

'Can We See It?': Contextualizing 'Deforestation' from an English-Medium Science Textbook for a Primary School Level

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Abstract. Understanding an English-medium science textbook is possibly challenging for some students. It is, for example, due to the language used. To deal with this issue, construing the use of the other mode, such as visual images, along with the verbal text is regarded useful. Thereby, the construal of multimodality in an English-medium science textbook becomes crucial. Albeit a myriad of inspections on multimodality exists, but to the best of the writer's knowledge, such investigation with respect to an English-medium science textbook, particularly at a primary school level, was found to be limited. Therefore, this study aimed to scrutinize the verbal text and visual image presented in a science textbook used for a primary school level which is presented in English. To that end, a descriptive research design was employed. In this regard, a systemic functional multimodal discourse analysis (SF-MDA) within the trinocular metafunctions encompassing ideational, interpersonal, and textual metafunctions was utilized. The systemic functional linguistics theory, the grammar of visual design, intersemiotic complementarity, and logico-semantics were the frameworks employed to analyze the artefact, the English-medium science textbook. The findings revealed that the visual image and verbal text interact with one another within the three metafunctions. Given the interaction between the two modes, the present study suggests that both teachers and students are required to take into considerations and be aware of the potential or roles of images along with the verbal text, i.e. the images are not merely accessories, but instead, these are able to assist the comprehension of the science materials learned.

Keywords: *CLIL, English Medium-Science Textbook, Intersemiosis, Multimodality, Systemic Functional Linguistics, Textbook Evaluation*

INTRODUCTION

Construing an English-medium science textbook might be challenging for students since there are some barriers that might come up, for instance, due to the medium or language it is used. In this regard, one of the languages used is English. The English language is one of the languages commonly used both in the academic setting (Crystal, 2003) and in the general setting or daily lives by many people around the world (Baker & Ishikawa, 2021). This condition has resulted in a novel pedagogical approach known as Content and Language Integrated Learning (CLIL). This approach, as the proponents assert (for instance, Cenoz, Genesee, and Gorter (2014) and Lasagabaster and Sierra (2009)), constitutes an approach that provides the opportunity for learners to learn the content (subject) and acquire the target language or foreign language simultaneously. Additionally, it is, on the one hand, considered to have positive effects on students' academic outcomes; however, on the other hand, some challenges are likely to appear, particularly if it is implemented to the students who have a low English proficiency and an insufficient preparation as well as a monolingual mindset as a result of maintaining their local language (Bigelow & Collins, 2019). As a consequence, to cope with the issues, imagination and creativity are required to make such an approach works as intended (p. 58). In this regard, these are realized through the materials that do not only utilize one mode, namely the verbal text, but the pervasiveness of the other mode, such as the visual image, embedded in the English-medium science textbook is necessarily required. Thus, understanding multimodality in such a textbook is worth scrutinizing.

The use of multimodality, i.e., the other mode (commonly the visual mode) that accompanies language in a textbook, is necessary at the present time. As Unsworth (2006) argue, in today's literacy and literacy pedagogy, images have key roles either for printed or electronic texts, along with languages. Images or pictures have the potentials to communicate certain messages (Sugianto, Andriyani, & Prasetyo, 2021; Sugianto, Denarti, & Prasetyo, 2021; Sugianto, Prasetyo, Aria, & Wahjuwibowo, 2021; Sugianto & Prastika, 2021). Conceptually, the notion of multimodality derives from social semiotics. In this regard, it derives from Halliday's (1978, p. 2) notion asserting that language is deemed as 'social semiotic'; hence, meaning-making involves 'social-cultural context'. In other words, the notion of social semiotic puts the emphasis on meaning as a result of 'social environment and social interactions' and another feature of social semiotics is that the meaning along with the forms of a sign hinges on the sign-makers; thereby, instead of 'arbitrary', it is considered 'motivated' (Kress, 2010, p. 55).

Moreover, concerning making meaning, the language of science is considered to be different from that which, for example, is used in social science. It is, as Schleppegrell's (2008, p. 114) notes, the language of science tends to function to 'build experience of the world' and the language of social science has to do with interpreting 'social experience'. Additionally, Lemke (1990, p. 158) asserts that the language of science tends to be 'expository' or 'analytical', whereas the language of social science tends to be 'narrative'. Such conditions might be challenging for children leading them to be in a condition that Halliday (2004, p. 199) calls 'alienation'. To cope with this issue, the pervasiveness of the other mode might be facilitative to assist the children in understanding the language of science. It is due to the fact that, as Lynch (1988, pp. 153-154) asserts, a visual image in scientific text is not a mere picture or illustration, but it has meanings that result in scientific objects are analyzable.

