What Japanese Teachers Say About School Science Textbooks

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ABSTRAK

Buku teks memainkan peranan penting dalam proses pembelajaran. Penelitian ini dilakukan untuk mendapatkan informasi tentang kesesuaian penyajian buku teks IPA dengan harapan guru dapat mengetahui aspek apa saja yang dianggap penting mengenai buku teks IPA. Untuk memperoleh data yang diperlukan, sebanyak 499 angket disebarkan kepada guru IPA SMP di sekitar Aichi Prefecture. Dari jumlah itu 65% dijawab dan dikembalikan oleh para guru. Hasil penelitian menunjukkan bahwa penyajian buku teks sesuai dengan harapan guru dalam kategori fisik buku, isi, dukungan terhadap pengajaran, aktivitas praktikum dan ilustrasi. Akan tetapi walaupun penyajian buku teks sesuai dengan harapan mereka, sangat sedikit guru yang menggunakan buku teks dalam menyelenggarakan pembelajaran. Hal ini mungkin disebabkan pandangan guru mengenai teori belajar, yakni sebagian besar menganut empirisme. Hal ini dapat dilihat dari penentuan mereka mengenai aspek yang dianggap penting dari buku teks.

Kata Kunci: buku teks, proses pembelajaran, teori belajar, pandangan guru

In order to assist students to reach the state of shared meaning which is the goal of education (Mintzes, Wandersee & Novak, 1998), good instruction must be enacted in the classrooms. Teachers should conduct an instruction which provides rich environment for students where they have opportunity to actively involve in sharing, enlarging and changing the meaning. Such an instruction may be fulfilled by adequate preparation from teachers. The teachers should conceive good plan of instruction. Analyzing subject matter, selecting appropriate method, providing necessary materials and teaching aids are some of what the teachers should do in the preparation.

One of teaching aids the teachers most frequently use is the textbook. It is well known that textbooks are ubiquitous and widely used in science classrooms. They are very important in determining what the students experience as they study science. Many teachers follow the content and guidelines prescribed within the textbooks as they conduct instruction.

The deliberation in the selection of textbooks to be used in instruction thus becomes a decisive activity, since it defines instruction the teacher will do. In this process the administrator has the strongest position to assess a program's budgetary impact, while the teachers are in the best position to assess its contents and instructional approach (Finley, 1979 as cited in Mayer, Crummey & Greer, 1988).

Teachers play an important role in selecting program content and instructional approach which may practically mean selecting textbooks. Teachers are the decision makers in selecting the best textbooks for themselves and their students. Therefore asking the ideas of school science textbook is likely to provide information of how textbooks are appropriate for instruction conducted in the classroom.

This study was conducted to gather information about the presentation of textbooks used by teachers in science instruction in accordance with their expectation. Additionally, the important aspects of textbooks concerned by the teachers were also examined. To assist the teachers examine the textbook, a list of criteria were provided by which they possibly judge the presentation of the textbooks. However, in case of some aspects not be covered within the criterion listed, an open question was available, so that the teachers could write about the aspects.

This study was accomplished to answer of the following research questions:

1. To what degree does the presentation of textbooks used by teachers meet their expectation?
2. What criterion as conceived by the teachers is the most important aspect of a textbook?

Textbook as tool of instruction

The success of student's learning is highly depending on the instruction conceived and conducted by teacher. It is the teacher's duty to define learning objectives to be achieved by students, selecting appropriate method, and providing necessary materials and teaching aids. Apparently this process is not a simple matter, careful deliberation should be involved to engender good lesson plan imply to good instruction.

As given in particular cases, some teachers develop lesson plans following the scope and the sequence of their textbooks, subscribe to the instructional design and approach implicit in that sequence, and rely on lesson plans without significant adjustment or the use of supplementary materials and activities. Then it is fair to say that teaching is determined by and dependent on the textbook (Woodward & Elliott, 1990).

In many cases teachers use the textbooks excessively. Stakes & Easley (as cited in Chiang-Soong & Yager, 1993) argued that 90% of all science teachers use their textbook in excess of 90% the time they are teaching. Novice teachers particularly, or those who teach out of their expertise often rely on heavily upon the textbooks. They use the assigned textbook as their content outline and storyline for their courses (Chiapetta, Fillman & Sethna, 1993).

Considering the importance of textbooks in science instructions, some researcher reported that the status of school science could be summarized in one word: textbook (Chiang-Soong &Yager, 1993). Textbooks which are basically of teaching aids often played as curriculum in the instructions. Westbury (1990) suggested that textbook has long served not only to support instruction but also symbolized that instruction-- in other words the textbook defines the curriculum. Align with this statement Gottfried & Kyle, Jr. (1992) asserted that textbook often dictated the science 'curriculum' experienced by the students, thereby becoming the primary source of knowledge for most students. The textbooks convey a great deal of information that the students receive. In independent learning, textbook is very important, since in independent learning the students do not have tutor to ask help for their question nor an option to change a given text (Koch, 2001). They will merely follow all content the textbook prescribes. Most importantly, these instructional materials influence how students and teachers perceive the scientific enterprise (Chiapetta, Fillman & Sethna, 1991).

