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To What Extent Do Teachers of Gifted Students Identify Inner and Intermodal Relations in Knowledge Representation?

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Abstract. Gifted students get bored of reading authoritative and descriptive multimodal texts. They need coherent, explanatory, and interactive texts. Moreover, because of the pandemic, gifted students took courses online, and teachers had to conduct their lessons on digital online tools with multimodal representations. They posted supplementary teaching materials as multimodal texts to the students. Hence, teachers of gifted students should pay attention to inner and intermodal relations to meet the needs of gifted students and support their learning experience. The research aims at examining to what extent teachers of gifted students identify inner and intermodal relations because before designing these relations, the teacher should recognize these types of relations. The educational descriptive case study was applied. Six experienced primary school teachers were involved. The data were analyzed via content analysis. The results showed that teachers just identified the primitive level of inner and intermodal relations. The conclusion can be drawn that several educational design research should be increased to construct professional development courses for teachers about this issue. Learning and applying inner and intermodal relations are crucial for teachers of gifted students, in addition to having curiosity, they have a high cognitive level in different areas, thus they demand advanced forms of multimodal texts.

Keywords: Gifted Education, Multimodality, Intra-Text Cohesion, Intermodal Relations, Online Teaching

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INTRODUCTION ~ The interactive digital media enables multiple modes, such as verbal statements, written texts, visuals, and sounds in knowledge representation (Bezemer & Kress, 2008). There is a significant increase in the coherent relationship of text with other modes in digital environments. For example, in the field of scientific disciplinary discourse, scientific concepts are presented via the orchestration of multimodal forms of representation like video, animation, infographics, and presentations (Andersen & Munksby, 2018). Hence, Tang et al. (2014) stated that multimodal representations became an inseparable part of science education. They have a crucial role in enabling students to participate in scientific culture (Murcia, 2010). They are critically important for scientific literacy because scientifically literate one should comprehend how scientific concepts are represented and should be familiar with how scientists think and act in knowledge presentation (Gillies et al., 2016). The new digital environment demands students to understand science from the perspectives of using multimodal representations (Tolppanen et al., 2013). Briefly, integrating multimodal representations into a science classroom improves what knowledge students are capable of constructing through analysis and synthesis of diverse modes (Wilson & Bradbury, 2016). Hence, teachers, especially teachers of gifted students, should have awareness of coherent relationships between and within modes.

All these things mentioned above are taken into consideration, thus the point is clear that teaching and learning in science are realized through multimodal representations, which have significant potentials for promoting science conceptual understanding deeply (Jewitt, 2008; Prain & Waldrip, 2010; McDermott & Hand, 2015). Orchestrating various types of modes provide students to synthesize information from different semiotic sources, which is thought as an important step in science learning because each mode enables the same, overlapping, or different/supplementing information (Hubber et al., 2010; Towstand et al., 2018).

In this context, effective facilitation of modes and their meaningful integration of them in mono and multimodal texts (written text, and written+visual text) are accepted as the core of learning in any discipline with growing consensus over the last few decades (Daniellsson & Selander, 2016). In addition, having skills in identifying and comprehending the nature of the interplay of modes help teachers make close and constant integration among modes in a plausible way that encourages students' learning (Jaipal, 2010; Sivle & Uppstad, 2018). Therefore, the current research claims that multimodal representations should be designed coherently to teach effectively and support learning deeply, especially for gifted students who get bored of reading authoritative and descriptive text. They demand challenging text (high-level multimodal text), which pays attention and interest to them and improve their curiosity, creativity, and critical thinking skills. In beginning, teachers should prepare text (written mode) in cohesion, then construct intermodal relations between a written and visual mode in order to design coherent and high-level multimodal representations. Hence, teachers, require new abilities, such as (1) having abilities to recognize and identifying aspects of intra-text cohesion in written text and intermodal mechanisms in multimodal representations, (2) representing knowledge to students, (3) transforming one mode to another, (4) and finally designing and critiquing these types of representations (Jewitt, 2008; Daniel et al., 2018).

THEORETICAL FRAMEWORK

Characteristics of Gifted Students

Gifted students are atypical learners in terms of cognitive and language abilities, interests, personalities, motivation levels, learning styles, personality traits, habits, and behaviors (Housond, 2016). VanTassel-Baska (2011) stated that gifted students have three definite characteristics, namely complexity, precocity, and intensity. The former refers to having abilities to handle complex ideas, performing higher-order thinking, and enjoy challenging activities that originate from their precocity and their intense emotional responsiveness about issues they find interesting.

National Association for Gifted Children (2010) identifies that gifted students are demonstrated by their high level of competence in a specific subject area such as math, science, art, and so on. They are curious by nature and verbally fluent. They have superior language ability and see a big picture by connecting and manipulating different parts and patterns of texts (Davis et al., 2014).

Characteristics of Teachers of Gifted Students

Teachers of gifted students should select, improve, and design differentiated teaching methods and materials to pay attention to gifted students. They should prepare well-organized and well-grounded materials to motivate gifted students, and trigger their interests. These materials should challenge them and focus on process and product. Teaching materials and the environment should be designed for promoting individualized learning. Teachers should have abilities of teaching higher-level thinking skills, including creativity and problem solving (Davis et al., 2014).