Thereby, multimodal texts are considered to have significance for students in comprehending the scientific text.

To construe multimodal text of science textbooks, a few scholars have developed and proposed some frameworks. One of the most common ones derives from systemic functional linguistics, abbreviated as SFL (Halliday, 1994; Halliday & Matthiessen, 2004, 2014). As its name, SFL draws on two features, namely system and functional. The former has to do with a notion that sees the 'organization of a language as options for meaning' and the latter refers to the way people use language in daily lives (Martin & Rose, 2008, pp. 21-24). Additionally, there are three types of metafunctions comprising ideational metafunction, interpersonal metafunction, and textual metafunction through which the language is used to negotiate messages or information. In this regard, the ideational metafunction has to do with employing language to express the world (Thompson, 2014). The ideational metafunction focused in the present study has to do with the experiential meaning. It is realized through a transitivity system. The transitivity system comprises several processes, such as the material process or the process in which several entity does or conducts actions (involving some participants, such as Actor, process of material, Goal/Range/Beneficiary), the behavioral process associated with 'physiological and psychological behaviour' (comprising some participants, such as Behaver, process of behavioral, Behaviour/Phenomenon), the mental process or the process related to thinking or feeling (consisting of some participants, such as Sensor, process of mental, and Phenomenon), the verbal process or the process of 'saying' (involving some participant, such as Sayer, Receiver, and Verbiage), the relational process or the process of 'being' (divided into two types of processes, i.e., identifying process involving some participants, such as Token, process of identifying, and Value; attributive process involving some participants, such as Carrier, process of attributive, and Attribute) the existential process or the process of 'existing' indicated by the use of 'there' (involving some participants, such as Existent and process of existential) (Eggs, 2004, p.213-249); additionally, Gerot and Wignell (1994) asserts one additional process, that is, the meteorological process which is characterized by an 'introductory it'.

In addition to the ideational metafunction, another metafunction through which the language is used to negotiate messages is the interpersonal metafunction. It refers to using language to build rapport with other people (Gunawan, 2020; Martin & Rose, 2007). The interpersonal meaning is realized by two types of systems, namely Mood system and Modality system. The former refers to the typical pattern indicating a clause realized by two broad types of constituents, namely MOOD consisting of the main grammatical features of a clause such as Subject and Finite and RESIDUE comprising some complementary constituents of a clause, such as Predicator, Adjunct, and Complement (Emilia, 2014). The other system having to do with interpersonal meaning is Modality system which refers to the intermediate degrees of a clause (Halliday, 1994). The modality system is typically divided into two categories, namely modalisation (also known as epistemic modality in formal grammar) associated with the degrees of probability and usuality and modulation (refers to deontic modality in formal grammar) associated with the degrees of obligation and inclination (Halliday & Matthiessen, 2014; Thompson, 2014). Moreover, the last metafunction is the textual metafunction. It refers to using a language so as to organize the two previous metafunctions discussed above based on a particular context (Martin & Rose, 2007). This metafunction is realized by Theme system which typically comprises two main

elements, namely Theme which refers to 'point of departure' through which the addressee can understand the way a message is developed, and Rheme which refers to the rest of the part of a clause or message besides Theme (Halliday & Matthiessen, 2014).

Furthermore, in the case of construing the visual image, the framework of the grammar of visual design proposed by Kress and van Leeuwen (2006) is one of the most commonly used by scholars. This framework derives from systemic functional linguistics; therefore, this framework also includes three typical metafunctions of systemic functional linguistics, namely ideational, interpersonal, and textual/ compositional metafunctions. The ideational metafunction is divided into two types of structures or representations, namely narrative and conceptual structures/representations. The former comprises some processes, such as action process, reactional process, speech or mental process, and conversion process, as well as geometrical symbolism; the latter consists of conceptual, analytical, and symbolic processes (pp. 63-105).

