SECONDARY SCHOOL SCIENCE TEACHERS' CONCEPTIONS, PERCEPTIONS, AND PRACTICES OF THE INQUIRY-BASED TEACHING METHOD

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Abstract. The purpose of this study was to examine teachers' conceptions, perceptions, and practices of the inquiry based teaching method (IBTM) in science classrooms in secondary schools of the South West Shewa Zone of Ethiopia. In order to meet the objectives of this study, a descriptive survey design was employed. Thus, 116 teachers, ten principals, and four supervisors were selected using availability sampling as well as 347 students were selected using stratified cluster sampling. Questionnaires and interviews were used for collecting data. A classroom observation structured checklist was used to supplement the data. The data obtained through the questionnaires were analyzed using frequency, percentages mean, and standard deviation. The information obtained through open-ended questionnaires and the interview was qualitatively analyzed to support the quantitative data. The findings revealed that the majority of teachers had awareness on IBTM, they believed that IBTM was useful for students learning but they did not use it in their classroom. The major challenges identified were lack of a conducive learning environment, stu-

dents' interest toward the inquiry based method; large class size, teachers' work load, lack of teaching materials, and lack of teachers' experience in using inquiry based teaching method.

Keywords: conception, perception, practice, inquiry based teaching method, science, mathematics

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Introduction

Background

The main purpose of teaching at any level of education is to bring a fundamental behavioral change in the learner. To facilitate the process of knowledge transmission, teachers should apply appropriate teaching methods that best suit specific objectives and desired learning outcomes. In the traditional epoch, many teaching practitioners widely applied teacher-centered approaches (TCA) to impart knowledge to learners, comparative to student-centered approach (SCA). Still, questions about the effectiveness of teaching methods on student learning have consistently raised considerable interest in the thematic field of educational research (Adunola, 2011).

In order to achieve these objectives, there are two broad approaches of instruction, which are used as a framework of instruction at various educational levels (i.e., elementary, secondary, and tertiary level). These are teacher-centered and student-centered approaches. In a teacher-centered approach, students put all their focus on their teachers and most of the time they are passive learners. In this approach during the classroom activities, the only participants and primary sources of knowledge are the teachers. The student-centered approach on the other hand, enables students to put all their focus on their knowledge and goals so they are active learners. As such, the student-centered approach is a method of teaching in which the focus of instruction is shifted from the teacher to the students.

There has been a paradigm shift in pedagogy across the world from a teacher dominated teaching approach to a more student-centered approach. Tadesse & Gillies (2015) stated that various pedagogic approaches exist to promote effective teaching so that teachers can transform classrooms into more engaging and supportive learning environments. In original usage, a student-centered approach aimed to develop learner autonomy and independence by putting responsibility for the learning in the hands of students. Learning is not a spectator sport. Students do not learn as much just by sitting in class listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives. Student-centered instructional strategies promote deep and lasting learning (Fahraeus, 2013).

A student-centered approach is a broad concept that includes various specific methods of teaching. One of which is the inquiry based teaching method (IBTM). IBTM has been seen to be an effective teaching and learning method by which students are actively engaged and progress towards becoming literate about what science is, what science looks like, how to do science, and how to communicate science (NRC, 1996). In the area of science teacher preparation, these pre-service teachers' experiences have become a logical target for change. While teachers should utilize an arsenal of different strategies when teaching science, the National Research Council (NRC) (2000) described five essential features of classroom inquiry that apply across all grade levels: questions, evidence explanations from evidence, learner connects explanations to scientific knowledge, learner communicates, and justifies explanations. IBTM is a successful teaching technique where students develop a sense of curiosity about the world around them and are introduced to scientific ways of thinking.

In science subjects, learners encounter problems they do not understand, they formulate questions, explore problems, observe, and apply new in-

formation in seeking a better understanding of the world. The natural process the learners follow when seeking answers and deeper understanding closely follows the generally accepted scientific method. The question is, can an IBTM help in any way? The Programme for International Students Assessment (PISA) results of 2003 show that there is a close correlation between the teaching techniques and the performance of learners (OECD, 2009). Moreover, from a science perspective, IBTM engages students in the investigative nature of science while from the pedagogical perspective; inquiry-oriented teaching is often contrasted with the more traditional expository methods. In its essence, inquiry-oriented teaching engages students in investigation to satisfy curiosity that gets satisfied once individuals have constructed mental framework that adequately explains their experiences (Chang & Lee, 2010).