Gifteds Students Learning Needs

Gifted children are sitting in their classrooms without their abilities being noticed and their needs met. Most of them get bored easily, and they are waiting for non-gifted peers to learn concepts that they had learned one year earlier (Davis et al., 2014). They find the classroom environment intolerable so that they do not want to attend classroom activities. Therefore, curriculum, classroom environment, and teaching materials should be designed to meet the needs of their advanced capabilities (Renzulli & Reis, 2014). Teaching materials should be prepared to pose challenges to these students even after they leave the classroom setting (VanTassel-Baska, 2011). They should be prepared to improve their interest and in turn their motivation. Instruction should direct gifted students to learn research skills and scientific process skills. Gifted students should be encountered a high level of multimodal representations, which demand students to make inferences, establish causal relationships, and questioning (Housond, 2016). These types of teaching materials improve gifted students' curiosity, creativity, interest, and motivation.

Gifted students are curious, creative, interested, and motivated by nature (Housond, 2016). However, these abilities should be activated continuously by providing well-organized and well-grounded teaching materials because these skills involve cyclical processes when satisfied trigger each other (Rimm et al., 2018).

Intra-text cohesion (Innermodal Relations)

Textbooks or teaching materials are written in authoritative, expository, informative, and compact syntax format, so they are challenging for students to learn with text (Kloser, 2013, 2016). The lack of coherence in text and unjustified claims fail students to participate in the scientific process, in other words, text in low cohesion does not lead students to a step forward - from what we know to how we know - (Phillips & Norris, 2009). Hence, instructors state that there is a need to make the text more apparent in order to scaffold students' learning (Norris, Stelnicki, & de Vries, 2012). At this point, this research uses the term intra-text cohesion to refer to explicit and clear the text by manipulating several patterns, such as its argumentative structure, epistemic stance, syntax, sentence structure, vocabulary, conceptual overlapping, etc. (Roseman et al., 2010; Uccelli et al., 2015).

The use of argumentative-narrative structure and scientific language scaffolding with daily language have positive impacts on students' comprehension of scientific epistemology (Baram-Tsabari & Yarden, 2005; Brill & Yarden, 2003; Norris et al., 2012). On the contrary, students experience difficulties in analyzing components of text and establishing meaningful links between sentences when they encounter expository text (Goldman & Bisanz, 2002). Kloser (2016) also showed that epistemically enriched text with justified claims with quantitative and qualitative data support learning and comprehension in students. McNamara et al. (2011) indicated that narrative-argumentative texts are more challenging than informative texts, which is crucial for gifted students. Sánchez et al. (2016) stated that if the text is organized in a scientific process narratively, students performed better in attending to the text than students who read authoritative text.

Intermodal Relations Between Image-Text

Multimodality states that knowledge construction and its representation are realized through the orchestration of different modes. Moreover, it investigates the relationship and embeddedness between modes in multimodal representations (Kress, 2003). In this regard, multimodality proposed that there are two main relations between image and text in the process of meaning-making, namely concurrence and complementarity (Chan & Unsworth, 2011; Daly & Unsworth, 2011; Unsworth & Chan, 2009). They are known as intermodal relations. Daly and Unsworth (2011) define concurrence as an image or text repeat the same meaning of another by specifying or describing it. It creates redundancy and repetition in meaning. On the contrary, in complementarity, an image and text create a new meaning together, transcending their meaning (Daly & Unsworth, 2011). Grasping meaning from complementarity is more challenging than concurrence.

Integration of images with text features in coherent ways has important roles in teaching science concepts (Marquez et al., 2005; Prain & Waldrip, 2006). Otherwise, conflicting meaning can be raised in which it leads to misconceptions. Shortly, non-coherence science texts result in misleading meaning that correctly prevents understanding (Eilam, 2013; Danielsson, 2013; Tang & Moje, 2010; Tang et al., 2014; Zhao et al., 2020), thus having an ability to establish relations between image mode and written mode is crucial for teachers (Prain & Tytler, 2012).

Gebre and Polman (2016) pointed out that an image-based diagram with text in high cohesion reduces cognitive load, helps working memory, in this way individuals situate in a meaningful learning experience. McDermott and Hand (2015) and Keles (2016) showed that utilizing multiple modes improves deeper science conceptual understanding. In addition, integrating different modes into science instruction develops students' skills of representing and communicating their understandings (Waldrip et al., 2010).

Purpose of the Study

Several studies investigated (1) the abilities to recognize and identify aspects of intra-text cohesion in written text and intermodal mechanisms in multimodal representations, (2) represent knowledge to students, and (3) transform one mode to another (Danielsson, 2013; Forey & Polias, 2017; He & Forey, 2018; Tang et al., 2014). However, this research states that before investigating these three skills, an examination is required to what extent teachers are capable of recognizing and identifying aspects of intra-text cohesion in written text and intermodal mechanisms between image-text. This is the gap that this research aims at addressing.

In the context of this research, because of the COVID-19 pandemic, the teachers conduct their lessons online, carry out lessons with presentations via digital learning platforms, and post teaching materials to students. Hence, the researchers claimed that teachers should design their teaching materials by considering intra-text and intermodal relations to support gifted students' learning experience. Due to the limited knowledge in this area, this research aims at investigating to what extent teachers of gifted students identify intra-text and intermodal relations. Therefore, the researcher investigates by following questions: (1) To what extent do teachers of gifted students identify differences between monomodal texts regarding intra-text cohesion?, and (2) To what extent do they identify differences between multimodal texts concerning intermodal relations?.

METHOD

The research is an educational descriptive case study. It includes a detailed and rich description of the subject of study by gathering information through a process of considering participants' perceptions (Savin-Baden & Major, 2013). This research examines teachers' perceptions about intra-text cohesion in written text and intermodal relations between image-text in multimodal representations for each case. The case study is bounded by a definite number of participants interviewed. It is particularistic that focuses on specific points. It is also contextual like historical, political, and educational. At last, the case study should be clear in describing the case to the reader.