In addition to the ideational metafunction of the visual image above, the other metafunction is interpersonal metafunction, also known as interactive meaning, which is realized by contact, social distance, and attitude. The contact is realized by the way the represented participants look at directly the viewers/readers; the social contact is concerned with the way the represented participants are shot or taken, close-shot, medium-shot, or long-shot; the attitude refers to subjectivity or objectivity of the visual image (pp. 116-149). Another concern with the interpersonal metafunction of visual image is modality which is realized by modality markers such as colour saturation, differentiation, modulation, contextualization, brightness and so forth (pp. 160-162).

Furthermore, the other metafunction is textual metafunction also known as compositional metafunction. This type of metafunction is realized by three systems comprising information value or the way the participants are placed in the visual image; salience or the way the participants are made to draw the viewers/readers' attention through several factors such as placement, size, or colour; framing or the way the frames appear in the visual image (p. 177). Moreover, to know whether the verbal text and the visual image interact or interrelate with one another, some scholars develop some frameworks. In this regard, Hermawan and Sukyadi (2020) assert, based on the notions of Royce's (1998) intersemiotic complementarity and Martinec and Salway's (2005) logico-semantics, that the intersemiosis between the two modes, the verbal text and the visual image, exist if the items identified between the two modes interact one another.

Moreover, current trends have shown that multimodality has been an increasing and growing interest, particularly in science classrooms and science textbooks, in recent years. For instance, Fernandez-Fontecha, O'Halloran, Wignell, and Tan (2020) investigated the features with respect to visual thinking that significantly helpful in scaffolding science classroom; Fredlund, Remmen, and Knain (2021) revealed the potential of epistemological commitment of modes in learning and teaching process in regard to the topic of the greenhouse effect; Alyousef (2021) studied the multimodal cohesive devices employed by university undergraduate students taking a Science Dentistry Program; Hermawan and Rahyono (2019) scrutinized the ideational meanings and interpersonal meanings of science textbook deriving from the national curriculum, KTSP 2006 and Kurikulum 2013; Guo (2004) analyzed a multi-semiotic concerning cells from a biology textbook; Menese, Escobar, and Veliz (2018) investigated the influence of multimodality on the way students in the fifth

grade comprehend science reading texts; Nur'graha and Hermawan, (2020) conducted a study regarding the ideational meaning of a science textbook for a university-level; Doran (2019) inspected significance of images in physics. Despite lots of studies concerning multimodality in science classrooms and science textbooks above, the studies discussing the multimodal texts used in a primary school level were found to be limited; thereby, the present study aimed to fill the gap left by the previous studies. In this regard, this study is focused on a multimodal text of a science textbook for primary school level within three types of meanings, i.e., ideational, interpersonal, and textual meanings.

RESEARCH METHOD

Systemic Functional Multimodal Discourse Analysis was utilized in the present study. The rationales underlying the use of the approach comprise its suitability to the text scrutinized, which in this case, multimodal (Knox, 2013; K. O'Halloran & Fei, 2014). The interactions between the two modes were scrutinized within the trinocular of systemic functional linguistics (M. A. K. Halliday, 1994; M. A. K. Halliday & Matthiessen, 2004, 2014) and grammar of visual design (Kress & van Leeuwen, 2006; 2021), and intersemiotic complementarity (Royce, 1998; 2007), as well as logico-semantics (Martinec & Salway's, 2005).

In addition, the artefact scrutinized was a Science textbook, entitled *Science: Pupil's Book 4* (Leng & Fairclough, 2017). There were some grounds for selecting the textbook to be scrutinized. To begin with, its ubiquitous use in some public primary schools in Indonesia. Additionally, it was published by an international publisher which was reputable and credible. Also, the present study was focused on one page-layout on a learning topic, that is, *deforestation* from chapter three of the textbook. The rationales for selecting the excerpt were determined and encouraged by the researchers' thorough perspectives, interests, and judicial judgements (Fairclough, 2003; Hermawan & Sukyadi, 2020). The artefact was considered multimodal due to the fact that verbal texts and images are provided on the topic. Next, the time constraint was another reason to conduct the partial topic of this book. Furthermore, analyzing a short fragment of a topic is feasible for such inspections constitute the common features of analysis utilizing systemic functional linguistics or social semiotics, i.e., 'micro analysis of selected short fragments' (Jewitt, Bezemer, & O'Halloran, 2016, p. 11). Besides, such analysis with respect to a short fragment multimodal text were also conducted by some scholars, for instance, Jauhara, Emilia, and Lukmana (2021) scrutinizing a multimodal text on a topic 'Greetings'; Royce (1998) investigating a 'page-based multimodal text in the form of an advertisement and he also analyzed a finance issue from a magazine with a heading entitled 'Mountains still to climb (Royce, 2007).