Reported in Westbury (1990), the Internal Association for the Evaluation of Educational Achievement (IEA), concluded that textbook availability is associated with a more comprehensive curriculum, with more content oriented forms of teaching, and with more efficient use of classroom time. The textbook often enacts as a driving force in instructional practices.

Textbook of science in Japan lower secondary school

A key feature of effective teaching is the selection of instructional materials and teaching aids that meet the need of students and fit the constraint of teaching and learning environment. Textbook is a very common mode of teaching aids used in science classrooms all over the world. It is believed that well chosen textbooks help students to understand how information and ideas can be organized. One of important aspect of any science class is helping the student to make sense of the mass of information and ideas in a field (Science Teaching Reconsideration, 1997).

Instructional content in Japan schools is driven by the provision of Course of Study (学習指導要領) which is dispensed by The Ministry of Education, Culture, Sport, Science and Technology (*Monbukagakusho*). All learning objectives and content are constructed referring to this Course of Study, so are the textbooks.

Monbukagakusho publishes textbooks to be used for instruction in the schools. Nevertheless, it is also possible for the schools to use other textbooks published by private publisher. The schools may freely select which textbook is the most appropriate for instruction in their classrooms. As for the textbooks published by private publishers, they should fulfill the standard established by *Monbukagakusho*. Thus, the textbooks are examined and approved by *Monbukagakusho* before they are published.

The structure of a textbook determines how reader builds cognitive representation from the text. According to Dee-Lucas & Larkin (1990), there are two categories of structure of science text, a proof –first or a principle –first. The proof first organization develops a proof or argument that builds to a conclusion, usually in the form of fundamental concept, principle or law. In principle first organization, a content or principle is stated explicitly, then the evidence needed to support is presented. According to Dee-Lucas & Larkin's study, the principle –first structure is more effective for long term retention and understanding by novice reader. The structure of Japan lower secondary school science textbooks is presented in either of these categories.

The Course of Study (学習指導要領) mandates the objectives of science teaching for lower secondary schools as to enhance students' interest in nature, to enable them to carry out observations and experiments by identifying clear purpose, and develop attitudes and abilities to investigate scientifically, and at the same time, to deepen their understanding of natural phenomena and to develop scientific view and thinking. Align with these objectives all the science textbooks dealing with issues of process as well as matter of facts, replete with essays, illustrations, work examples, problems and questions.

Method

The collected data in this study were gleaned from the questionnaires answered by science teachers of Lower Secondary Schools around Aichi Prefecture. Four hundred and ninety nine questionnaires were mailed to 109 schools which were selected by number of the science teachers. The questionnaires were mailed to schools where three or more science teachers are working. Among them, 324 of the questionnaires were answered and returned by the teachers.

There are 304 teachers who reported self information in this study, and 20 teachers did not report such information. The responding teachers consist of 254 men and 50 women. Among them 82% reported possession of bachelor degree and 11% held master degree. The teachers were major in different fields, 75 teachers were major in physics, 97 teachers were major in biology, 81 teachers were major in chemistry, and 48 major in earth science. The experience of the teachers ranged from 1 to 40 years; more than 90% had been teaching for 5 years or more, and the mean length of teaching experience in the sample was 16. 5 years.

A questionnaire was developed to glean information needed to answer the research questions. This questionnaire was developed with modification from the work of Ogan-Berkiroglu (2007) who developed criteria to determine the most appropriate high school physics textbooks. Several points were added to gain the necessary data. The modification was undertaken to fit the criteria within the questionnaire with the instructional circumstances in Japan Schooling.

In order to eliminate different interpretation by respondents, and to develop a common understanding of the meaning of the criterion, all criteria were reviewed by and discussed with Japanese teachers. The mailed questionnaire was written in Japanese.

To gather information for the two research questions, the instrument was developed in two sections. Section I was developed to gather the information with regard to the research questions. Section II was developed in order to gather information of how the teachers use the textbook in their instruction. The data obtained were used as support to delineate the background of teachers' responses on section I.

The section I has 35 criteria under the following five categories; physical appearance, content, instructional support, activity and illustration. The 35 criteria included in this section were presented as forced-choice questions. To answer this section the teachers were asked to rate the criteria on scale 1 = if the criterion does not meet their expectation, 2 = if the criterion fairly does not meet their expectation, 3 = if the criterion fairly meets their expectation, and 4 = if the criterion highly meets their expectation (The copy of the questionnaire is available in the first author). In case of any expectation not covered by the criteria listed, an open question was provided by which the teachers may write the expectation. In this section the teachers were also asked to determine which criterion was the most important to be heeded concerning the presentation of textbook, the reason for their choice should also be written.

In section II the teachers may choose one or more the appropriate statements about the use of textbook in their instruction related to the purpose of assigning textbook reading, activity conducted in instruction, instructional activity used with textbook

reading, and reference used for experiment and observation.

Result and Discussion

The teachers' responses on the questionnaire provided abound of data for the current study. The mean of teacher ratings on the textbook presentation on the scale 1 = do not meet expectation,…, 4 = highly meet expectation is presented on table 1.