At this point, the current research collected data via an interview with a definite number of participants regarding the points of (a) intra-text cohesion in monomodal texts and (b) image-text intermodal relations in multimodal texts in an educational context. Then, it describes the cases clearly.

Participants

The six primary school science teachers participating voluntarily in this research have had a degree in science teaching. One of them has a bachelor's degree in science teaching. Three of them have a master's degree in science teaching, and two of them are Ph.D. candidates. They are all experienced science teaching, the average teaching experience was 9 years. They are all teaching gifted students in primary schools in Turkey. Males and females were equally represented among the participants. They work in different regions of Turkey, but schools have the same attributes. Schools are designed to educate primary gifted students after formal education as a supplementary education. They also attend the online teaching process for gifted students during the COVID-19 process.

Data Collection

The data were collected through an unstructured interview during four weeks in the fall semester. The interviews were carried out by discussing monomodal and multimodal representations prepared (Appendix A). Firstly, the researchers distributed different types of monomodal and multimodal texts to the participants. Five minutes were given for each monomodal text, and three minutes were given for each multimodal text. Then, the researchers and participants discussed differences within monomodal and multimodal texts and discussed what purposes each text served.

Data Analysis

The data were analyzed based on content analysis (Savin-Baden & Major, 2013). It is an approach that analyzes the frequency and patterns of terms and phrases used. Interviews were transcribed into text. The researchers read transcripts several times, then start the process of identifying perceptions of teachers about intra-text cohesion and intermodal relations. The researchers analyzed and refined each category until a consensus was reached on their relevance. Afterwards, they paired these categories in intra-text cohesion themes and concurrence-complementarity themes by negotiating.

Procedure

The researcher prepared six monomodal texts in three different groups regarding intra-text cohesion (Kloser, 2013, 2016; Meneses et al., 2018; Ozuru et al., 2009) (Appendix A). The first group has criteria of (1) including headings as expository text or research question, (2) body text as expository-informative or narrative-argumentative, (3) involving scientific process (hypothesis, research question, data, and conclusion) or not. The second group is prepared based on criteria of (1) replacing ambiguous pronouns with nouns or not, (2) adding descriptions with examples or not, (3) inserting connectives to promote relationships between sentences or not, (4) adding and replacing words to improve conceptual overlapping or not. The third group is constructed through the principles of (1) including non-scaffolding academic vocabulary or not, (2) having un-compact syntax or compact syntax, (3) and highlighting with italic, bold, and underlying or not.

The researchers also designed multimodal texts in eight categories regarding intermodal relations between image-text (Daly & Unsworth, 2011; Keles, 2016; Meneses et al., 2018; Tang et al., 2019; Zhao et al., 2014) (Appendix B). Intermodal relations classify into two groups and eight categories. The first group is concurrence. Concurrence is a primitive form of multimodal representations. Chan (2011) defines it as "one mode elaborates on the meaning of other by further specifying or describing it while no new element or meaning is introduced by the written text or image." The concurrence classifies into four categories sequentially based on intermodal relationships: 1) decorational, 2) exemplary, 3) representational, and 4) extension. Decorational is the weakest intermodal relations in this category, and extension is the strongest one in primitive form.

Decorational means image or text may not be integrated, or even referred to each other. Few meaningful links can be established in decorational representations, do not encourage the learners to understand science concepts. Exemplary refer to the text as an example of an image or vice versa, either text or image more general. Representational means there is a correspondence between image and text in terms of redundancy of meaning. In other words, images mirror the information contained in the text or vice versa. Exposition means the re-description or re-identification of the image or the text in a different mode considering the same level of generality.

The second group is *complementarity*. A complementarity is an advanced form of multimodal representations. Chan (2011) identifies it as "a new meaning is introduced by either the written text or image. It can be in the form of extension." The complementarity classifies into four categories sequentially regarding intermodal relationships: 1) comparative, 2) organizational, 3) augmentational and 4) interpretational. Comparative is the weakest, and interpretational is the strongest one.

Comparative allows learners to make comparisons, and understand the similarities and differences between the information presented. Organizational refers to integrated image and text construct activity sequences and processes. Meaning is jointly distributed across text and image. Augmentation means images enable supplementary ideational elements to text or vice versa. Interpretational representations include causality and generative descriptions of a phenomenon. They provide opportunities for students to understand the knowledge deeply. Therefore, it helps students form well-designed mental/internal representations.

The researcher interviewed participants whether they recognize differences between monomodal and multimodal texts.

RESULTS

In beginning, the research investigated to what degree teachers of gifted students could identify differences between the monomodal text and intra-text cohesion. The cohesion was improved through ten attributes (Table 1).

Table 1. Text Cohesion Attributes

Attributes*	Low-Level Cohesion	High-Level Cohesion
Headings	Expository text	Research question
Body Text	Descriptive, informative	Narrative, explanatory
Examples	X	Examples with descriptions
Pronouns	Including pronouns	Replacing ambiguous pronouns with nouns
Connectives	X	Adding connectives to specify relationships between sentences
Highlighting	X	With italic, bold, and underlying
Academic vocabulary	Non-scaffolding	Scaffolding
Scientific Process	X	Including research question, hypothesis, and results
Conceptual Overlap	X	Replacing and inserting words
Syntax	Compact	Uncompact

**Attributes* are adapted to Kloser (2013, 2016), Meneses et al. (2018), & Ozuru et al. (2009).

Table 1 shows that all teachers of gifted styudents easily identified body text, highlighting, and academic vocabulary differences between texts. Half of them recognized connectives, while two of them perceived syntax, examples, and scientific process differences. Only one of them identified headings and pronouns differences. No one identified conceptual overlapping (Table 2).

