The Given-New Principle

- Our knowledge and information about the world accumulates over time
Parts of speech

Task 1. Underline the words representing each of the following grammatical classes.

Noun → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

Verb → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

Adjective → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

Adverb → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

Preposition → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

KEY

Noun → The Aalto-1 nanosatellite was gradually built in a student project in broad cooperation with other Finnish universities and institutes.

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Which of these units of information is the most important?

**Noun** (*substantiivi*)

- **Countable** → *Tables* usually have four *legs*.
- **Non-countable** → *Water* can be murky.
- **Pronoun** → *We* have a great plan.

**Noun Phrase** (*noun-plus-modifier combination*)

- A high *correlation* was observed between data points.
- The growing *demand* for asphalt is surprising.
- The EU has established strict *limitations* on the size of plates that can be handled.

What is the optimal order for NPs?

How to make your text *reader-friendly*?

Three key principles:

1. Put *Given* before *New* Information
2. Put "**Topical**" Information in *Subject* Position
3. Put "**Light**" Before "**Heavy**" NPs
Information in a sentence

Begin sentences with information that is **familiar (given)** to your reader.

Place any **new information** about the topic at the end of a sentence.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Verb</th>
<th>Object / Adverb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>is located</td>
<td>in the northern Europe but is not a part of Scandinavia.</td>
</tr>
<tr>
<td>Finland</td>
<td>is classified as</td>
<td>a Nordic country.</td>
</tr>
<tr>
<td>A water molecule</td>
<td>consists of</td>
<td>two hydrogen and one oxygen atoms.</td>
</tr>
<tr>
<td>The speed of light (c)</td>
<td>equals to</td>
<td>299 792 458 metres per second in a vacuum.</td>
</tr>
</tbody>
</table>

Task 2. Circle the main verb and underline the subject in the following text.

1 An antenna is an electrical device which converts electric power into radio waves, and vice versa.  
2 It is usually used with a radio transmitter or radio receiver.  
3 In transmission, a radio transmitter supplies an electric current oscillating at radio frequency (i.e., a high frequency alternating current (AC)) to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves (radio waves).  
4 In reception, an antenna intercepts some of the power of an electromagnetic wave in order to produce a tiny voltage at its terminals, which is applied to a receiver to be amplified.

Adapted from https://en.wikipedia.org/wiki/Antenna_(radio)
Task 2. Circle the main verb and underline the subject in the following text.

1. An antenna is an electrical device which converts electric power into radio waves, and vice versa. 2. It is usually used with a radio transmitter or radio receiver. 3. In transmission, a radio transmitter supplies an electric current oscillating at radio frequency (i.e., a high frequency alternating current (AC)) to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves (radio waves). 4. In reception, an antenna intercepts some of the power of an electromagnetic wave in order to produce a tiny voltage at its terminals, which is applied to a receiver to be amplified.

The new information is at end of each sentence (after the verb.)

Adapted from https://en.wikipedia.org/wiki/Antenna_(radio)

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Readability principles

**What is GIVEN Info?**

- **Concepts or objects that have already been discussed or are presumed to be understood from the context.**

**What is NEW Info?**

- **Concepts or objects that have not already been discussed or presumed to be known from the context.**
Topical progression

Three patterns for linking *Given* information

1. Constant Topic
2. Step-wise Topic
3. Hypertopic

1. Constant topic

**FAMILIAR**  →  **NEW**

1. **Constant topic** *(Every sentence begins with a familiar main topic)*

- Omnidirectional antennas receive ...
- Omnidirectional antennas are employed ...
- They are also used at ...

- Omnidirectional antennas receive or radiate more or less in all directions. Omnidirectional antennas are employed when the relative position of the other station is unknown or arbitrary. They are also used at lower frequencies where a directional antenna would be too large, or simply to cut costs in applications which do not require a directional antenna.
2. Step-wise topic

FAMILIAR ➔ NEW

2. Step-wise topic (*New info is presented at the end of sentence and is considered as familiar in the next*)

the gain of the antenna. This gain can be accomplished ...

leading to numerous antenna designs. antenna designs are fed ...

with additional components ... Such components include ...