Table 1: Teacher ratings on textbook presentation

No	Categories	Mean
1	Physical Appearance	3.7
2	Content	3.4
3	Instructional Support	3.3
4	Activities	3.2
5	Illustration	*3.5*

As can be seen on table 1 above, the rating given for overall presentation of the textbooks are over 3 which mean that the textbook presentation meet the teachers' expectation in all categories. Detail description of the result is described as follows.

Physical Appearance

Figure 1 shows the frequency of teacher ratings on textbook physical appearance. Apparently, most of the teachers rate 4 for this category, which mean the physical appearance of the textbook highly meets their expectation.

The examination on Japan Lower Secondary School Science Textbooks revealed that all textbooks, indeed, are presented in good quality of printing. The font size and line spacing are suitable for ease reading. Headlines are written in large font and bold, or written in different color from the text, so that the headline is striking and may effectively catch the reader interest. Important terms were stressed as bold character as they are easy to be recognized. The cover is designed in colorful fashion with attractive illustration.

The teachers were asked to determine which criterion was the most important concerning physical appearance. Their responses on this category were evenly distributing over all criteria. Further, from responses they asserted, we can conclude that the teachers agreed that good physical appearance of textbook is important to attract students' interest in order to rise willing, so that the student are prompted to read the textbook.

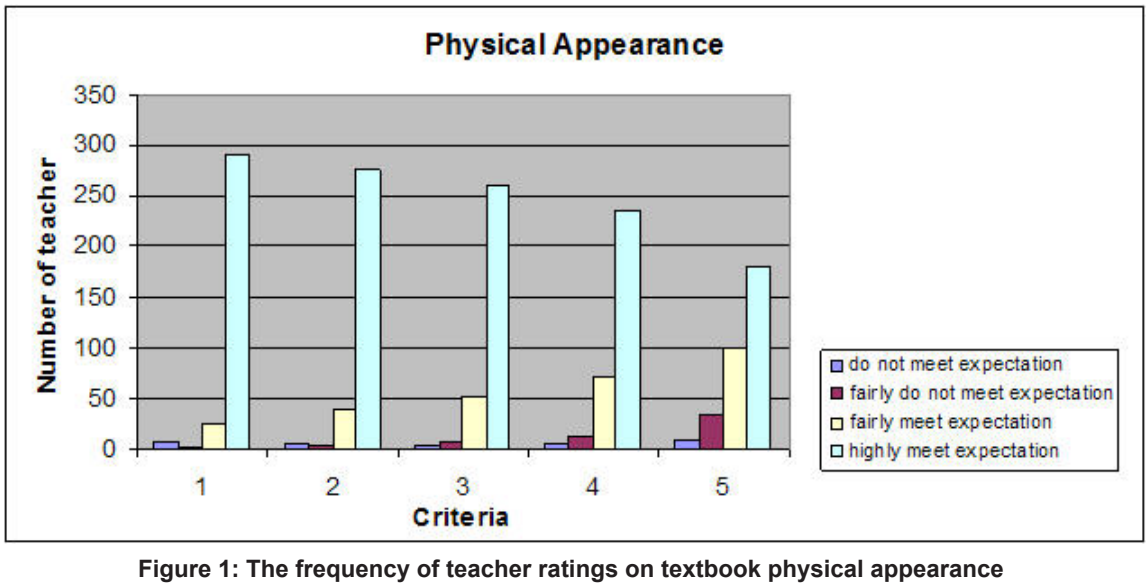

Figure 1: The frequency of teacher ratings on textbook physical appearance

Criteria: 1.The print should be in good quality.
2. Font size and line spacing should be suitable for ease reading.
3. Important terms should be stressed as bold or italic.
4. Headlines should be written as they attract students' interest.
5. Cover should be designed attractively.

The teachers also agreed that important terms should be stressed as bold or italic. They reason that the textbook is often used as a summary of learning, and the bold written terms were the minimum matter that the learner should acquire. Thus, to make the students conscious of these important terms, they should be presented in a way the reader easy for find in a glance as they look at the text.

The headline got teachers' attention as it important introduction which deliver the textbooks content to the students. The headline should attract students' attention and make clear what is going to be learnt within the chapter.

Content

Teacher ratings on the textbook content are presented in figure 2.