Teachers' beliefs about science and about the process of their teaching have been proposed to have a potential impact on the implementations of the reform-based teaching method. If a teacher does not believe that students can learn through inquiry then the teacher's belief becomes a major obstacle for such implementation (Kazempour et al., 2009). Thus, it is important to try to understand a teacher's beliefs, and in what ways these beliefs are enacted in their actual teaching practice of inquiry based methods (Bryan, 2003).

Statement of the problems

As stated, a potential benefit of a student-centered approach is that students are able to increase motivation and independence in their learning needs. The advantages of learner-centered approaches are that the learner becomes actively engaged in the learning process, takes responsibility for their own understanding, learns how to learn, develops a desire for lifelong learning, retains knowledge and understanding, and gains social skills by working with others. One of the biggest advantages of a learner-centered approach is that each learner learns through different means and the teacher as a facilitator

has the privilege of learning new things and new modes of communication. Students learn to direct their own learning, ask questions and complete tasks independently.

In Ethiopia's educational policy, a change in the aims of learning and teaching in recent years has led to a change in teaching method, i.e., from a teacher-centered to student-centered method. The goal of general Educational Sector Development Program (ESDP) V 2015/16 - 2019/20 priority programs is to improve the quality of general education in order to motivate children to complete primary and secondary school and provide them with the knowledge, skills, and values to become productive and responsible citizens. Similarly, it is important to note that Ethiopia has placed education at the center of its strategies for development and decentralization, with strong polices promoting quality of educational provision (TGE, 1994). The Ethiopian Government has given emphasis to the fields of science, mathematics, and technology. As a result, Ethiopia has to gear itself to provide the required training in scientific skills to meet the growing challenges of the modern world. Specifically, science education needs to provide for the development of understanding by students over their entire course of general secondary school.

Moreover, in 2003/4 Ethiopia introduced the Teacher Education System Overhaul (TESO) with a new curriculum promoting active learning and student-centered approaches. This curriculum was implemented in most of the teacher training institutions in the country. The aim was to replace the traditional teacher-centered approach with active learning, in which students could interact with teachers and other students (UNICEF, 2010). Although Ethiopia follows the pragmatics education system and there should have been a shift in the curriculum, textbooks, and teachers' guides to promote active learning methodology; teachers' beliefs and practices are not in line with the policy documents as well as the syllabus. Moreover, the adoption of active learning and student-centered methods were also discussed in ESDP II and ESDP III as

a means of giving more responsibility for learning and knowledge construction to students (MOE, 2002; 2005) and promoting more independent learning. In fact, Ethiopia has been working to bring in more active and student-centered learning since the introduction of the new education policy in 1994 (Zwiers, 2007).

Scholars such as Keys & Bryan (2001) have noted that there is little research available on high school teachers' enacting an inquiry-based method. For instance, many regional school compounds in Ethiopia have adopted a new science series in which the focus is on active learning; yet science literacy has been slow to show improvement in young children (Yazachew, 2014). This present study differs from those previously conducted by focusing on different variables, research setting, participants, and employing different research designs. Hence, to ensure the instrumentality of education in science, teachers' beliefs and knowledge on the teaching of science, selection of appropriate teaching methodologies, and an increase their own content knowledge is crucial to take specific action that strengthen science capacity since such knowledge and skills help citizens to find their own solution to their own problem.

There is a critical lack of research on inquiry-based method in secondary schools of the South West Shewa Zone of Ethiopia. Specifically, there is a literature gap on using IBTM in learning science in secondary schools of the South West Shewa Zone. Therefore, this study sought to answer the following questions: (1) to what extent are secondary school science teachers aware of IBTM; (2) what is the secondary school teachers' beliefs about the utility of IBTM for science; (3) to what extent do secondary school science teachers and students use IBTM in their class; (4) what are the challenges for science teachers from applying IBTM in secondary schools.

Research method

Research design

The research design used for this study was a descriptive survey design. As survey research enables the researcher to collect and describe a large variety of data. The data collected involved both quantitative and qualitative. As described in Creswell (2011), having both quantitative and qualitative forms of data provides a better understanding of a research problem than using either method separately.

Population, sample and sampling technique

This study was conducted in secondary schools of the South West Shewa Zone of Ethiopia. The population of this study included ten secondary schools of the four woredas (districts) of the zone. The main sources of data for the study consisted of secondary schools' teachers, school principals, secondary schools' supervisors, and relevant experts from the woreda education offices. Additionally, relevant national education policy documents and secondary schools' classrooms and technology teaching resources were used as sources of information for the study.