Table 2. Teachers' Perceptions About Intra-Text Cohesion

Attributes	T1	T2	T3	T4	T5	T6
Headings						
Body Text	+	+	+		+	+
Examples	+					+
Pronouns				+		
Connectives		+	+	+		
Highlighting	+	+	+	+	+	+
Academic vocabulary	+	+	+		+	
Scientific Process	+					+
Conceptual Overlap						
Syntax			+			+

**Attributes* are adapted to Daly & Unsworth (2011), Keles (2016), Meneses et al. (2018), Tang et al. (2019), & Zhao et al. (2014)

The descriptions about the body text can be classified into six categories including definition, descriptive, informative, technical descriptions, and general knowledge about low-level cohesion in the text. They described high-level cohesion in the text as written in accordance with categories of causality, explanatory, formal, fluent, event sequencing, and progress. The excerpts from teachers' descriptions as follows:

> Teacher1: General concepts are defined (Text 1). Written based on the causality principle. A more fluent language is used (Text 2).
> T5: A description has been made and general information has been given (Text 1). Concept and event sequencing has been made. It is stated how the insulin hormone was discovered over time (Text 2).

Participants distinguished low-level and high-level texts into three categories in highlighting aspects, namely italics, bold, and underlying. The excerpts from teachers' descriptions as follows:

> T2: Colored. Important places are underlined. Italicized (Text 6). Other text does not include any form of highlighting.
> T3: Underlined, bold, and colored text were used to emphasize (Text 6).

Teachers identified differences between low-level and high-level texts in two categories related to academic vocabulary, namely familiar words and words used in daily lives. They indicated that high-level texts include familiar words that reflect students' daily lives and explanations with parentheses attached. The excerpts from teachers' descriptions as follows:

> T5: Unknown terms and concepts explained in parentheses with familiar words (Text 6).
>
> T6: Technical words have been transformed into an everyday language(Text 6).

The descriptions about connectives are divided into two patterns written step by step and conjunctions.

> T2: Writing paragraphs step by step and using thematic sentences to bind the paragraphs made it easier to read (Text 4).
>
> T4: Using connectives like 'but' and 'because' provide establishing causal relationships between sentences (Text 4).

There were only two participants that realized differences in syntax between Text 5 and 6. They stated one aspect, extended.

> T3: When I compare two texts, I realized that the same sentence was written in an enriched way (Text 6).
>
> T6: The same concepts are not written in a closed form, but in more detail (Text 6).

Two teachers identified scientific processes by emphasizing categories of justified claims, research question, hypothesis, data, and results.

> T1: Scientists have thought about what functions the pancreas does, and experiments have been carried out by claiming this, and as a result, it has been concluded that it works in the control of glucose level. They are told in a process in the text (Text 2).
>
> T6: When I compare two texts, the second one includes research questions, and how to test them, and how they report results (Text 6).

T4 identified differences in pronouns. S/he stated that "The text does not include some nouns and this creates uncertainty. (Text 3)" None of the participants could detect the difference between the overlapping concepts and headings.

The research secondly investigated to what degree teachers of gifted students could identify differences between multimodal text regarding intermodal relations between image-text. Intermodal relations could be classified into two groups (concurrence-complementarity) in eight themes (decorational, exemplary, representational, expository, comparative, organizational, augmentational, interpretational) (Table 3).

Table 3. Intermodal Relations

Groups	Themes
Concurrence	Decorational Exemplary Representational Expository
Complementarity	Comparative Organizational Augmentational Interpretational

When the descriptions of the participants were analyzed, the results showed that they were capable of identifying decorational, exemplary, and representational relations in concurrence. Half of them also described easily comparative and organizational relations in complementarity (Table 4).

Table 4. Teachers' Perceptions About Intermodal Relations

Themes	T1	T2	T3	T4	T5	T6
Decorational	+	+		+	+	+
Exemplary	+	+	+		+	+
Representational	+			+	+	+
Expositional	+					+
Comparative		+	+			
Augmentational						
Organizational		+			+	
Interpretational	+					

The teachers described decorational relations in the categories of irrelevant, off topic, and no relationship. They stated that:

> T1: An unrelated but noticeable image has been added to pay attention. There is no meaningful relation between image-text (Multimodal Text 1-MT1).
>
> T6: There is only information about the subject told in text, the text and images do not refer to each other (MT1).

The participants generally described exemplary relations in the category of partial attribution:

> T2: The text mentions thyroxine hormone, thyroid gland, and minerals, and the visual shows only the location of the thyroid gland (MT2).
>
> T5: In the text, it was mentioned that the hormone secreted by the thyroid gland and iodine is required for hormone secretion. The picture only shows the location and shape of the thyroid gland (MT2).

The teachers identified representational relations in the category of reflection:

> T5: The location and shape of the pancreas are specified. The place and the shape are shown in the picture, the text and the picture reflect on each other as if there is a repetition of meaning (MT3).
>
> T6: The location of the pancreas in the body is stated in the text, and the image expresses the same (MT3).

The participants pointed out that image supports text in order to construct rich mental representations in mind when describing expositional relations. They described the relationship in the category of supportive:

> T1: The decrease in the activities of the digestive system is shown as a sleeping stomach, making it easier to visualize this situation in the mind (MT4).
>
> T6: Caricaturizing events with emojis, and using signs (arrows) to show the decrease in the activities of the digestive system made it easier to understand (MT4).

The teachers (two of them) identified comparative relations between image text as a comparison:

> T2: This text has been made meaningful by providing a visual and textual comparison of healthy type 1 and type 2 diabetes, and shows in which situations diabetes occurs. It provides us the opportunity to compare three situations (MT5).
>
> T3: We can easily compare the differences in healthy, type1, and type 2 diabetes by visual and texts (MT5).

