage in dialogue that reflects a respect for diverse ideas that lead to continued inquiry.	1	2	3	4	5
17	Professional development focuses on teaching and learning	1	2	3	4	5
18	School staff members learn together and apply new knowledge to solve the teaching-learning problems.	1	2	3	4	5
19	School staff members are committed to programs that enhance learning.	1	2	3	4	5
20	Staff members collaboratively analyze student work to improve teaching and learning	1	2	3	4	5
	Shared Personal Practice					
21	Opportunities exist for staff members to observe peers and provide comments and encouragement in classes.	1	2	3	4	5
22	Staff members informally share ideas and suggestions for improving student learning.	1	2	3	4	5
23	Staff members collaboratively review student work to share and improve instructional practices.	1	2	3	4	5

24	Opportunities exist for coaching and mentoring among staff.	1	2	3	4	5
	Supportive Conditions - Relationships					
25	Caring relationships exist among staff and students that are built on trust and respect.	1	2	3	4	5
26	A culture of trust and respect exists among staff for taking risks.	1	2	3	4	5
27	The outstanding achievement of staff is recognized and celebrated regularly in our school.	1	2	3	4	5
28	School staff members show a sustained and unified effort to bring change into the culture of the school.	1	2	3	4	5
29	Relationships among staff members support honest and respectful examination of data to enhance teaching and learning.	1	2	3	4	5
	Supportive Conditions - Structures					
30	Time is provided to facilitate collaborative work.	1	2	3	4	5
31	The school schedule promotes collective learning and shared practice.	1	2	3	4	5
32	Financial resources are available for professional development programs.	1	2	3	4	5
33	Appropriate technology and instructional materials are available for staff collective learning.	1	2	3	4	5
34	Resource people provide expertise and support for continuous learning.	1	2	3	4	5
35	There are Communication systems that promote a flow of information among staff members	1	2	3	4	5
	Total					

Appendix C: Science teaching self-efficacy Belief scale

Section3.Instruments for measuring teachers' science teaching self-efficacy belief

This part of the questionnaire measures your self-efficacy beliefs about teaching Science subjects (chemistry, physics, & Biology); Please select your agreement by **circling** your choice in front of the statements; '' Science'' is to mean the subject you are teaching. Use the following key:

Strongly Agree =SA; Agree =A; UC= for uncertain; Disagree=D; Strongly disagree =SD Statements

No	**Science teaching self-efficacy belief**	SD	D	UC	A	SA
1	When a student does better than usual in science, it is often because the teacher exerted more	1	2	3	4	5
2	I am continually finding better ways to teach my science subject	1	2	3	4	5
3	Even when I try very hard, I don't teach science (my subject) as well	1	2	3	4	5
4	I know the steps necessary to teach my science subjects' concepts.	1	2	3	4	5
5	I am not very effective in monitoring science experiments	1	2	3	4	5
6	The improvement of students' science achievement is due to their teachers' more effective teaching approach	1	2	3	4	5
7	I generally teach my science subject ineffectively.	1	2	3	4	5
8	The inadequacy of a student's science background can be overcome by good teaching	1	2	3	4	5
9	The low science achievement of some students cannot generally be blamed on their teachers.	1	2	3	4	5
10	I understand my subject concepts well enough to be effective in teaching.	1	2	3	4	5
11	Increased effort in science teaching produces little change in some students' achievement	1	2	3	4	5

12	The teacher is generally responsible for the achievement of students in science.	1	2	3	4	5
13	Students' achievement in science is directly related to their teacher's effectiveness in science teaching.	1	2	3	4	5
14	I find it difficult to explain to students why science experiments work	1	2	3	4	5
15	I am typically able to answer students' science questions.	1	2	3	4	5
16	I am happy if I have the necessary skills to teach science	1	2	3	4	5
17	Effectiveness in science teaching has little influence on the achievement of students with low motivation.	1	2	3	4	5
18	Given a choice, I would not invite the principal to evaluate my science teaching.	1	2	3	4	5
19	When a student has difficulty understanding a science concept, I am usually at a loss	1	2	3	4	5
20	I don't know what to do to turn students on to science	1	2	3	4	5
21	Even teachers with good science teaching abilities cannot help some students learn science	1	2	3	4	5

Appendix D: Science teaching resource availability measurement scale

Section 4. Instrument for measuring the perception of teachers on the influence of availability of science teaching resources to increase teacher's teaching self-efficacy

This instrument is used to measure how much the extent of science teaching resources and facilities in the school affects the teaching efficacy of teachers. It is assumed to represent common teaching resources for all science subjects (chemistry, physics & Biology). So, if you believe that there is sufficient resources and facilities that increase your teaching efficacy, select strongly agree (SA); for medium(average) resources and facilities select agree(A), select Disagree(D) for insufficient resources and facilities and SD= Strongly disagree, if there are no resources or facilities/ practices at all, and if you are not sure select uncertain (UC). Please complete the following by **circling** your choice in the appropriate space.