The South West Shewa Zone has eleven woredas. To manage the study, four woredas were selected by using stratified or cluster sampling technique. The sampled woredas composed of 36.3% of the total woreda and this was sufficient to represent the population. According to Creswell (2011), 10% to 20% of sample respondents can represent the population. Accordingly, ten target schools were selected for the study. Then all the science teachers in the schools were approached for inclusion for the study. Similarly, four woreda education office experts, four school supervisors, and the ten school principals were invited to participate in this study.

Participating students were from grades 9 and 10. Out of a total population of 7069 students, 378 students agreed to participate in this study. To de-

termine the sample, Kotari (2004) suggests that when the population sizes are not the same, stratified sampling technique is applicable. The summary of sample participants is presented on the Table 1.

Table 1. Summary of sample study participants

Name of sample school	teachers	%	principals	supervisors
Gindo secondary school	69	19.9	1	1
Deluidak secondary school	9	2.6	1	
kota secondary school	26	7.5	1	
Goro secondary school	20	5.8	1	1
Gurura Adis Alem secondary school	13	3.7	1	
Hibret Fire secondary school	140	40.3	1	1
Awash Bune secondary school	5	1.4	1	
Lemen secondary school	48	13.8	1	1
Gibiso secondary school	8	2.3	1	
Adadi Mariam secondary school	9	2.6	1	
Total	**347**	**100.0**	**10**	**4**

Data collection instruments

The instruments used in this study were questionnaires, interviews, and classroom observations.

(A) Questionnaires

The questionnaires were prepared to collect data from teachers, students, principals, and supervisors. The questionnaire consisted of items that intend to examine teachers' awareness, beliefs, practices, and challenges of IBTM in science classes. The questionnaires were adapted from the TBIAQ-R. Some wording modifications were made by the researchers to match better the objectives of the study.

(B) Interview

Semi-structured interview guides were employed to collect data from the teachers about using IBTM. The purpose of the interview was to gather

information about teachers' practices and awareness of IBTM. The interviews were conducted with six of the teachers. The interview protocol allowed sufficient freedom to digress and was designed to probe far beyond the answers to the teachers' prepared and standardized questions. The interviews took place in a face-to-face situation with the participants in the classroom and the interview was audio-recorded to facilitate data analysis.

(C) Classroom observation

Classroom observations were held in order to record the teacher's IBTM practice in their science classrooms. For the purpose of the observation, a structured checklist was developed and employed. The observation was undertaken based on the checklist, which focused on classroom instructional activities or techniques employed by teachers, the role of teachers, and instructional materials used in the teaching learning process. The observation checklist was adapted from Drayton & Falk (2001): some wording modifications were made by the researcher to align the checklist with the objectives of the study. Each class was observed twice.

Validity and reliability of research instruments

To assess the validity of the instruments of data collection, the questionnaires were given to both a language and an educational expert so that they were check for grammatical clarity and validity of instrument, respectively. Finally, after the necessary modifications and corrections were made, the researchers worked with the advisors in order to get comments on the appropriateness of the instruments. Moreover, to address the issue of reliability, a pilot test study was carried out with one of the secondary school teachers to pre-test the research instrument. The result of the pilot testing was statistically computed by using SPSS-version 20. Based on the pilot test, the reliability coefficient (Cronbach's alpha) of the instrument was found to be 0.864, which was

taken to be reliable (Field, 2009).

Procedure for data collection

The data collection procedure was conducted with letters written from the zone education office of the woreda, to encourage participants' cooperation in the study. The informed consent of each woreda education office was obtained. All participants were informed about the objectives of the study by the researchers. Finally, observation and interviews were conducted with participating schools. In collecting the data, it is important to use procedures, which enhance obtaining high quality of data, since the quality of any research study depends largely on the quality of the data collected and the data collection procedure.

After meeting the teachers, the researchers distributed the questionnaire to each and enough time was given for them to fill it in and return it. Then after the questionnaire and classroom observation data collection began. Finally, the interview data were collected from classroom teachers.