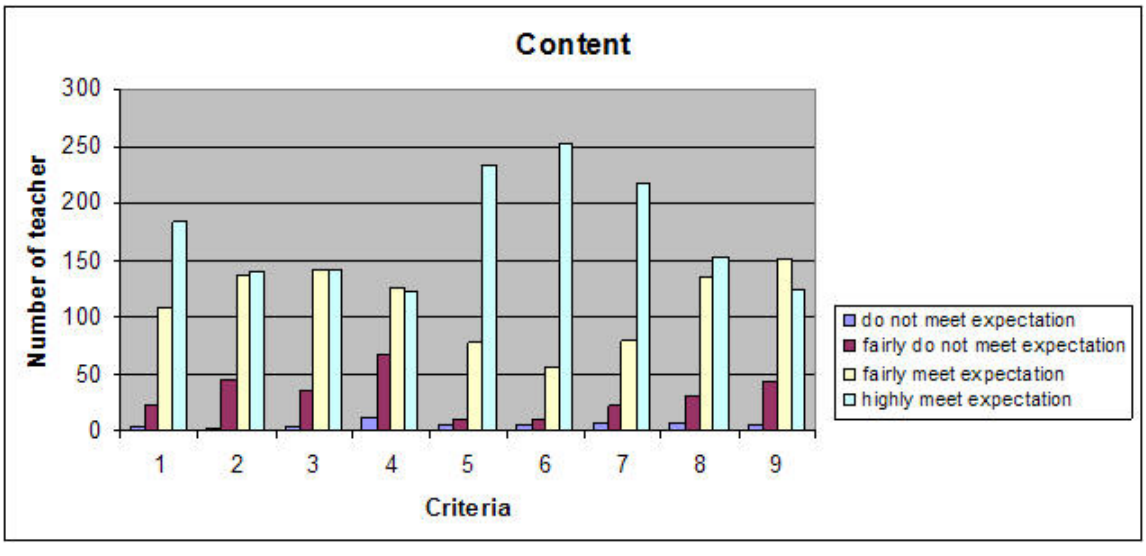

Figure 2: The frequency of teacher ratings on textbook content

Criteria:
1. Content should be presented in sequential order.
2. The information given should be enriched by illustration.
3. The information given should be enriched by analogies.
4. The information given should be enriched by marginal glosses.
5. Content should be up to date.
6. Content should be scientifically accurate.
7. Content should be appropriate for grade level of students.
8. Content should stress science as inquiry.
9. Content should stress the interaction of Science, Technology and Society.

We can see that the teacher ratings on the presentation of content are mostly 3 or 4, which mean that the content presentation meets their expectation. However, striking responses appear on some criteria. A fairly large number of teachers considered that information given in the content is not enriched by illustrations, analogies and marginal glosses (criteria 2, 3, and 4). Many teachers also considered that the content does not stress the interaction of science, technology and society (criterion 9). These responses were striking since all of the textbooks presented contain rich illustration and were complemented by marginal glosses. The examination of all textbooks revealed that all pages were written in integration of text and illustration. Moreover, the portion of picture and drawing in the pages was large compared to the portion of text.

Since the content of textbooks complies with the provision of Course of Study, the presentation of all textbooks follows a common pattern. For instance, the sequential order of concepts presented within the textbooks are the same.

Concerning the most important aspect for textbook content, the teachers responded that the criterion of content should be scientifically accurate. Unfortunately, most of them did not give plausible reason for their choice. Many teachers simply reasoned that scientifical accuracy is the absolute condition for textbook content. The others asserted that inaccurate content has no meaning and should

not be conveyed to the students. Only one teacher suggested that textbook is the resource of all information for students.

The second important aspect is that content should be appropriate for grade level of the students. The teachers contended that disparity of students' level is large; adjusting content to that level can ease students understanding. If the content is too high or too low, the student will lose interest in reading it.

Many teachers also paid attention to the criterion that content should be presented in a sequential order. They argued that sequential order of content is necessary to maintain coherency of concepts within the textbook. Systematic presentation is also necessary to maintain students' order of thinking, since the initial content learnt serves as foundation for the next learning. The teachers believed if the student fails to learn the previous matter, they cannot proceed to the next stage.

Another aspect which received teachers' attention is that content should stress science as inquiry. Many teachers stated that science is problem solving learning and should be presented as inquiry. They believe that inquiry is the most feasible learning in order to enhance students' interest in science, deepen their understanding, and raise thinking ability. However, the teachers did not explain in what way inquiry helps students deepen their understanding and raise their thinking ability.

Instructional support

Similar to the two previous categories, teacher rating on textbook instructional support generally meets their expectation. However, a rather low rating was given on some criteria. The first criterion 'textbook should convey an overall sense of purpose and direction that is understandable and motivating students', was not considered to meet their criterion by many teachers. Similar feature can be seen on criterion 4 'textbook should help teachers to create classroom environment encouraging students' curiosity and questioning'. Criterion 6 'at the end of the chapters there are summary' and criterion 9 'questions should help teachers diagnose students' alternative conception' also was not considered to meet the expectation by a large number of teachers. The overall frequency of teacher ratings on instructional support of textbook can be seen in figure 3.