I	**References &Texts**	SD	D	UC	A	SA
1	The presence of sufficient curriculum material for my subject encourages me to teach effectively.	1	2	3	4	5
2	There is clear and guiding syllabus so that it gives me confidence for teaching	1	2	3	4	5
3	There is enough text book for students and for me in my subject to teach effectively	1	2	3	4	5
4	There is adequate reference material for my subject for further understanding	1	2	3	4	5
5	There are laboratory manuals(guidelines)to properly teach my subject	1	2	3	4	5
II	**Human resource**					
6	There is trained lab technician for assisting me to experiment lab in my subject effectively	1	2	3	4	5
7	There are enough number of teachers in my subject so that I teach tirelessly	1	2	3	4	5
8	There are School principals who are responsive in fulfilling science resources	1	2	3	4	5

III	**Infrastructure**					
9	There is availability of water to conduct science experiments	1	2	3	4	5
10	There is continuous supply of electric power for conducting my laboratory work effectively	1	2	3	4	5
11	There are well ventilated and enough spaced rooms in the laboratory so that I conduct lab experiments with my students	1	2	3	4	5
12	There are enough seating stools/ chairs for all students so that they can observe the experiment comfortably	1	2	3	4	5
13	There are well fixed sinks for waste liquids in the laboratory to teach effectively	1	2	3	4	5
14	There are enough tables and cabinets to conduct laboratory work in the laboratory	1	2	3	4	5
15	There is enough shower access used for accidents in my subject laboratory	1	2	3	4	5
16	There are ramps for physically disabled students in the lab buildings	1	2	3	4	5
17	There is enough access of teaching technology for my subject	1	2	3	4	5
18	The absence of separate laboratory for each science does not affect my teaching	1	2	3	4	5
	Chemicals and materials related					
19	The presence of enough chemicals does not encourage me to conduct experiments in my subject	1	2	3	4	5
20	The absence of enough equipment and apparatus discourages me to conduct experiments in my subject effectively	1	2	3	4	5
21	There are enough models to teach students effectively in my subject laboratory	1	2	3	4	5
22	There are adequate safety wares used for protection during lab work so that I conduct experiment without fear	1	2	3	4	5
	Total					

Appendix E: Interview questions

Interview questions for secondary school science teachers

A/ Preparatory or forethought phase

1/Do you evaluate yourself about your preparation? If yes how? If not why not?

2/Do you assess your environment what teaching materials are needed for your classroom teaching?

3/ Do you consider students' characteristics and need during your preparation? If yes how? If not, why not?

4/ How do you evaluate the teaching-learning environments before class? If yes how?

5/ Do you craft the learning objectives of your lesson? If yes why? If not, why not?

6/Do you identify the strategies to achieve the learning objectives? If not, why not?

7/why do you prefer the teaching profession? Why do you teach?

B/Performance or volitional phase

1/How do you control yourself while you are teaching?

2/How do you evaluate whether you teaching according to your plan?

3/ Do instruct yourself while you are teaching? If yes, how? If not, why not?

4/Do you record your activities while you are teaching? If yes how? If not, why not?

5/What do you feel if you get a challenge while you are teaching?

6/Do you ask help when needed in your teaching? If not, why not?

C/ Self-reaction or self-reflection Phase

1/What do you do by the last minutes of your class?

2/ Do you evaluate your classroom teaching effectiveness? If yes how? If not, why not?

3/How do you evaluate students' satisfaction by your teaching?

4/What do you feel if you are successful in your teaching?

5/ what do you feel if you are not successful in your teaching?

6/who is more effective in their self-regulated teaching? Male or female teachers? Why?

Appendix F: Classroom Observation Check list

Classroom observation check list

No.	Items	Yes	No	Remark
1	Daily lesson introduced			
1	Objectives are communicated			
3	Descriptions and explanations of the topic of the lesson are made			
4	Activities are delivered to students			
5	Resources are used in the lesson			
6	Students are observed while doing activities			
7	Manage the time as per the plan			
8	Assessment strategies applied in the classroom as per the plan			
9	Alternative strategies are applied when needed			
10	Students' questions, comments and suggestions positively entertained			
11	Conclusion of the lesson was made			

Appendix G: Document Analysis check list

Lesson plan observation checklist

No.	List of items	yes	no	Remark
1	Name of the school, Topic of the lesson, Grade level, section, time of the lesson covers are included at the top			
2	Objectives areidentified			
3	Teacher's activities are identified			
4	Students' activities are listed			
5	Times/minutes/are assigned to teacher's and students' activities			
6	Resources for the lesson are identified			
7	Assessment strategies are listed			

Appendix H: Amharic version of interview Questions

<u>የ መምኅራንን ስለራስ ሚና የ ሚስተሜር ስነ ዘዴልምድየ ተዘጋጀ ቃለ ማጠይቅ</u>

ወድመምሪራን የ ዚህ ማጠይቅዋና ዓላማዎ ሁለ ተኛደረጃሳይን ስ መምህራነ ስለራስ -
ሚና የ ሚስ ተሜር ልምድምን እንደሚሳ ልበ ቃለ -
መጠይቅመረ ጃለ ማስ ብሰ ብሲሆን ጠቀሜታውምላ ሶ ስ ተኛ ድግሪ ማ□ያነ ው፥ ፡