Data analysis

In this study, both qualitative and quantitative analysis techniques were employed. The data collected through questionnaire and observation checklists were presented through frequency distributions, mean, standard deviation, and percentage to see the teachers' awareness, beliefs and their practice in the use of IBTM and any challenges that affected them. Data from interviews were transcribed, classified, and presented in a narrative form. Generally, the qualitative data were used in support of the quantitative data to further enrich and enhance the information collected.

Ethical consideration

In this study, the researchers secured by a letter of cooperation from the College of Education and Behavioral Science of Jimma University allowing the researcher to carry out the study. Then the researchers informed the South West Shewa Zone education office and the concerned woreda education offices about the research and requested their cooperation in this study. This study obtained informed consent form participants. The dignity and rights of the participants were protected. Furthermore, the participants were assured that the information they provided would be kept confidential.

Results

The purpose of the research was to assess teachers' conception, perception, and practices of IBTM in science at Secondary Schools of the South West Shewa Zone of the Oromia Regional State, Ethiopia. Subsequently, this section deals with the presentation, analysis, and interpretation of data. Under this section data related to teachers' awareness, beliefs, and practices of IBTM is presented.

Awareness of teachers on inquiry-based teaching method

Teachers' views of learning and teaching are shown to be important predictors of classroom behavior. Crawford (2007) described these views as the combination of teachers' knowledge and beliefs of scientific inquiry and the way children learn science. Relevant literature in the field shows that teachers' awareness and understanding of a certain method determines the teachers' use of that method. Thus, this study investigated secondary school teachers' awareness of IBTM and the result is summarized in Table 2.

The items 1 to 13 in Table 2 describe the teachers' awareness of IBTM. Accordingly, the average mean of those who responded 'yes' were 84

(72.2%), whereas of those who responded 'No' were 32 (25.2 %). These show that the majority of these participating teachers had an awareness regarding IBTM.

Moreover, the information obtained from interviewees showed that these teachers had awareness about IBTM in science. For instance, one of the department head representatives from a school said: "honestly speaking I am not sure whether the secondary school teachers were working with inquiry based teaching but we have awareness about inquiry based teaching method. I myself use this method rarely." It would seem most of these secondary school teachers know what IBTM is.

Table 2. Teachers' awareness of inquiry-based method

No.	Item	Yes		No		Total	
		#	%	#	%	#	%
1	IBTM needs collaboration with teachers	85	73.3	31	26.7	116	100
2	IBTM requires trust between teachers, students, and parents	94	81	22	19	116	100
3	IBTM requires small, interdisciplinary teams of teachers work together	69	59.5	47	40.5	116	100
4	IBTM requires the teacher to facilitate the process	95	81.9	21	18.1	116	100
5	IBTM requires inquiry the form of authentic (real-life) problems within the context of the subject matter	83	71.6	33	28.4	116	100
6	IBTM capitalizes on student interest	81	69.8	35	30.2	116	100
7	In IBTM requires teacher models the behaviors of inquirer.	82	70.7	34	29.3	116	100
8	IBTM requires the teacher to uses language of inquiry ongoing basis	82	70.7	34	29.3	116	100
9	In IBTM students take ownership of their learning	95	81.9	21	18.1	116	100
10	IBTM requires the teacher to facilitates the process of gathering and presenting information	71	61.2	45	38.8	116	100
11	Inquiry is both content and pedagogy.	93	80.2	23	19.8	116	100
12	In IBTM, teachers and students interact more actively than during traditional teaching.	86	74.1	30	25.9	116	100
13	In IBTM, students are actively involved in hands-on experiences.	77	66.4	39	33.6	116	100
	Average	**84**	**72.2**	**32**	**25.2**	**116**	**100**

Teachers belief on the utility of inquiry-based teaching method (IBTM)

Beliefs are a very important factor in terms of student and teacher performance in the teaching and learning of science. For learning to be effective, knowledge should be built, discovered, transformed, and comprehensive by students. For this to happen, the main role of teachers should not be dominant factor of the class but teachers should create conditions within which the students can construct knowledge from what they are learning (Pehkonen, 2003). These secondary school science teachers were requested to complete a 12-item questionnaire to see to what extent teachers' believe the utility of IBTM on students' learning and the result is presented on Table 3.