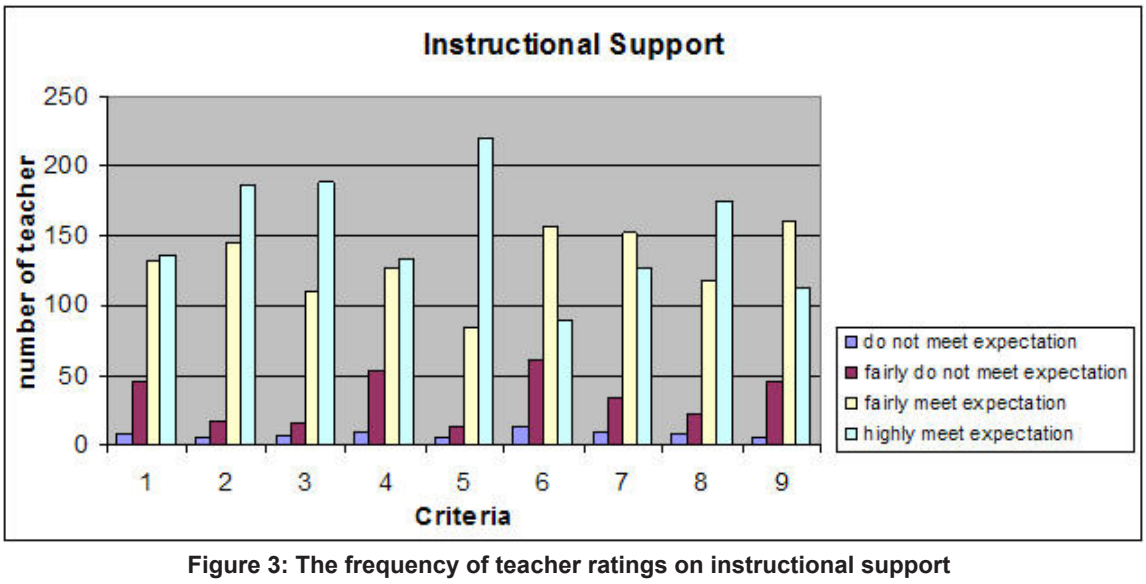

Figure 3: The frequency of teacher ratings on instructional support

Criteria:
1.Textbook should convey an overall sense of purpose and direction that is understandable and motivating students.
2. Textbook should engaging student with relevant phenomena.
3. Textbook should help teachers to structure instruction which is understood by the students in ease.
4. Textbook should help teachers to create classroom environment that encouraging students' curiosity and questioning.
5. Textbook should have experiment and observation activities.
6. At the end of the chapters there are summary.
7. At the end of the chapters there are references for further study.
8. Questions should direct students to think critically and investigate.
9. Questions should help teachers diagnose students' alternative conceptions.

The textbook examination revealed that the representation of textbooks obviously reflects support on the endeavor of achieving the science teaching objectives as mandated by the Course of Study. All of the textbook replete with essay, illustration, work example, problem and question. There is no chapter contained merely text explanation. There are always supporting illustration, activities such as observation and experiments, and essays as advance learning for the students.

A typical characteristic common in all textbooks is apparent, the matter discussed within the chapters or sections is always initiated by question which invites students to think and encourage their curiosity. This question is usually written as headline in attractive fashion. At the end of sections some questions are available to assist the students verify what has been learnt. The chapter is concluded by summary and end chapter questions. To help teachers use the textbook, all textbooks are accompanied by teachers' guide.

Teachers' determination of the most important aspect on instructional support category bear out that the criterion 2 ' textbook should engage students with relevant phenomena' was considered an important aspect. The reasons they asserted for this choice was generally related to enhance or deepen students' interest. The teachers suggested that students' interest evoked as they deal with familiar phenomena directly. Engaging students with relevant phenomena in studying science was also believed to be useful in linking the study with real life. Some teachers reported that they wanted to provide common experience to the students by engaging them with familiar phenomena.

The criterion that textbook should have experiments or observations was also considered an important aspect by a large number of teachers. The teachers cited that experiment and observation are typical activity of science. No science without experiment. Moreover, a teacher who stated that science was born from experiment and observation. Many teachers want to have their students work directly with a real thing. Some teachers believed that experiment and observation enhance students' motivation to learn science. Other teachers argued that experiment is the expedient effective to deepen students' understanding. The teachers also believed that experiment evokes students' query which is good to cultivate thinking ability. By experiment the students may verify the query by themselves vividly.

The third aspect heeded by the teachers is the criterion that textbook should help teachers to structure instruction which is easily understood by the students. Unfortunately they did not give clear reason for this aspect. Only one teacher asserted that textbook is a basis and should be easy to understand step by step, and the effectiveness of class depends on the structure of the class.

It is interesting to see that only three teachers considered the criterion of questions should diagnose students' alternative conception as an important aspect of textbook. They considered it is good to connect the students' query with their odd thinking.

Activities

Teacher ratings on activities within the textbooks can be seen in figure 4. Different from the three previous categories, salient ratings are apparent in this category. Despite overall rating that the presentation of activities in the textbook meets teachers' expectation, low was rating received by the criterion 1, 2, 4, and 5. Many teachers considered that the textbook presentation does not meet their expectation on these criteria.

Careful examinations undertaken on the textbooks revealed that all of them are very rich with experiments as well as observations. The entire chapters within the textbooks definitely embrace experiments or observations activities. However, it appears that the experiments and observations were delivered to the students without establishment of purpose or hypotheses. Usually, the students were directly asked to do the procedural steps prescribed by the practical guide in the textbook. The steps of the activities were presented by text sentences and illustration. It is also common to provide some discussion questions at the end of activities to confirm what the students learnt from the activities.