In analyzing the artefact, some steps were conducted. To begin with, the verbal text was broken down into clauses. They were investigated within the metafunctions of systemic functional linguistics, namely ideational, interpersonal, and textual metafunctions. Besides, along with the construing the meanings of the verbal text within the three metafunctions, the visual image was inspected using the grammar of visual design, similar to the verbal text, within the three metafunctions. Then, as the inspection of the verbal text and visual image had been scrutinized, the intersemiotic interaction (based on logico semantics and the intersemiotic complementarity) between the modes was carried out. Additionally, to

anticipate the copyright issue, the artefact colours were changed into monochrome. Figure 1 shows the artefact scrutinized.



Figure 1. The Excerpt of Multimodal Text on Deforestation (Leng & Fairclough, 2017, p. 74)

RESULT AND DISCUSSION

This section is focused on unravelling the findings of the data analyzed with respect to the ideational, interpersonal, and textual meanings of the verbal mode and visual mode of the artefact shown in Figure 1 above. Thus, there are three sub sections comprising ideational meaning followed by interpersonal meaning, and textual meaning respectively.

Ideational Meanings

As the explanation aforementioned, each mode was analyzed before the intersemiotic between the two modes were scrutinized. To begin with, to figure out the ideational meanings of the verbal text, the transitivity analysis was conducted. In this regard, the text was broken down into chunks of clauses to find out the elements constructing each clause of the text. Some abbreviations were used. They consist of the following: V=Value; Pi=Process: intensive; T=Token; A=Actor; Pm=Process: material; Pc=Process: causative; Cr=Carrier; G=Goal; R=Range; Cl=Circumstance:location;Cc=Circumstance:cause;Ca=Circumstance:accompaniment; Cm=Circumstance:manner; ARP= Attributive Relational Process; At=Attribute; B=Beneficiary; Ag=Agent. The following are the text that has already been broken down into clauses and analyzed using the transitivity analysis.

1. The clearing of forest (V) is called (Pi) deforestation (T).
2. Humans (A) clear (Pm) forests (G) to develop (Pm) land (G) for different uses (Cc), //such as farming (Pm) and building (Pm) houses (G).
3. However, this (A) kills (Pm) the plants (G) and destroys (Pm) the habitats of living things (G) that live (Pm) in the forests (Cl).
4. Many living things (A) lose (Pm) their homes (G) and sources of food (G).
5. They (A) may die (Pm) as a result (Cc).
6. The roots of plants (A) hold (Pm) soil together (G).
7. When a forest (B: Recipient) is cleared (Pm), soil (B: Recipient) can (F) be (P) easily (Cm) washed away (Pm) by rain (A) or blown away (Pm) by wind (A).
8. This (V) is called (Pi) soil erosion (T).
9. It (A) can cause (Pm) landslides (G) that can bury (Pm) people (G) and destroy (Pm) buildings (G).

Table 1. Types of Processes Used in the Verbal Text on Deforestation

Types	Material	Mental	Verbal	Intensive	Circ, Cause, and Possessive	Behav.	Exist.
Total	8	-	-	2	-	-	-

Based on the Transitivity analysis of the verbal text above, several findings were obtained. To begin with, the participants found encompassed 'deforestation', 'humans', 'living things', 'the roots of plants', and 'soil erosion'. Moreover, there are some processes found comprising relational processes, as shown in clauses 1 and 8 (identifying relational process) and clause 6 (attributive relational process). The identifying relational processes show the entity referring to the participants that have particular identities attached to them (M. A. K. Halliday, 1994). Additionally, there are material processes indicated by clauses 2, 3, 4, 5, 7, and 9. The findings concerning the total number of material processes surpassing the relational