Table 3. Teachers' belief on inquiry based method (N=116)

No.	Items	Mean	Std. D
1	A primary objective of mathematics/science is to develop the ability to identify and solve problems generated from real-life situations.	3.56	1.253
2	Teachers should provide students with the opportunity to develop and build upon their own understanding of mathematics/science concepts.	3.29	1.463
3	Understanding the process in mathematics/science is as important as obtaining the right answers.	4.00	1.134
4	Problem solving can be facilitated by students working in groups.	4.02	1.103
5	Students learn best in mathematics/science when they are allowed to explore problems and test ideas about possible solutions	3.35	1.528
6	Teachers should have the ability to teach hands-on and minds on science/mathematics in confidence	3.60	1.426
7	Students learn best in science/mathematics through teacher explanations.	3.98	1.071
8	If more time could be spent on recall of facts/drill and practice, students would do better in science/mathematics.	4.00	1.172
9	Inquiry-based learning increase students' understanding of the learning outcomes mandated by the curriculum I must cover	3.43	2.270

10	Inquiry-based learning increase students' ability to read, write and reason	3.34	1.626
11	IBTM help to meet the curriculum standards of the school	2.28	1.443
12	IBTM improved my students' test scores	3.81	1.215
	Average Mean	**3.55**	**1.39**

As it is observed from Table 3, these secondary school teachers were asked about their beliefs about the usefulness of IBTM and the average mean were (M=3.55, SD= 1.39) this shows that the majority of participants agreed that they have positive attitude towards IBTM.

Likewise, the information gathered through interviews confirmed that these participating teachers also confirmed their positive attitude towards IBTM. For instance, one of the interviewees stated: "I have tried to use inquiry based method rarely in the class room. In a way that awarding one point for the student with the correct answer, to motivate them. But students' participations were less." It appears that these secondary school teachers believe that IBTM is important for students' learning.

Teachers' practice of inquiry-based teaching method

There is a difference in these participating teachers' practice of IBTM which includes differences in teachers' curricular interpretation (McNeill, 2009). The reasons for this may be that science is a broad discipline with many sub-divisions and every teacher in his or her respective discipline will most certainly practice IBTM differently. To see the extent of teachers' practice of IBTM among secondary school science teachers Likert type questionnaires were prepared and administered to teachers and students. The summary of their response is presented on Table 4.

Table 4. Teachers practice on inquiry based teaching method (teacher, N=116; student, N=347)

No	Items	Teachers		Students	
		M	S.D	M	**S.M**
1	Students start with easy questions and work up to harder questions	3.74	1.185	3.02	**1.511**
2	Students learn through doing exercise	3.77	1.233	2.32	**.967**
3	Student choose which question they tackle	1.88	1.120	2.25	**1.098**
4	Students learn through discussing their idea	2.40	1.413	1.95	**.963**
5	Students' scientific ability is strengthened by developing his/her inquiry skills.	2.33	1.431	1.41	**.894**
6	Student are taught differently according to individual need	1.92	1.158	1.73	**1.033**
7	Students learn through engage and discussing their idea in group and independently	3.26	1.499	1.59	**.985**
8	The role of a teacher is to facilitate students' own inquiry	3.06	1.476	1.50	**1.001**
9	Students solve practical problems before I show them.	2.48	1.411	1.57	**1.044**
10	Students to suggest new ideas for classroom activities or topic.	3.09	1.503	1.99	**.725**
11	Students learn by finding solutions to problems through working in groups and independently**.**	3.18	1.591	-	-
	Average	**2.82**	**1.36**	**1.933**	**.726**

*Accordingly, the calculated means were interpreted as follows: 4.5-5.00= strongly Agree 3.5 -4.49= Agree, 2.5 -3.49= fairly/moderate, Agree, 1.5-2.49= Disagree 1.00-1.49= strongly Disagree

Table 4 highlights the differences in how these teachers and students understand IBTM and its utilization in class. The average mean score of the teachers was (2.82, SD =1.36), whereas the students' average mean score was (1.933, SD=0.726). These results indicate that the majority of participants be-

lieve that teachers did not practice IBTM in their classrooms. From this result, one could assume that secondary school science teachers are not using this method in their classrooms.

Similarly, the result of interviews showed that the teachers in the secondary schools did not practice whether in groups or individually IBTM in their classrooms. For instance, one of the interviewed chemistry teachers said: "in my opinion, during classroom activities students are not engaging in group or independent, since in their background (elementary school era) they did not practice on IBTM. Even when I give them a chance to participate in group or independently, they can't involve well."

The challenges on implementation of IBTM

The implementations of any teaching learning methods, including IBL, can be influenced by various challenges. These possible challenges could be class size, ability to manage an inquiry, resources constraints, availability of time, and the nature of any interaction with peers. Participants were requested to rate which factors influenced the use of IBL method and the results are summarized in Table 5.