Concerning the most important criterion within activities presented in the textbook, most of the teachers choose 'The safety rules should be given' as the most important, followed by 'Explanation should be supported with illustration' and 'Procedure and data collection should be explained in steps'. The criterion 'Material in the experiment should be easy to obtain' received the fourth position

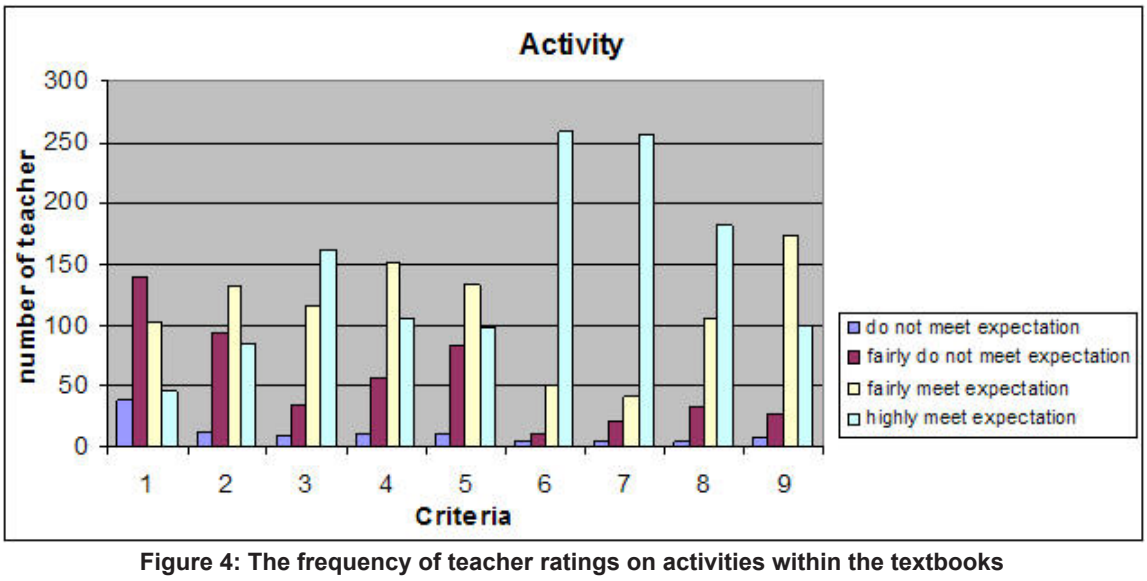

Figure 4: The frequency of teacher ratings on activities within the textbooks

Criteria: 1. Purpose(s) of the experiments should be determined.
2. Students should be directed to establish hypotheses.
3. Procedure and data collection should be explained in steps.
4. Students should be directed to draw conclusion.
5. There should be some discussion question.
6. The safety rules should be given.
7. Explanation should be supported with illustration.
8. Materials in the experiments should be easy to obtain.
9. There should be some guiding statements for observation.

as the most important aspect of activities in the textbook. The teachers argued that students are ignorant; hence safety rules is important to make the students always conscious about dangers that often accompany experiment. To assure that students do the experiments correctly and do the operation skillfully, the teachers considered that procedure and data collection should be explained in steps. Illustration, particularly for construction of experiment tool is demanded to provide concrete image for the students. Many teachers state it is impossible to do experiment if the material is difficult to obtain.

In contrast, very few teachers considered that presenting purpose(s) of experiments, directing students to establish hypotheses or providing discussion questions important. They argued that by having purposes, the students will keep thinking in doing the experiments. Without hypotheses the experiments will become merely operation. If experiments emphasize on the operation and conclusion and thinking are neglected, it will be difficult to transfer the knowledge into the students' mind.

Illustration

As can be seen on figure 5, teacher ratings on this category are considerably high almost in all criteria. Most of the teachers rate 4 for criterion 1, 2, 3 and 5. This means that the presentations of illustrations in these criteria highly meet their expectation. Only criterion 2, 'Illustration should be colorful' was not considered to meet the expectation by many teachers. This is astonishing since all of the illustrations in the textbooks were colorful. Perhaps it is typical of Japanese School Science Textbook that illustration is abound even compared to the text explanation. We may find some pages contained full illustration with very few texts.

For illustration, the criterion 'relevant with the topic' was considered the most important. Their reason is related to the function of illustration as support for what is being explained in the content. They believed the text supported by illustration is more interesting for the students and easier to understand. Placing illustration on the same page with the text is also important, so the students will read the text while looking at the illustration. The photographs used as illustration should be up to date, since science is progressing along the time. The teachers considered up to date information will become stimulus for students' learning.