The participants (two of them) described organizational relations in the categories of cycle and process.

> T2: By utilizing visuals, texts, and symbols, the relationship between the hormones and organs involved in the regulation of blood sugar was established and the process was explained (MT6).
>
> T5: Hormone secretion was expressed in a process by indicating the stages sequentially with arrows (MT7).

There was only one teacher that recognized interpretational relations, and s/he stated that this type of multimodal text includes causality.

> T1: The relationship of the two hormones working opposite was expressed by the balance in the seesaw and how this balance would be established in the case of hunger and satiety. The reader of this text was asked to establish this causality (MT8).

DISCUSSION

Relating to the first question of the research, the research shows that teachers of gifted students identified attributes of intra-text cohesion regarding body text, highlighting, connectives, and academic vocabulary differences. The first three can be called the introductory level of intra-text relations. The scaffolding academic vocabulary can be put into the category of moderate-level intra-text relations. The results show that most of them were not capable of identifying high-level intra-text relations like compact-uncompact syntax, conceptual overlapping, and scientific process including research questions, hypothesis, data, and findings.

The findings also reveal that most of the teachers of gidfted students identified primitive forms of intermodal relations between image-text such as decorational, exemplary, and representational. Most of them did not have awareness about the advanced form of intermodal relations like comparative, organizational, interpretational, and augmentational relations.

The findings of research questions are discussed below respectively.

The Relationship Between Teacher and Gifted Students

Since gifted students are demonstrated with a high level of competence in cognitive and language abilities, learning, performing higher-order thinking, and enjoy challenging activities, teachers of gifted students should select, improve, and design differentiated teaching methods and materials to improve students' creativity, and increase their motivation and interest. However, results show that they did not have capable of identifying and determining aspects of more challenging monomodal and multimodal texts. They did not aware of what purposes, such as discussion, interaction, paying attention, making inferences, establishing causal relationships, presenting scientific process, etc., each one serves in the classroom environment. In this situation, it seems difficult for teachers to meet the needs of gifted students.

Text Cohesiveness

Science writing in textbooks is expository and passive. They include an extensive amount of new vocabulary, nominalizations, and lack of intra-text relations, historical accounts, and justified claims (Uccelli et al., 2015a; Uccelli et al., 2015b). Therefore, this writing style asks students to memorize and places a high cognitive burden on students to construct meaningful mental representations (Kloser, 2013). Hence, the teachers should be aware of how to navigate students to analyze texts semantically by decoding words, sentences, and paragraphs. To do this, firstly, teachers can identify these promoting impacts, but the results show that their awareness level is at the introductory level.

A low level of awareness arouses some disadvantages in the process of teaching. Since narrative-argumentative writing in the category of body text makes students realize elements of the epistemology of science, helps them comprehend naive conceptions of science (Kloser, 2016), on the contrary, expository writing results in memorizing. In the context of gifted education, students should encounter argumentative text. Exposing students to these types of texts enables them to encounter authentic questions, methods to solve these questions, and quantitative-qualitative data, thus lack of scientific process do not meet the need of gifted students' cognitive level, decrease their attention, interest, trust towards the text. Attending to the scientific process, transforming academic vocabulary into daily language, and uncompacting syntax encourages students to generate coherent mental representations (Van den Broek, 2010). When students compare low and high cohesion text related to reliability and interest, they indicated that the former is less reliable and interesting than the latter because of conceptual overlapping, scientific process, and connectives (Sandevol & Çam, 2011; Nicolaidou et al., 2011). With increased interest and trust, students explore text more actively to comprehend.

Intermodal Relations

The results show that teachers have awareness about the categories of concurrence relations, but they experience difficulties in identifying the categories of complementarity relations. The reason for this situation is that there is a repetition of meaning in concurrence. However, interpretational relations in complementarity demand the reader to realize a high level of cognitive level like making causal relationships between image and text, so the former is easier than the latter to identify (Meneses et al., 2018). Eliam et al. (2014) pointed out that teachers have some feelings about representations, but they are not capable of identifying in which purposes representations are being used, and what attributes they have. Patron et al. (2017) also indicated that teachers do not choose representations intentionally. Choices are generally arbitrary because they have not an awareness of aspects of the multimodal text. Teachers do not consider how to connect several representations, they do not focus on affordances of representations (Scheid et al., 2018).

Intra-text and intermodal relations are important for science teachers, especially for gifted science teachers, because gifted students have a high cognitive level in different areas with their curiosity, and so they demand an advanced form of multimodal text. These texts attract their attention and navigate them to establish causal relationships, justify claims, question, and attend the scientific process. How ideas are organized based on attributes of text and intermodal relations, especially promoting gifted students' reading comprehension (Sánchez et al., 2016). An advanced form of multimodal text helps gifted students move away from novice understanding of scientific concepts towards an expert understanding of the subject depicted in the representations (Mishra, Clase, Bucklin, & Daniel, 2018).

CONCLUSION

The study has revealed that while teachers have awareness of the low level of intratext and intermodal relations, they are not capable of identifying a high level of these relations. Teachers of gifted students are aware of the needs and capabilities of gifted students, but they are not capable of putting this awareness into practice. This conclusion should be considered unsurprising because the subject of designing coherent multimodal representations do not part of the science teacher education program in higher education. The problem is stemmed from the reason that since teachers do not encounter these types of enriched texts, they do not construct schemas in their minds for this type of text.

The research explicitly shows that teachers tend to identify and determine the purpose and attributes of low-level monomodal and multimodal representations. They did not identify and determine the aim and aspects of the high level of monomodal and multimodal texts. They did not have awareness of how multimodal texts improve discussion, interactivity, creativity, and curiosity in the classroom environment. Currently, this research clearly showed that teachers of gifted students should be taught about the aspects of multimodal representations to meet the pedagogical needs of gifted students.