processes follow Butt, Fahey, Feez, Spinks, and Yallop's (2003) notion that the material process constitutes the most frequently found process that students encounter. Moreover, as Emilia (2014) argues, the use of the material process is a means for introducing and entrenching information on the issue, which in this case, it has to do with deforestation. Moreover, a number of types of entities referring to the participants of the verbal texts were found, for example, concrete everyday entity (e.g. 'humans'), concrete specialized entity (e.g. 'living things', 'the roots of plants', 'deforestation', 'soil erosion') (Martin & Rose, 2007). The uses of the terms, particularly the concrete specialized entity outnumbering the concrete everyday entity, indicate that the Science language is different from the other subject and it has its own language (Fang, 2004; Muspratt & Freebody, 2013). Moreover, some categories of circumstances were found to be used in the verbal text shown by clause 2 (cause), clause 3 (location), clause 5 (cause), clause 7 (manner). These findings in regard to circumstances used were found to be interesting for there were two circumstances of cause found. The use of such circumstances provides the emphasis of the causes with respect to the issue posed in the text, namely 'deforestation'. These also were emphasized by the use of circumstance of manner provided in the text. Meanwhile, the circumstance of location used assists the reader to get the information concerning the specific place in which the living things live and are affected by the negative effect of deforestation.

Moreover, along with the verbal text, there are three visual images presented, namely a picture with a caption *Forest being cleared (henceforth FBC)*, a picture with a caption *baby racoon that loses its habitat after the forest is cleared (henceforth BR)*, and a picture with a caption *landslide in a housing area (henceforth L)*. All these captions are written in yellow. Besides, to provide contrast with the visual image, the yellow captions can be contextually interpreted as cautions (Morton, 2021), which in this case, with respect to the actions represented in and associated with the pictures having to do with deforestation. In addition, the pictures are depicted with high saturation. The use of the high saturated colours is considered to have an association with realistic pictures since it illustrates the real entities as in the real world (Hermawan & Sukyadi, 2020). Also, both the visual images and the captions, based on the logico-semantics relations, are regarded to have elaborative relations, particularly exposition, in which the pictures and the text have the same generality concerning the information provided (Martinec & Salway, 2005). In other words, the visual image restates the information represented in the captions and vice versa.

Additionally, the first image of the deforestation topic, FBC, has some represented participants comprising an excavator, a tree, and four trucks. Also, some processes were found in FBC. In this regard, it reveals some transactional processes, for example, the excavator placed on the foreground constitutes the Actor and the tree and the surrounded things cleared land is the setting as well as the Goal of the transactional process; also, the trucks in the background may be considered to have the role as the Actor carrying the results of the cleared forest, for instance, the soil Goal. Moreover, FBC also generates the other process, namely unstructured analytical process, in which the represented participants encompassing the excavator, the trucks, tree, and the cleared forest constitute the Possessive Attributes of the Carrier referring to deforestation. Furthermore, the second image of the deforestation topic, BR, has a baby racoon as the main represented

participant. The type of process found includes the symbolic suggestive process, as Kress and van Leeuwen (2006, 2021) point out, which can be indicated by the way it was zoomed out that resulted in the exaggerated size. Also, the cut trees shown in the background and foreground of the baby racoon constitute the circumstance of setting. The use of circumstance of setting provides the emphasis of the negative condition of the habitat in which the baby racoon lives. The negative condition was on account of the fact that the deforestation was carried out. Moreover, if BR and FBC are considered as an integrated and unified image, another process was generated, i.e., an inclusive analytical process. This inclusive analytical process is created due to the fact that BR takes the space of FBC; hence, BR is considered as the Possessive Attributes of the FBC which constitutes the Carrier. Based upon this inclusive analytical process, BR can be considered as the part of FBC, which then can be interpreted that BR associated with the racoon's habitat loss is due to FBC or deforestation that happened. Next, the third image, L, reveals some represented participants, namely some adults and a ruined house. Based on L image, some processes were encountered, for example, transactional processes indicated by the adults, Actor, going down the steep land. Besides, the symbolic process shown by the Carrier a ruined house with the surrounding scattered ruins as the Carrier. Moreover, the rocks that come out of the house's surrounding provide the locative circumstance indicating the place where the event happened, i.e., it happened in the place where the trees were cleared.

Furthermore, the verbal text in terms of the ideational meaning interacts directly with the meaning of the visual image. In this case, it is, for example, realized by the verbal text that uses 'deforestation', 'living things', and 'humans' as the participants that are in association with the represented participants in visual image, such as 'a barren forest', 'an excavator', 'trucks', 'a baby racoon', '(adult) people' and 'a ruined house'. Moreover, another interaction was also found in the way the circumstance was used, which in this regard, the verbal text and the visual image were found to have the same circumstance type, namely setting or locative circumstance. Moreover, in terms of the logico-semantics, the two modes are deemed to be equal and belong to exposition in which the visual image restate the message in the verbal text and vice versa. The findings of the Transitivity analysis of the verbal text and visual images are shown and summarised in Table 2 below.