The use of textbook in instruction

Interesting finding was obtained from teachers' responses on section II of the

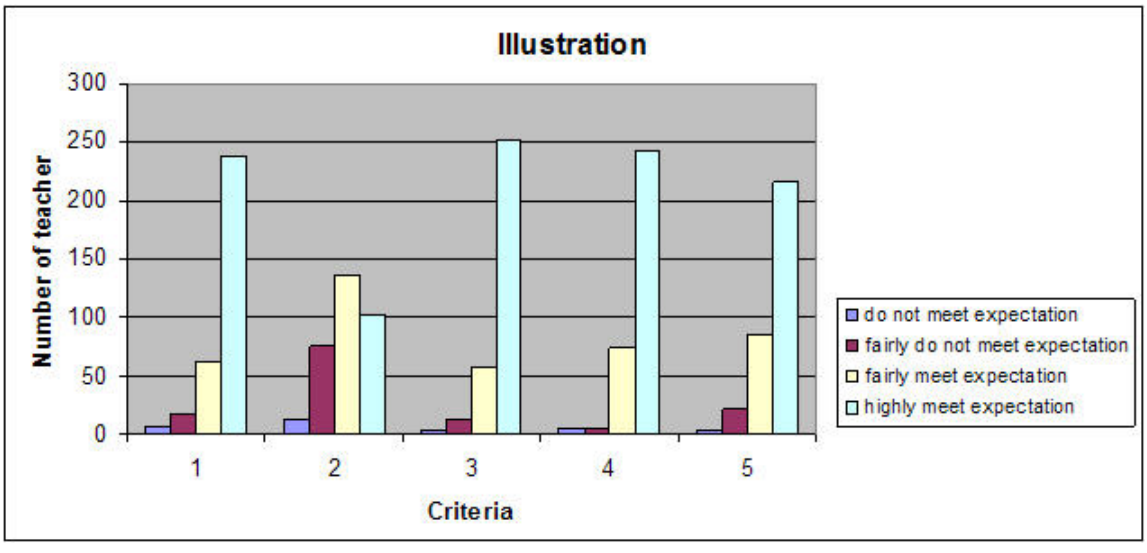

Figure 5: The frequency of teacher ratings on activities within the textbooks

Criteria: 1. Illustration should be clear.
2. Illustration should be colorful.
3. Illustration should be relevant with the topic.
4. Illustration should be in the same page with the related text.
5. The photograph should be up to date.

questionnaire. That is, 25 teachers do not use textbook in their instruction but other resources, unfortunately they did not report what the resources were.

Having students to read textbook was reported as the least often used activity in instruction, done only by 24 teachers. The most frequently done activity is having students do experiments and observation, and this activity was done by 223 respondents. Giving lecture done by 142 teachers and 55 teachers use to engage their students in discussion. Teachers who use textbooks reported that their purpose of assigning textbooks in instruction are to preview and reinforce the lesson being taught in the class.

When the teachers have their students to read textbooks, they ask question to ensure that the students read the text. When they have the students to do experiment or observation, most of the teachers use textbooks and other resource as reference for the students. Some of them do not use textbooks, but the practical manual conceived by the teachers.

Discussion

Findings of the current study have shown that the representation of textbooks available for science teaching in Japanese lower secondary schools meet the teachers' expectation. Nonetheless, only few teachers use the textbook to conduct instruction in the classroom. Moreover, there are some teachers who do not use the textbook at all in helping students deal with scientific information.

Teachers' responses on the physical appearance of textbook revealed that good physical appearance of textbook is important to attract students' interest in order to rise willing, so that the students are prompted to read the textbook. This supports Kang's (2007) suggestion that commonly, learners approaching textbook out of their curiosity or interest, but simply because they have to. Thus, well written and designed textbook is an important condition to engage and hold students' interest (Holliday, n.d.) so that, they can willingly read the textbook and study the science information illuminated within it. Textbook helps to reinforce, expand and consolidate course content to provoke thought and reflection.

Although the teacher did not give any plausible reason, they agreed that textbook content should scientifically be accurate. They determined that appropriateness of content with students' level is also important, not too low or too high. Students should be presented with a material that matches their level of cognitive development. Some moderate-level challenges might be helpful in order to keep the developmental process moving along, but there is no reason to expect students to use the rational thought process that involves

operations that they have not yet acquired and are not expected to be acquired for some time (De Boer, 1991).

The teachers believe presenting science as inquiry is useful to enhance students' interest in science, deepen their understanding and raise thinking ability; however they did not explain in what way the inquiry helps students deepen their understanding. This is congruent with the study of Haney, Czerniak, and Lumpe (1996) that the following four beliefs were the most salient to teachers' interest to initiate inquiry:

1. Increase students' enjoyment and interest in science.
2. Foster positive scientific attitudes and habit of mind.
3. Helps students learn to think independently; and
4. Make science relevant to the students' everyday life.

Apparently, even in Haney, Czerniak, and Lampe's study there is no statement which gives light on how inquiry helps conceptual change in the students.

Concerning the instructional support of textbook, it appears that most responding teachers are learning and knowledge empiricists according to Hashweh (1996). Hashweh characterized science teachers as learning constructivist, learning empiricist, knowledge constructivist and knowledge empiricist. Learning and knowledge constructivist tended to believe that scientific knowledge is tentative and invented, recognize students' naïve ideas, and believe that the learner has an active role in knowledge construction. In contrast, learning and knowledge empiricist tended to believe that scientific knowledge is an objective collection of facts, were not aware of naïve conceptions, believed in reinforcement as a method of learning, and emphasized the scientific method, both as a paradigm for scientist and for instruction.