Antennas that are more complex than the dipole or vertical designs are usually intended to increase the directivity and consequently the gain of the antenna. This gain can be accomplished in many different ways leading to numerous antenna designs. A vast majority of antenna designs are fed with a balanced line (unlike a monopole antenna) and are based on the dipole antenna with additional components (or elements) which increase its directionality. Such components include ...

3. Hypertopic

FAMILIAR ➔ NEW

3. Hypertopic (*A topic sentence introduces a set of subtopics*)

Aperture antennas can be divided into four main categories.

- Parabolic antennas are the most
- Horn antennas are simple
- Slot antennas include
- Dielectric resonator antennas consist of

Aperture antennas are the main type of directional antennas used at microwave frequencies and above. Aperture antennas can be divided into four main categories. Parabolic antennas are the most widely used high-gain antenna type in radar antennas, satellite communication, and radio telescopes. Horn antennas are simple antennas with moderate gains of 15 to 25 dBi commonly used for applications such as radar guns, radiometers, and as feed antennas for parabolic dishes. Slot antennas include a waveguide with one or more slots cut in it to emit the microwaves. They are used as UHF broadcast antennas and marine radar antennas. Dielectric resonator antennas consist of small ball or puck-shaped piece of dielectric material excited by aperture in waveguide. They are used at millimeter wave frequencies.

Examples adapted from “Antenna (radio)”. Wikipedia: https://en.wikipedia.org/wiki/Antenna (radio)
Example text


Chang et al (2012). *Light emitting diodes reliability review*. **TEXT PART 1**
(1) Does the author maintain given-new principle?
(2) If yes, which patterns of topical progression are used?
Tip: Underline subjects and circle the main verbs.

1. Introduction

Light emitting diodes (LEDs) are a solid-state lighting source increasingly being used in display backlighting, communications, medical services, signage, and general illumination [1–6]. LEDs offer design flexibility, from zero-dimensional lighting (dot-scale lighting) to three-dimensional lighting (color dimming using combinations of colors), with one-dimensional lighting (line-scale lighting) and two-dimensional lighting (local dimming, i.e., area-scale lighting) in between. LEDs have small exterior outline dimensions, often less than 10 mm × 10 mm. LEDs, when designed properly, offer high energy efficiency that results in lower power consumption (energy savings) with low voltage (generally less than 4 volts) and low current operation (usually less than 700 mA). LEDs can have longer life—up to 50,000 h—with better thermal management than conventional lighting sources (e.g., fluorescent lamps and incandescent lamps). LEDs provide high performance, such as ultra-high-speed response time (micro-second-level on-off switching), a wider range of controllable color temperatures (4500 K–12,000 K), a wider operating temperature range (−20 °C to 85 °C), and no low-temperature startup problems.

Text 1
What is the reason for the following commas?

• To signal parenthetical (non-essential) information within a sentence, such as additional information, examples and re-naming something

• Parenthesis (and dashes -) are used for a similar purpose

Light emitting diodes (LEDs) are a solid-state lighting source increasingly being used in display backlighting, communications, medical services, signage, and general illumination [1–6]. LEDs offer design flexibility, from zero-dimensional lighting (dot-scale lighting) to three-dimensional lighting (color dimming using combinations of colors), with one-dimensional lighting (line-scale lighting) and two-dimensional lighting (local dimming, i.e., area-scale lighting) in between. LEDs have small exterior dimensions, often less than 10 mm × 10 mm. LEDs, when designed properly, offer high energy efficiency that results in lower power consumption (energy savings) with low voltage (generally less than 4 volts) and low current operation (usually less than 700 mA). LEDs can have longer life—up to 50,000 h—with better thermal management than conventional lighting sources (e.g., fluorescent lamps and incandescent lamps). LEDs provide high performance, such as ultra-high-speed response time (micro-second-level on-off switching), a wider range of controllable color temperatures (4500 K–12,000 K), a wider operating temperature range (−20 °C to 85 °C), and no low-temperature startup problems.
Information on commas

Academic Writing in English (AWE) website


TEXT PART 2
(1) Does the author maintain given-new principle?
(2) If yes, which patterns of topical progression are used?
Tip: Underline subjects and circle the main verbs.