Table 2. Intersemiosis of the Ideational Meanings on Deforestation Topic

Verbal mode	Intersemiosis	Visual mode
1. There are nine clauses.	1. The verbal text employs the	1. The visual images have some represented
2. The main participants are deforestation, humans, living things, the roots of plants, rain, wind, and erosion.	participants realized by 'deforestation', 'living things, and 'humans' which relate to the represented	participants, such as a tree, an excavator, trucks, a baby racoon, eleven adults, and a ruined house.
3. The processes encompass attribute	participants provided in the visual modes such as a barren forest, an excavator, trucks, a ruined house,	2. The processes found comprise analytical processes, symbolic processes and transactional processes.

<p>and relational and material processes.</p> <p>4. The circumstances comprise circumstances of location (place/spatial) and accompaniment.</p>	<p>a baby racoon, and adults.</p> <p>2. The verbal text makes use of the type of circumstance which is equal to the visual mode, that is, locative circumstance.</p> <p>3. In respect to the logico-semantics, the visual image is considered to have equality with the caption. It can be regarded as exposition, that is, the visual image restates the message or information by the verbal text and vice versa.</p>	<p>3. The circumstances encompass a locative circumstance.</p>
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Interpersonal Meanings

To begin with, the verbal text was broken down into clauses to figure out its interpersonal meanings. The clauses were analyzed using Mood analysis. In this regard, the constituents are symbolized using the following. S=Subject; F=Finite; P=Predicator; C=Complement; Ca=Attributive Complement; F/P=fused Finite and Predicator; Fn:Finite (negative); A=Adjunct; Ac=(Circumstantial) Adjunct; Aj=Conjunctive; Fms=modalised (Finite); Fml=modulated (Finite); Am=(Mood) Adjunct. The following are the results of the Mood analysis.

1. The clearing of forest (S) is (F) called (P) deforestation (C).
2. Humans (S) clear (F) forests (C) to develop (P) land (C) for different uses, such as farming and building houses (Ac).
3. However (Aj), this (S) kills (F/P) the plants (C) and (Aj) destroys (F/P) the habitats of living (C) [[that live (P) in the forests (Ac)]].
4. Many living things (S) lose (F/P) their homes and sources of food (C).
5. They (S) may (Fms) die (P) as a result (A).
6. The roots of plants (S) hold (F/P) soil (C) together (Ac).
7. When (Aj) a forest (S) is (F) cleared, soil (S) can (Fml) be (P) easily (Ac) washed away (P) by rain (Ac) or (Aj) blown away (P) by wind (Ac).
8. This (S) is (F) called (P) soil erosion (C)
9. It (S) can (Fml) cause (P) landslides (C) [[that can (Fml) bury (P) people (C) and (Aj) destroy (P) buildings (C)]].

In terms of the interpersonal meaning, the declarative Mood was found to be used in all clauses in the verbal text. Moreover, some modal operators were found in some of the clauses, for example, in clause 5 and clause 9 that are categorized as modalisation (epistemic modality) of probability. Nevertheless, these two modal

operators are classified to have low values (Halliday & Matthiessen, 2014). These low values show that the unit of information provided in the clauses using the modal operators is arguable or debatable. Moreover, the absence of the first personal pronouns, such as 'I' or 'we' and the second personal pronoun, such as you, indicate that the verbal text only offers information without providing any attempt to involve the readers in the information provided. Besides, the absence of these two types of personal pronouns in the verbal text indicates the authority between the writer of the text and the readers are not equal (Hermawan & Sukyadi, 2020).

Furthermore, in terms of the interpersonal meanings of the visual images, some of the represented participants were found to be in oblique angles, namely FBC and L. These oblique pictures indicate that the represented participants only offer the information to the viewers/readers and there is no involvement between them. However, another represented participant was found to be depicted in frontal angle, picture BR. This frontal gaze realizes 'demand' to the viewers/readers; hence, involvement from the viewers/readers are attempted to be constructed here. Moreover, the BR visual image was depicted at eye-level indicate that the authority or power between the represented participants and interactive participants. Besides, in terms of modality, the visual image was depicted in full-colour saturation and detailed background. Hence, it can be considered it has a high modality and validity; thereby, it is naturalistic (Kress & van Leeuwen, 2006, 2021).