በ መሆኑ ምለ ቃለ -
ማጠይቁትከ ከለ ኛወን መልስ በ ማስ ጠት ትብብራችሁእን ዳይለየ ኝእ ጠየ ኩለ ምታደር ጉልኝት ብብር ምክ ወዲሁአ ሚሳ ግና ለሁ ፡ ፤

ማስ ሰቢያ

የ ምተሰ ጠት ማን ኛ ወፃመረ ጃበ ምር ምር ህ ግና ደን ብማስ ረ ትስ ማቸሂ ሁአ ይጠቀ ስ ም፤
ለ ማን ምአ ሳ ልፎ ምየ ሚይሰ ጥና ሚስ ጥራዊ መሆኑ ን አ ረ ጋ ግጥላ ቸህ ሃ ለሁ፤ ፤

<u>ግለ ሂ ወት መረ ጃ</u>

1/ ስ ም----------ጾ ታ---------የ ሚስ ተሜር ልምድ------- ---የ ትምህ ር ትዓ ይነ ት----------የ ትምህ ር ትቤቱስ ም----------

<u>ሀ / ቅድመዘግጅትምዕ ራፍን በ ተመለ ከተ</u>

1/በ ቅድመዘግጅትግዜእ ራስ ህን /ሽን ስለ ዝግጅትህ /ሽ ትገ መግሜለ ህ /ሽ?አ ዎከ ሆነ እ ንዴት? ካልሆነ ለ ምን ?

2/ለ ምታስ ተምረ ወ/ሪ ወትምህ ር ትይዘ ትምን ምን ነ ገ ሮች እ ንደሜየ ስፈልግና እ ንደምት ጠቀምባ ትዳሰሳ ታደር ጋለ ህ /ሽ ?

3/ስለ ተሜሪ ዎችህ ፍላጎ ትና ችሎታአ ስቀድመህ በ ሜዎቅትዘ ጋጃለ ህ /ሽ?አ ዎከ ሆነ እ ንዴት? ካልሆነ ስለ ምን ?

4/ለ ሚስ ተሜር ምን ምቹሁኔ ታና መሟ ትስለ ሚ ባቸውነ ገ ሮች ቅኝትታደር ጋለ ህ /ሽ?

5/ለ ዕለ ቱትምህ ር ትመዳረ ሻይቀረፃ ል?ካልሆነ ስለ ምን ?

6/መዳረ ሳ ን ለ ሚስ ካትስ ትራቴጅዎችን ትለ ያለ ህ /ሽ?

7/የ ሚስ ተሜር ን ስ ራለ ምን ሚ ጥከ ወ/ሻ ው?ለ ምን ስ ታስ ተምራለ ህ /ሽ?

<u>ለ / የ ትግበራምዕ ራፍ</u>

1/በ ከፍልወስ ጥስ ታስ ተምር /ሪ እ ራስ ሽን እ ን ዲትትቆጣጠራለ ህ /ሽ?

2/የ ምታስ ተሚ ወትምህ ር ትእ ንዴትእ የ ሄደእ ንደሆነ ትቃኛለ ህ /ሽ?

3/ ክፍልወስጥስታስተምር/ሪ ራስህንበራስህ/ሽ ታስተምራለህ/ለሽ?ከሆነ ስእንዴት? ካለሆነ ለምን?

4/በምታስተምርበትጊዜወደፊትሊሻሽልወይምሊጠነ ከርየ ሚ ባወን ትማዘ ግባለህ ?እንዴት?

5/ እያስተማርክ/ሽ እያለህ/ሽ ማስናክል/ተግዳሮትቢገ ጥምህ/ሽ እንዴትተወጣሽው/ሽው፤ ትወጫዋለሽ/ለህ?

6/በምታስተምርበትጊዜእገዛሲያስፈልግትጠይቃለህ/ለሽ? እንዴት?

<u>ሐ/የ ፅብረቃ/አፀ ግብሮትምህ ራፍ</u>

1/ በክፍለጊዜህሜጩሳቹደቂቃዎችምን ታደረጋልህ/ሽ?ሂደቱነ ስእንዴትትገ መግሚህ?

2/ስለማስተማርስኪትትገ መግሚህ/ለሽ?እንዴት? ካልሆነ ስለምን?

3/ምንተንካራጎን፤ ምንደካማንእንዳለህአራስህነ በራስህ/ሽ ትገ መግሚህ/ሽ?ከኖነ በምንመልክ? ካልሆነ ስኪታመምሆንአለመሆንህንበምን ታውቃለህ?

4/ስለተማሪዎችህእርካታታረጋግጣለህ/ሽ?እንዴት? ካልሆነ ስበምንተወቃለህ/ሽ?

5/በማስተማርህወጤታማከሆንክ/ሽ ምንይሰሚኝል/ሻል?

6/ወጤታማትሆንበትጊዜስምንትላለህ/ሽ?በምንተሳብባለህ?

7/ወጤታማስትሆንለቀጣይምን ታስባለህ/ለሽ?ሳትሆነ ስ?