Table 5. Challenges to implement of inquiry based teaching method

No	Items		Teachers response		Principals		Supervisors	
			F	%	F	%	F	%
1	Teachers' lack of awareness on inquiry-based teaching	Yes	45	38.8	5	50.0	2	50.0
		No	66	56.9	5	50.0	2	50.0
2	Having positive inclination on traditional teaching method rather than modern inquiry based teaching/student-centered method	Yes	61	52.6	6	60.0	4	100.0
		No	46	39.7	4	33.3		
3	Teachers' lack of teaching experience about inquiry	Yes	78	67.2	9	90.0	3	75.0

	based teaching method	No	35	30.2	1	8.3	1	25.0
4	students' academic ability	Yes	80	69.0	9	90	3	75.0
		No	35	30.2	1	10	1	25.0
5	Shortage of time	Yes	59	50.9	1	8.3	4	100.0
		No	56	48.3	9	75.0	3	75.0
6	Work load	Yes	70	60.3	6	60.0	1	25.0
		No	46	39.7	4	33.3		
7	Large class size	Yes	60	51.7	8	66.7	4	100.0
		No	54	46.6	2	16.7		
8	Students' lack of interest towards inquiry based learning	Yes	72	62.1	7	58.3	4	100.0
		No	44	37.9	3	25.0		
9	Lack of conducive learning environment,	Yes	73	62.9	7	58.3	4	100.0
		No	43	37.1	3	25.0		
10	Lack of use of teaching local material	Yes	79	68.1	4	33.3	4	100.0
		No	35	30.2	6	60.0		
1.	**Average Mean**	**Yes**	67.7	58.36	6.2	57.49	3.3	82.5
		No	42.5	36.66	3.2	27.66	0.7	17.5

As it is shown in Table 5, secondary schools teachers, principals, and supervisors were asked to identify the major challenges that teachers and students face in using IBTM. Accordingly, the average mean of teachers, principals, and supervisors who responded 'yes' were (F=68, 58.36%), (F=6, 57.49%) and (F=3, 82.5%), respectively. Whereas the average mean of teachers, principals, and supervisors who responded 'No' were (F=43, 36.66%), (F=3, 27.66%) and (F=0.7, 17.5%), respectively. These show that the majority of these participants have challenges implementing IBTM.

The data taken from interviews show that; there are many challenges in secondary schools. One of the department heads listed that laboratory room, lack of facilities, laboratory technicians, number of students in the classroom, lack of awareness of teachers, and students' academic ability to exercise the IBTM especially in mathematics and physics. The following quote elaborates on this: "I have interest to use inquiry based method, but there are a number of challenges to implement it. In my option inquiry based method is best to teach the mathematics and science especially in recent era. In our school the teachers

are fresh to this method and are assigned in class without train pedagogical /methodology or PGDT".

Similarly, one of teachers stated: "Challenges can be observed in two ways; teachers challenge that their ability to teach students, lack of confidence to bring students with this method and classroom condition uncomfortable conditions. In addition, lack of awareness about the method and low capacity of students with grade level they attend before. From the above descriptions of respondents, it would seem that among the main challenges teachers faced in using IBTM the lack of laboratory and training.

Discussion

The first objective of the study was identifying to what extent secondary school science teachers are aware of IBTM in secondary schools of the South West Shewa Zone of Ethiopia. The results of this study indicate secondary school teachers have a good awareness of IBTM. This result is consistent with the findings of scholars in the area that indicate teachers' views of learning and teaching are shown to be important predictors of classroom behavior (Haney et al., 2002). In other words, when teachers have incomplete understanding of scientific processes, teachers do not know how to teach student-centered lessons (Anderson, 2002). Furthermore, as investigating teachers' views related to reform-based teaching like IBTM is important as key components in delivering an effective instruction (Keys & Bryan, 2001).

The other finding of this research is related to teachers' belief on the utility of IBTM for students learning. The results showed that these teachers have a positive attitude towards this method meaning that these teachers believe that IBTM is very useful for teaching science in their school. Research has shown that teachers' beliefs about science and about the process of their teaching have been proposed to have a potential impact on the implementations of the reform-based teaching method. If a teacher does not believe that

students can learn through inquiry then the teacher's belief becomes a major obstacle for such implementation (Kazempour et al., 2009). Thus, it is important to try to understand a teacher's belief, and in what ways beliefs are enacted in actual teaching practice of inquiry based methods (Bryan, 2003).