LED application areas include LCD backlights, displays, transportation equipment lighting, and general lighting (see Table 1). LEDs are used as a light source for LCD backlights in products such as mobile phones, cameras, portable media players, notebooks, monitors, and TVs. Display applications include LED electronic scoreboards, outdoor billboards, and signage lighting, such as LED strips and lighting bars. Examples of transportation equipment lighting areas are passenger vehicle and train lighting (e.g., meter backlights, tail and brake lights) [9], and ship and airplane lighting (e.g., flight error lighting and searchlights). General lighting applications are divided into indoor lighting (e.g., LED lighting bulbs, desk lighting, and surface lighting) [10,11], outdoor lighting (e.g., decorative lighting, street/bridge lighting, and stadium lighting), and special lighting (e.g., elevator lighting and appliance lighting) [12,13]. The use of LEDs in general lighting has increased, beginning with street lighting in public areas and moving onto commercial/business lighting and consumer applications.

Better: LCD backlights use LEDs as a light source

Hyper-topic sentence with four subtopics
(1) Does the author maintain given-new principle?
(2) If yes, which patterns of topical progression are used?
Tip: Underline subjects and circle the main verbs.

Yes

Hypertopic pattern:
LED application areas

Better: LCD backlights use LEDs as a light source

LED application areas include (1) LCD backlights, (2) displays, (3) transportation equipment lighting, and (4) general lighting (see Table 1).

1) LEDs are used as a light source for LCD backlights …
   Better: LCD backlights use LEDs as a light source …

2) Display applications …

3) Examples of transportation equipment lighting areas …

4) General lighting applications …

Text 2

**TEXT PART 3**

(1) Does the author maintain given-new principle?
(2) If yes, which patterns of topical progression are used?
Tip: Underline subjects and circle the main verbs.

The color temperature of a white light is defined as the temperature of an ideal Planckian black-body radiator that radiates light of comparable hue to that white light source. The color temperature of light is equal to the surface temperature of an ideal black-body radiator in Kelvin heated by thermal radiation. When the black body radiator is heated to high temperatures, the heated black body emits colors starting at red and progressing through orange, yellow, white, and finally to bluish white. The Planckian locus starts out in the red, then moves through the orange and yellow, and finally enters the white region. The color temperature of a light source is regarded as the temperature of a Planckian black-body radiator that has the same chromaticity coordinates. As the temperature of the black body increases, the chromaticity location moves from the red wavelength range toward the center of the diagram in Fig. 2.
(1) Does the author maintain given-new principle?
(2) If yes, which patterns of topical progression are used?
Tip: Underline subjects and circle the main verbs.

[The color temperature of a white light] is defined as the temperature of an ideal Planckian black-body radiator that radiates light of comparable hue to that white light source. [The color temperature of light] is equal to the surface temperature of an ideal black-body radiator in Kelvin heated by thermal radiation. When the black body radiator is heated to high temperatures, the heated black body emits colors starting at red and progressing through orange, yellow, white, and finally to bluish white. The Planckian locus starts out in the red, then moves through the orange and yellow, and finally enters the white region. The color temperature of a light source is regarded as the temperature of a Planckian black-body radiator that has the same chromaticity coordinates. As the temperature of the black body increases, the chromaticity location moves from the red wavelength range toward the center of the diagram in Fig. 2.
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Text 3

What is the reason for using the following commas?

Use commas to separate an introductory phrases and subordinate clauses from the subject.

The color temperature of a white light is defined as the temperature of an ideal Planckian black-body radiator that radiates light of comparable hue to that white light source. The color temperature of light is equal to the surface temperature of an ideal black-body radiator in Kelvin heated by thermal radiation. When the black body radiator is heated to high temperatures, the heated black body emits colors starting at red and progressing through orange, yellow, white, and finally to bluish white. The Planckian locus starts out in the red, then moves through the orange and yellow, and finally enters the white region. The color temperature of a light source is regarded as the temperature of a Planckian black-body radiator that has the same chromaticity coordinates. As the temperature of the black body increases, the chromaticity location moves from the red wavelength range toward the center of the diagram in Fig. 2.
Subordinate clauses at the beginning of a sentence can be used to link back to previous information.