Intersemiotically, the verbal text and the visual image have interaction to only a particular extent. To begin with, on the one hand, it can be considered that the two modes were found to have a low interaction. It is on account of the fact that the verbal text that uses the modal operator such as 'can' or 'may' are considered to have low values, which in this case is in contrast with the visual image, which is depicted with a high modality indicated by the full-colour saturation and detailed background. However, to bear in mind, these conditions seem only prevail in the third picture, L, which is in association with the last clause, clause 9, that employs such modal operator. Another low interaction was found, for example, in the way the represented participant is depicted in terms of 'contact' of the BR picture, which is depicted in frontal angle meaning 'demand' and address the viewers/readers directly and explicitly (Kress & van Leeuwen, 2021) which is in contrast with the verbal text indicated by the absence of the second personal pronoun such as 'you'. On the other hand, the absence of the second personal pronoun 'you' in the verbal text was also found to interact with the other two pictures, FBC and L, depicted in oblique angle with a very long shot indicating the public social distance (Torres, 2015). The findings of the interpersonal meanings of the two modes are summarised in Table 3 below.

Table 3. Intersemiosis of the Interpersonal Meanings on Deforestation Topic

Verbal mode	Intersemiosis	Visual mode
1. The clause is in the form of a statement.	1. The use of epistemic modality indicated by 'can' found in the	1. Both obliques (for the pictures of FBC and L) realizing offer

2. The MOOD belongs to declarative.	verbal text can be considered to have low interaction with the	and frontal gaze (for the Br) realizing demand were used.
3. The epistemic modality is used. It is indicated by the use of 'may' and 'can' showing probability.	high colour saturation as the indication of the modality of the visual mode.	2. The oblique angles were found in Fbc and L pictures. Meanwhile, the frontal angle was found in BR picture.
	2. The omission of the second personal pronoun in the verbal text is found to interact with the visual images that have an oblique angle result in the picture as offering information.	3. The Br is presented at eye-level angle, whereas the FBC and L were depicted at high angles.
		4. The modality markers used comprise the uses of full-colour saturations, a maximally diversified range of colours, a fully articulated and detailed background, and a maximum representation of pictorial detail.

Textual Meanings

Similar to the Transitivity and Mood analyses, the textual meanings of the verbal text are analyzed by breaking down the text into clauses. The clauses are scrutinized using theme analysis. The following are the terms with their keys: Theme (T) is underlined, textual theme (Text Th) is written in italics, interpersonal theme (Int Th) written in capitals, topical theme (Top Th) is written in bold, and dependent clause as theme is indicated by whole clause in bold. The results are shown below.

1. **The clearing of forest** (T/Top Th) is called deforestation.
2. **Humans** (Top Th)/(T) clear forests to develop land for different uses, such as // farming and building houses.
3. *However* (Text Th), **this** (Top Th) /(T) kills the plants and destroys the habitats of living things [[**that** (Top Th)/(T) live in the forests]].
4. **Many living things** (Top Th)/(T) lose their homes and sources of food.
5. **They** (Top Th)/(T) may die as a result.
6. **The roots of plants** (Top Th)/(T) hold soil together.
7. **When a forest is cleared** (Top Th)/(T), **soil** (Top Th) can be easily washed away by rain or blown away by wind.
8. **This** (Top Th) / (T) is called soil erosion.

9. **It** (Top Th) / (T) can cause landslides [[that (Top Th)/ (T) can bury people and destroy buildings]].

In terms textual meaning, in terms of the verbal text, the main themes were found. They consist of *the clearing of forest, humans, living things, soil erosion*. Moreover, the title was typed in black and bold. Besides, the type of font used is Segoe UI. Similarly, the clauses in the text were written in black and the font type is Segoe UI. Meanwhile, in terms of the visual image, the full saturation used to depict the pictures indicates high modality. Besides, the captions in the pictures were found to be written in yellow, which were embedded in the pictures, i.e., in this case, to make contrast with the colours of the picture, the caption of the picture FBC was placed on the top left corner of the picture and the same way was found in Br picture in which it was placed on top of the represented participant, whereas in L picture the caption was placed on the bottom of the picture. Based on the placement of the captions, these are interpreted that for pictures FBC and BR, the captions become the Given in the pictures, whereas the caption in L becomes the new element in the picture. Moreover, the pictures FBC and BR with respect to the first paragraph of the verbal text seem to be placed in Ideal Given. Meanwhile, the picture L was found to be the new element with respect to the verbal text of paragraph 2 and the two modes were found to be overlap; in this regard, some of the clauses in paragraph 2 of the verbal text were positioned partially in the L image while the other clauses were found to be outside of the image. Based on these findings with respect to *given-new*, the pictures FBC and BR can be considered as the information that might be known by the viewers/readers, whereas the information provided by the picture L is considered as something new for the readers/viewers (Kress & van Leeuwen, 2006, 2021).