For its implication, further research should be carried out as educational design research in different contexts in order to improve teachers' professional development in designing multimodal representations in gifted education programs. They should consider disciplinary content knowledge, intratext-intermodal relations, and affordances of each mode. Secondly, teachers should reason about their use of multimodal representations in which representation can be used for paying attention that can be used for a causal relationship, and be used for pointing similarities and differences about a concept taught, etc. Teachers should attend in-service education programs, which provide teachers opportunities of practicing the use of multimodal representations with colleagues.

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Appendix A

Monomodal Texts

Text 1

Pancreas

The pancreas is a triangular organ located between the stomach and the first part of the small intestine. The pancreas plays many roles in the body. For example, the pancreas produces enzymes that break down into the small intestine and help break down starches, proteins, and fats. Enzymes are proteins that help biochemical reactions occur more easily and often much faster. The pancreas also secretes hormones. Hormones are small molecules that travel through the bloodstream and affect other parts of the body. Hormones have an effect on certain cells that recognize them and affect the way organs work. This hormone produced by the pancreas is called insulin. Insulin is produced in special pancreatic cells called Langerhans. Insulin is then introduced into the bloodstream and travels to the liver and muscle cells. Insulin helps these cells take up sugar and store it so it can be used for energy.

Diabetes and Insulin Use in the Body

Diabetes is a condition that affects millions of people. People with diabetes either have a pancreas that does not produce enough insulin or their body cells cannot use insulin properly. As a result, a person with diabetes has a high blood sugar level and even sugar is found in their urine. In fact, hundreds of years ago, people with diabetes were identified by their sweet-smelling urine.

People with diabetes often have diets that limit the amount of sugar they eat. Their body doesn't break down sugar. Unused sugar is excreted in the urine and cannot be used for energy. If left untreated, people with diabetes experience weight changes and feel weak and hungry. In addition, diabetics may urinate frequently and become thirsty as the kidneys try to excrete excess sugar in the body. The long-term effects of diabetes are serious. It can cause blindness, kidney failure, and heart disease.

There are two main types of diabetes. Type I diabetes usually begins in childhood or early adulthood. In type I diabetes, the pancreas produces little or no insulin. People with this condition must sometimes use a needle to inject insulin into their body to stay healthy. Type II diabetes usually develops during adulthood. In this situation, the pancreas does not produce enough insulin or the body cells do not respond normally to existing insulin. People with type II diabetes can control their symptoms through adequate nutrition, weight control, and exercise.

Text 2

How does the pancreas control blood sugar?

People have known diabetes for hundreds of years. A long time ago, diabetics were identified by their sweet-smelling urine caused by excess unused sugar in their bodies. This disease has affected millions of people whose cells are unable to get sugar from the blood and use it for energy. Diabetes can cause weight changes, fatigue, and constant hunger. Over time, diabetes can cause blindness, kidney failure, and heart disease.

In 1889, two scientists named Joseph von Mering and Oskar Minkowski believed that the pancreas, an organ close to the stomach and intestines, could help the body use sugar for energy. In their animal experiments, they detected high levels of sugar in the blood of an animal without a pancreas and a low amount of sugar in the blood of those with a pancreas.

After scientists learned that the pancreas helps the body use sugar molecules for energy, they wanted to know how this happened. Frederich Banting and Charles Best believed that the pancreas secretes a hormone, a small molecule that affects the function of other cells, into the blood to help cells take up and use sugar.

Banting and Best conducted an experiment to test their hypothesis. First, scientists removed the pancreas from a few dogs. As expected, the blood sugar levels of these dogs were much higher than normal 9%. Then, they took the fluid from the pancreas. This fluid contained small molecules believed to help cells take up blood sugar. Scientists injected this liquid into the veins of dogs with diabetes. They re-measured the dogs' blood sugar levels to see if the molecules in the liquid were affecting their blood sugar level, and they observed that their blood sugar was at a normal level.

Scientists have found that molecules injected from the pancreas help dogs control their blood sugar levels. This supported Banting and Best's hypothesis that the pancreas secretes hormones that help other cells get sugar from the blood that can be used for energy. Five years later, the hormone was isolated and called insulin. Insulin is now produced artificially, some diabetics inject themselves with insulin to control their blood sugar levels.

Text 3

The circulatory system is responsible for the distribution of heat in the body. This applies to both 'warm' and 'cold blooded' animals. The term warm-blooded is the name given to those who can keep their body temperature higher than those in their environment. Birds and mammals can be given as examples.

This is not always the case; some allow temperatures close to ambient temperature, such as those who hibernate. Some of these, for example mammals in the tropical savanna, keep their body temperatures below the scorching temperatures of the surrounding area to survive.

There are two characteristics that distinguish birds and mammals from the rest of the animal kingdom. First, they keep their body temperature within narrow limits regardless of the ambient temperature. For this reason, they are often described as homeothermic. Second, they are endothermic; The heat they retain body heat is produced in the body.

Text 4

The circulatory system distributes heat through the blood vessels in an animal's body. This system is responsible for heat transport for both warm-blooded and cold-blooded animals.

Examples of warm-blooded animals include birds and mammals, cold-blooded animals, reptiles, amphibians and fish. The term warm-blooded is a name given to birds and breasts because they can keep their body temperature higher than their surroundings and are generally able to do this.

This is not always the case because some warm-blooded animals - such as hibernating ones - allow their body temperature to be close to the temperature of the air around them when they hibernate.