The teachers in the current study believed that the representation of textbooks in a way that engage students with relevant phenomena is the most important. Textbooks should have observation and experiments. But the presentation of questions in the textbook that should diagnose student's alternative conception considered the least important. Viewing the teachers' reason as to engage the students with real or familiar phenomena, or their consideration that science is born from experiments and observations, it is all obvious shows that most of them are empiricist teachers. In addition, they did not consider diagnosing students' alternative conceptions as important aspect of textbook.

Regarding the experiments or lab activities, De Boer (1991) suggested that more than a century, lab activities have been used in science teaching as essential classroom activities. However, the effectiveness of the use of lab activities in school science learning has not been clearly demonstrated (Welch et. al. 1981). Tobin (1986) cited, lab activities were typically used as "frill" that was not conceptually integrated with the science course as a whole. In the current study teachers believed that experiment and observation enhance students' motivation to learn science, and experiment was deemed an effective expedient in order to deepen students' understanding. The teachers also believed that experiment evokes students' query which is good to cultivate thinking ability. By experiment the students may verify the query by themselves vividly.

Asking teachers to undertake consideration on science textbook representation were inevitably involving their belief of teaching science. Beliefs are important component of practical knowledge and serve as the filter through which practical knowledge is developed (Wallace & Kang, 2004).

As for the current study, it appears that some teachers used the epistemological belief in considering the representation of the textbook, whereas the others used practical knowledge. The epistemological dimension of learning addresses a process of conceptual restructuring in which students evaluate new knowledge by using evidence that support or conflicts with their prior ideas. Teaching for conceptual change, therefore, involves making students' prior ideas explicit, presenting an anomaly that students' prior ideas fail to explain and proposing a scientific explanation that can inclusively explain both prior experience and the anomaly. The teachers' practical knowledge is based on experience, action oriented, rooted in context, related to views of subject matter, tacit and integrated (Van Driel, et.al., 2001). Practical knowledge is situation specific, as it is adapted to a context which includes the students, the course book and other learning materials, the curriculum, the school culture an so on. Practical knowledge is affected by teachers' concerns about their own teaching context. There are only few teachers

who considered the activity in the textbook from epistemological view, most of them used practical knowledge in considering the important aspects of activities within the textbook.

Teachers who used epistemological view considered that presenting purpose(s) of experiment, directing students to establish hypotheses and providing discussion questions are important. These considerations were parallel with De Boer (1991) suggestion that instruction intended to develop thinking should provide students with opportunities to generate and test hypotheses within the context of the discipline being taught. However, generally students were taught the technical skills of experiments, but insufficient time was spent on the creative activity of formulating hypotheses.

Teachers who use practical knowledge in viewing the textbook determined important aspects of experiments which related to operational work such as 'The safety rules should be given', 'Explanation should be supported with illustration', 'Procedure and data collection should be explained in steps, and 'Material in the experiments should be easy to obtain. The teachers reported they want to assure that the students can do the experiments correctly as prescribed by the procedure, and the most important is that the possible injury can be prevented.

The criterion 'relevant with the topic' is considered as the most important. Placing illustration on the same page with the text is also important, so that the students may read the text while looking at the illustration. Holliday (n.d.) suggested that visuals can elaborate, clarify, and make the text memorable that they accompany; summarize the information and present concepts in a quickly read format. Layout and illustrations are important predictors of a texts' effectiveness. One of the most effective types of illustration, especially for students with low verbal aptitude, is a simple multicolor line drawing (Holliday, et. al., 1977). Although realistic drawings or photographs more visually appealing, and more prevalent in the current textbooks, they are less effective at enhancing students learning. The organization of information on a page also affects students learning (Wendt, 1979 in Science Teacher Consideration, 1997).

Conclusion

The findings of this study indicate that in spite of the matching of textbook presentation with their expectation, only few science teachers have their students read textbook in the instruction. This phenomenon is interesting as it is apart from what is cited in most literatures that textbook commonly drive the class curriculum and many teachers depend on textbook in conducting instruction.

The discussions the researcher had with some science educators in Japan give a light on this phenomenon. They suggested two possible explanations for this phenomenon. Firstly, most of Japanese science teachers are quite good teachers. They conceive and conduct instruction using many resources around them independent of the textbook. Secondly, since most of the teachers are empiricist they believe having students to find facts by experiments and observations is the best way to help them master the science knowledge. Many teachers believe having students read textbook will lose students' interest to do the experiment.

Concerns were given to the apparent situation that many teachers emphasize science instruction on the activity that involves students in practical work and not to the activity engaging students in thinking activity which bring them to conceptual change. As we have seen in the result of this study that teachers' determination on important aspect of textbooks is mostly related to the operational activity which is possibly done accordingly. Serious attention should be paid to this situation if we want to warrant that students were engaged in the process of constructing knowledge during instruction, otherwise they will merely be busy with operational task without thinking which can potentially bring conceptual change in their mind.

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