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• A 15-minute break?
  – Ends 10:49
Use of verbs

**Question:** In the text above (texts 1-3) by Chang et al. (2012), which voice (active vs passive) and verb tense (past vs present) are predominant?

**A:** active voice and present tense (text 1 & 3), Text 2 mix of active & passive and present perfect

<table>
<thead>
<tr>
<th><strong>Active (present tense)</strong></th>
<th><strong>Present perfect tense (often used to overview previous studies or trends)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LED application areas include...</td>
<td>The use of LEDs in general lighting has increased ...</td>
</tr>
<tr>
<td>The heated blackbody emits ...</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Passive (present)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LEDs are used...</td>
</tr>
<tr>
<td>General applications are divided into ...</td>
</tr>
</tbody>
</table>

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**Use of verbs**

**Past tense + active voice**
(often used to report a specific previous research/study)

- *Meneghini et al. [106] analyzed* the degradation of p-GaN contacts degraded under high-temperature storage at 250 C.
- An electrothermal degradation study on In-GaN LEDs by *Pavesi et al. [72] also showed* that LEDs electrically stressed at 100 mA without a heat sink.
- *Barton and Osinski [149] also suggested* that yellowing is related to a combination of ambient temperature and LED self-heating. *Their results indicated* that a temperature of around 150 C was sufficient to change the transparency of the epoxy, causing the attenuation of the light output of LEDs.

Names of authors can be used write reader-friendly sentences and maintain cohesion. However, this varies across journals and disciplines.
Cohesion and paragraphing

**Q:** Each of the three text examples begins with a special sentence. What is the name of this type of sentence?

1. Light emitting diodes (LEDs) are a solid-state lighting source increasingly being used in display backlighting, communications, medical services, signage, and general illumination [1–6].
2. LED application areas include LCD backlights, displays, transportation equipment lighting, and general lighting (see Table 1).
3. The color temperature of a white light is defined as the temperature of an ideal Planckian black-body radiator that radiates light of comparable hue to that white light source.
Cohesion and paragraphing

• Q: Each of the three text examples begins with a special sentence. What is the name of this type of sentence?

• A: a topic sentence

Topic sentence = general statement about the paragraph
Cohesion and paragraphing

1. **Light emitting diodes (LEDs)** are a solid-state lighting source increasingly being used in **display backlighting, communications, medical services, signage, and general illumination** [1–6].

2. **LED application areas** include **LCD backlights, displays, transportation equipment lighting**, and **general lighting** (see Table 1).

3. **The color temperature** of a white light is defined as the **temperature of an ideal Planckian black-body radiator** that radiates light of comparable hue to that **white light source**.

Types of topic sentences

1. **New topic (neutral)**

2. **Enumeration (neutral or claim)**

3. **Claim**
Types of topic sentences

1. New topic (neutral)

The Finnish higher education system consists of universities and polytechnics.

What kind of information could appear in the rest of the paragraph?

→ Definitions and descriptions.

See also: http://sana.aalto.fi/awe/cohesion/topsen/new/index.html

Types of topic sentences

1. New topic (neutral)

The Finnish higher education system consists of universities and polytechnics. The universities stress the connection between research and teaching. The basic purpose of the universities is to carry out scientific research and to provide teaching in related subjects. Students at universities may take a lower (Bachelor’s) or higher (Master’s) academic degree, as well as academic further education, consisting of licentiate and doctoral degrees. Universities also arrange further education and open university teaching. In contrast, polytechnics emphasize a connection with working life, and the degrees offered are higher education degrees with a professional emphasis. Located throughout Finland, universities and polytechnics aim to ensure that all prospective students have equal opportunities for study, regardless of where they live.
Types of topic sentences

2. Enumeration (neutral)

One method for predicting the lifetime of LEDs is the use of an accelerated test approach where the estimated lifetime in the accelerated life tests is multiplied by an acceleration factor. The process involves four steps:

- measuring the light output of samples at each test readout time;
- estimating LED life under the accelerated test conditions (using functional curve fitting of time-dependent degradation under the test conditions) or finding observed lifetime for L50 or L70, as shown in Fig. 4;
- calculating an acceleration factor; and
- predicting lifetime under the usage conditions by using the acceleration factor multiplied by the lifetime of the test condition, as shown in Eq. (1):

Adapted from Chang et al (2012). Light emitting diodes reliability review.