Mammals living in the heat of the tropical savannah are another example of warm-blooded animals that do not always keep their body temperature higher than the surrounding temperature. These animals often have to keep their body temperature below the scorching heat of their environment.

However, there are two characteristics that distinguish warm-blooded animals from most of the rest of the animal kingdom:

1. Warm-blooded animals are homeothermic. In other words, unlike other animals, birds and mammals keep their body temperature within narrow limits regardless of the surrounding temperature.
2. Two warm-blooded animals are endothermic. Endothermic animals are different from cold-blooded animals whose body temperature is protected by heat from external sources. Therefore, although some cold-blooded animals, such as lizards that sunbathe in the sun, develop body temperatures as high as those of birds, these creatures retain their body temperature from the outside. Such animals are called ectothermic.

Text 5

Events During the Carbon Cycle Process

1. Emission: Carbon emission is the emission of carbon dioxide gas released as a result of the reaction of carbon-containing fuels with oxygen to the atmosphere.

2.Photosynthesis: The process of green plants capturing light energy and converting it into chemical energy is called photosynthesis.

3. Respiration: Living things need energy to maintain their metabolic activities. This energy is obtained by the chemical reaction of glucose with oxygen in the cells, resulting in carbon dioxide being released as water and energy. This event is called breathing.

4. Decomposition: The process of transforming dead organic structures into inorganic structures by decomposers is called decomposition.

5. Fossilization: The folding and mineralization of hard parts of living things with sediments as a result of decay that occurs after death is called fossilization.

Text 6

Events During the Carbon Cycle Process

1. Emission: Carbon emission (*release*) is the emission of carbon dioxide gas released as a result of the reaction (*burning*) of carbon-containing fuels (*fossil fuels: oil, natural gas, coal, etc.*) with oxygen to the atmosphere.

2.Photosynthesis: The roots of green plants take water and minerals from the soil, carbon dioxide from the atmosphere with their stems and leaves, and light energy from the sun. The process of producing food (*glucose-sugar*) and oxygen with this energy is called photosynthesis.

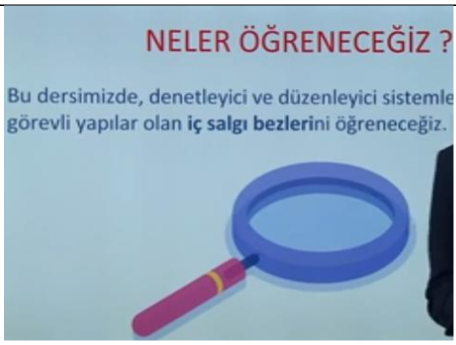
3. Respiration: Living things need energy to maintain their metabolic (*vital*) activities. For example, digestion and urinary system. This energy is obtained by the chemical reaction (*burning*) of glucose (*sugar*) with oxygen (O_2) in the cells, resulting in carbon dioxide (CO_2), water (H_2O) and energy (ATP). This event is called as respiration.

4. Decomposition: The process of transforming dead organic structures (*consisting of C, H and O*) into inorganic structures (*minerals and vitamins*) by decomposers (bacteria and fungi) is called decomposition.

5.Fosilization: The mineralization (*the combination of minerals in the shell's structure and surrounding minerals such as calcium and iron*) by covering the hard parts (*skeleton*) of the creature with sediments (*sand and sea*) after death is called fossilization.

Appendix B
Multimodal Texts

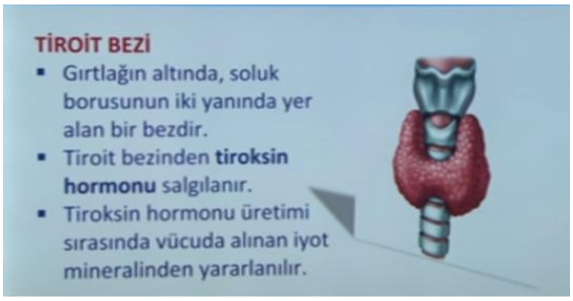
Decorational Relation



What will we learn?

We will learn about the endocrine glands.

Exemplary Relation



Thyroid Gland

-It is a gland under the larynx on both sides of the windpipe.

-Thyroxine is secreted from the thyroid gland.

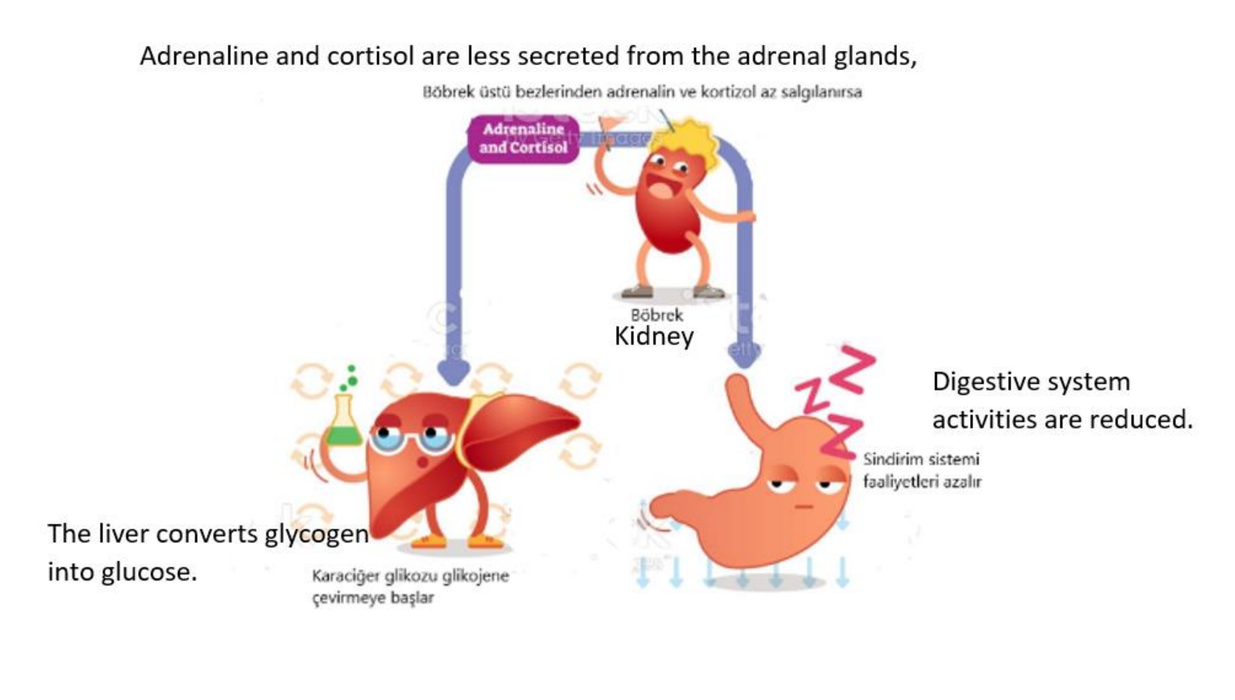
-During the production of thyroxine hormone, the iodine mineral taken into the body is used.