Regarding teachers' practices of IBTM, the results indicated that these teachers did not practice IBTM in their classrooms. Substantiating this finding scholars such as Toh et al. (2004) explained that despite the introduction of such reforms, teaching practices still appear to be highly teacher-centered at all levels of schooling. Similarly, Keys & Kennedy (1999) noted many challenges for teachers' practice of IBTM including lack of time, the challenge of turning questions back to students, and teaching mandated concepts was difficult through inquiry. This study provides empirical evidence that even experienced science teachers face challenges in implementing IBTM. The literature reviewed also indicates that beliefs influence science teachers' practice of IBTM. For example, Crawford (2000) documented and examined the beliefs and practice of an experienced rural public high school science teacher to determine how this teacher created an inquiry-based classroom environment.

Finally, regarding the major factors that hindered teachers from using IBTM in their classroom the results revealed that at the beginning secondary teachers had five constraints that impacted their implementation of science IBTM. These constraints were the teachers': understanding of inquiry and nature of science, strength of content knowledge, pedagogical content knowledge, beliefs about teaching in general, and management and students' concerns. This last factor concerns the ability of students to engage in science IBL (Roehrig & Luft, 2004).

Substantiating the above idea scholars such as Capps & Crawford (2013) noted that teachers' qualifications were not a guarantee for practicing IBL. What is highlighted as a factor influencing practice of IBL was teachers' work experience and students who actively engaged in the investigation great-

ly benefited from IBL. This was emphasized by other studies done by Chang & Wu (2015), in which it was re-emphasized that teachers with more years of experience were more likely to embrace IBTM than their counterparts with less years of teaching experience. Science teachers' practice of inquiry-based instruction is also a function of their intentions and actual classroom practices regarding.

Conclusion

Based on this study's findings, the following conclusions were drawn. The results of this study indicate that secondary school teachers have an understanding on the IBTM since teachers have a clear view on the nature of inquiry based teaching, characteristics features of inquiry based teaching, process of inquiry based teaching, content and pedagogy of inquiry based teaching.

Beliefs are the indicators of the decisions individuals made throughout their lives. Teacher attitudes and beliefs affect their pedagogic practice and play an important role for the development of student attitudes towards science. The results of this study showed that what teachers believe as to the importance and utility of IBTM is a strong indicator for using it in a classroom. Since if a teacher does not believe that students can learn through inquiry then the teacher's belief becomes a major obstacle for such implementation.

It is clear in these results, that these secondary school teachers were not practicing IBTM in their classrooms. This implies that even though teachers have a good awareness on the nature of IBTM and have a positive belief on the utility of IBTM this cannot be a guarantee of using this method in their classroom. Hence, it can be concluded that there are other factors that can affect teachers from using IBTM in their classroom.

The major challenges that affect teachers from implementing IBTM are related to teachers themselves (lack of experience in using such method, lack of inclination to use this method, shortage of time, workload and large class size),

students (lack of interest, lack of students' academic ability), lack of teaching materials and lack of conducive learning environment to use inquiry based learning method.

Recommendations

Based on the findings and the conclusions of the study, the following recommendations are forwarded. Even though the majority of teachers have an awareness of IBTM there are some teachers who have a lack of awareness about IBTM, thus the woreda education office should fill this gap by providing training that can develop teachers' awareness on IBTM.

In this study, the teachers did not practice IBTM. Therefore, it is recommended that teachers should know that having awareness and belief do not have meaning unless they use the IBTM in science classroom in the secondary schools and allow students to practice this method. Moreover, the research finding showed that teachers almost do not practice IBTM in classroom rather they used a more traditional method. The concerned education administrators should take measures to tackle these problems such as prepare experience sharing workshop and review how the policy SSMAEE (Strengthening of Science and Mathematics Education in Ethiopia) implement in real in the class.

The study also revealed that there are challenges that affect teachers from using inquiry based learning in their classroom such as lack of conducive learning environment, laboratory room their facilities, and laboratory technician. So the concerning body should solve the listed problems by participating the community and also contact education office, NGO and other. In addition, the school principals should find out the root challenge of inquiry based teaching method in schools in order to prepare the solution and enhance inquiry based teaching method in science and mathematics.

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