In addition, some clauses of the verbal text were found to be connected closely to the pictures. For instance, the themes found in clause 1, 'The clearing of forest', and in clause 7, 'when a forest is cleared', were found to be closely related to the picture FBC, i.e., particularly to the caption in the picture 'Forest being cleared'. Similarly, the theme in clause 4, 'Many living things' interacts with the picture BR. Also, clause 9, 'that' which refers to 'landslides' was found to be in association with the last picture, L. The other interaction was found in terms of the font type used. The two modes were found to have the same font type, namely Segoe UI with the same colour, i.e. black. The summary of the textual meanings of the multimodal text is depicted in Table 4 below.

Table 4. *Intersemiosis of the Textual Meanings on Deforestation Topic*

Verbal mode	Intersemiosis	Visual mode
1. The main themes found comprise <i>the clearing of forest, humans, living things, soil erosion</i> .	1. The theme in the verbal text is realized the same way as the represented participants depicted in the picture, for instance, one of the living things is associated with the baby racoon, the deforestation is	1. The information value follows the top and bottom, in which the two first pictures (FBC and BR) appear after the first clause, whereas the third picture, L, appears at the bottom.
2. The colour of the font for the title is black and written in bold. The font		2. The salience aspect is realized by, for instance,

<p>colour in the clause is black.</p> <p>3. The font used is Segoe UI.</p> <p>4. The colour of the title is black in bold. Similarly, the colour of the font for the clauses are black but in regular style or not in bold.</p>	<p>realized by the represented participant an excavator picture.</p>	<p>the use of a yellow caption in the picture, zooming in the represented participant (BR).</p> <p>3. The framing is realized by the white space. Meanwhile, in the third picture, there is no actual line shown because it seems the picture appears to be the background of the verbal text.</p>
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CONCLUSION

Based on the findings and discussion aforementioned, this study arrives at several conclusions. To begin with, some interactions between the visual mode and verbal mode were found in three types of meanings, i.e., ideational, interpersonal, and textual meanings. In terms of the ideational meanings, the participants and the circumstance used and included in the verbal text were closely related to the participants and circumstances of the visual image. Similarly, regarding the logico-semantic, the visual image is considered to have equality with the caption and some of the clauses of the verbal text. In this regard, the interaction between the two modes with respect to logico-semantic is regarded as exposition in which the message or information found in the verbal text restate the message or information found in the visual image each other, and vice versa. In a similar vein, in terms of the interpersonal meanings, the interaction between the two modes was found in terms of the absence of a second personal pronoun in the verbal text that is closely related to the oblique angles of the two pictures provided that indicate the verbal text and the visual image is used to merely offer information. Nevertheless, few differences were also found between the two modes in terms of the modality; in this case, the verbal text utilizing the modal operators, such as 'may' or 'can' indicating modality was in contrast with the visual mode which has high modality due to the full-colour saturation and detailed background and portrayal provided. In terms of textual meaning, there is an interaction between the two modes found; in this regard, the main theme, for instance, in the verbal text, is manifested the same as the represented participants in the visual image as well as the captions included in the visual images.

Furthermore, upon the findings of the interaction between the modes, it is suggested that the Science teacher should provide an assertion and emphasis to their students that it is also important for the students to observe the pictures along with the verbal text since the pictures are not merely images or accessories. To facilitate the students to deal with this issue, Science teachers are required to equip themselves with the insight or knowledge concerning the multimodality that constitutes a common phenomenon at the present time. Moreover, exploring the other topics in the textbook as well as comparing this with the textbooks different publishers are highly recommended so as to give the elaboration and portrayal of the multimodal texts over the textbook and the other textbook.

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