Representational Relation

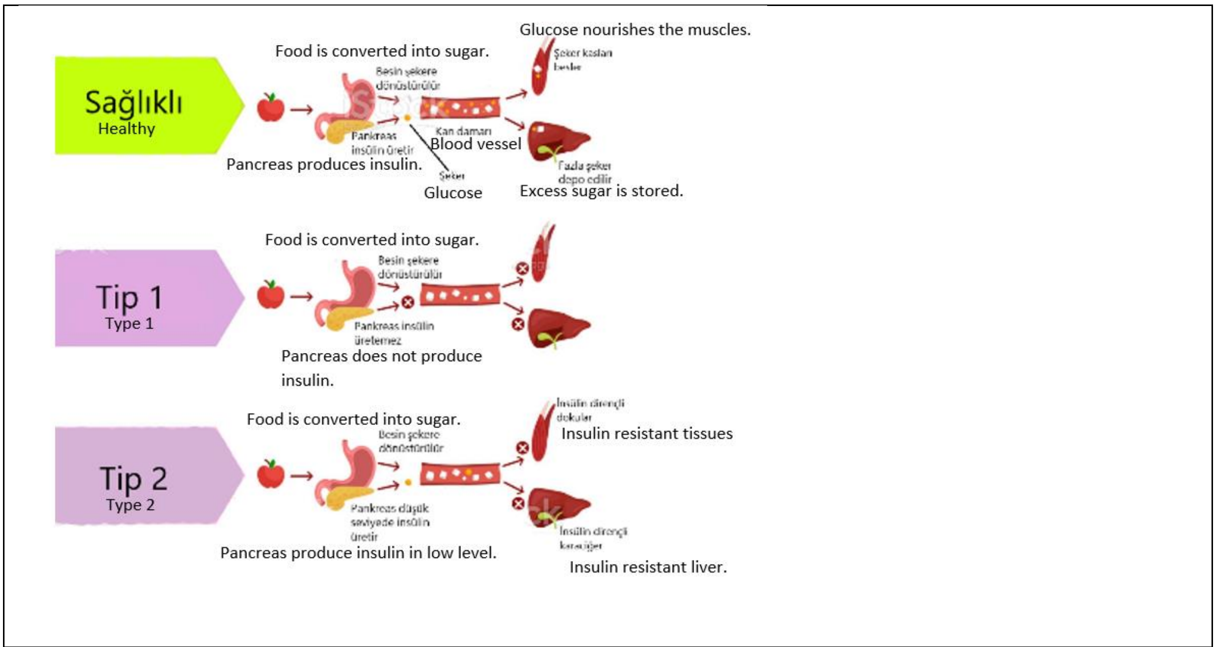
Pancreas

is an organ located in the lower and back of the liver.

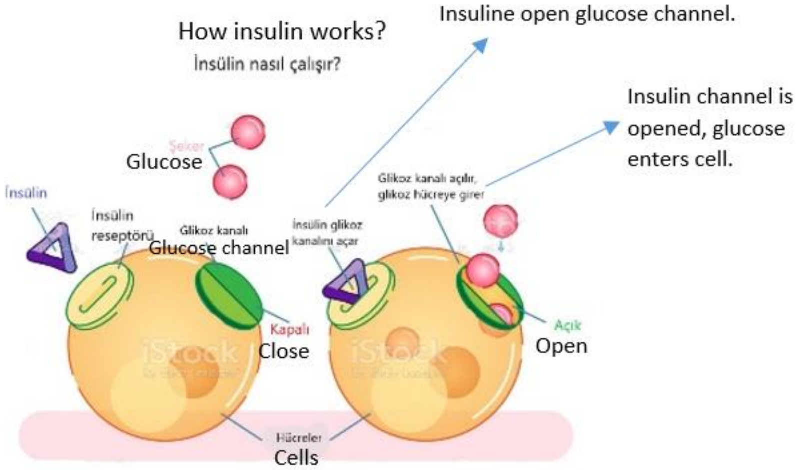
Expositional Relation



Comparative Relation



Augmentational Relation



Organizational Relation

Grounding

If the neutral P object is brought closer to the negatively charged R object, the side of P near R becomes positive and the far side negative.

If the negatively charged part of the P object is connected to the ground with a conductive wire, the negative charges are transferred to the ground.

Interpretational Relation