Note
- the parallel structure using – ing
- the proper use of semicolon ; in separating the complex list items
3. Claim

Finnish is an easy language to learn. It is written the way that it is pronounced. Finnish has no articles (i.e., a, an, the), nor does it distinguish between masculine and feminine forms, as do other European languages, such as Spanish, French and German. Thus, Finnish makes no distinction between she and he; one word hän serves for both sexes. Another feature that makes Finnish easy to learn is that words are formed from common "roots", thus learning the word kirja (book) quickly opens the way to learning other related words, including kirjasto (library), kirje (letter), and kirjoittaa (to write). Furthermore, Finnish has no separate preposition words (e.g., to, from, on, in). Instead, they are all simply added to the end of words.

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- The later sentences provide evidence to support the claim


TEXT PART 4
3. Failure modes and mechanisms in LEDs

In this paper, the failure mechanisms of LEDs are divided into three categories: the semiconductors, interconnects, and the package. Semiconductor-related failure mechanisms include defect and dislocation generation and movement, die cracking, dopant diffusion, and electromigration. Interconnect-related failure mechanisms are electrical overstress-induced bond wire fracture and wire ball bond fatigue, electrical contact metallurgical interdiffusion, and electrostatic discharge. Package-related failure mechanisms include carbonization of the encapsulant, delamination, encapsulant yellowing, lens cracking, phosphor thermal quenching, and solder joint fatigue. This section discusses the various failure mechanisms of LEDs.
In this paper, the LED’s failure mechanisms are divided into three categories: the semiconductors, interconnects, and the package.

Exemplary use of a number + superordinate noun + colon in listing.

Comma indicates the subject in the sentence (i.e., the failure mechanisms of LEDs).

The keyboard of a computer
The computer keyboard

Types of “familiar” or repeated information

1. Direct repetition
2. This/These + repeated noun/superordinate
3. Demonstrative pronoun (this/ these + Ø)
4. Repetition using pronouns (it/ they)
5. Synonyms
1. **Direct repetition**

   A. **Use generic forms [a(n), Ø+ plural, the + singular]**

   A **solar panel** is a packaged interconnected assembly of solar cells. The **solar panel** is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. **Solar panels** use light energy (photons) from the sun to generate electricity through the photovoltaic effect.

   A **dipole antenna** consists of two conductors extending in opposite directions, with a total length that is often a half of a wavelength long. **Dipoles** are typically oriented horizontally in which case they are weakly directional.

1. **Direct repetition**

   B. **The + Repeated noun with variation**

   An **electromagnetic wave refractor** in some aperture antennas is a component which selectively delays or advances portions of the electromagnetic wavefront passing through it. The **refractor** alters the spatial characteristics of the wave on one side relative to the other side.

   **Carbonization of the plastic encapsulation material** on the diode surface under electrical over ... **Carbonization of the encapsulant** ...
Types of “familiar” or repeated information

1. Direct repetition
   C. Use acronyms

   A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. The color of an LED is determined by the semiconductor material, not by the coloring of the plastic body.

2. This/These + repeated noun/superordinate

   By using a this/these or such (a) plus the exact term or a superordinate

   Reflection of the original signal also occurs when it hits an extended conductive surface, in a fashion similar to a mirror. This effect can also be used to increase signal through the use of a reflector, normally placed behind the active element and spaced so the reflected signal reaches the element in-phase.
3. **Demonstrative pronoun (**this/ these + Ø**)**

   Use ‘bald’ **this/these** to refer back to an entire idea or sentence.

   The radio signal's electrical component induces a voltage in the conductor. **This** causes an electrical current to begin flowing in the direction of the signal's instantaneous field.

4. **Repetition using pronouns (**it/ they**)**

   By substituting a recently topical noun with **it/ they**.

   **Yagi-Uda array** uses passive elements to greatly increase gain. **It** is built along a support boom that is pointed toward the signal.
5. Synonyms or collective nouns

Students often bring their smartphones, laptops or tablets with them to the classroom. In addition to taking notes, such devices can be used in a variety of ways to enrich classroom teaching.