Analyzing Word Formation Found in NASA News Article:
A Morphological Study

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Abstract

This research aims to analyze the types of word formation found in NASA news articles. In this study, the researcher conducted a comprehensive analysis of the types of word formation in NASA news articles, which are related to outer space, planets, and galaxies. This study uses a descriptive qualitative approach in collecting object data. The result of this study shows that there are 6 types of word formation found in NASA news articles. A total of 81 word formations were identified, consisting of 17 derivations, 46 inflections, 11 compounding, 2 acronyms, 4 borrowings, and 1 initialization. This study attempts to connect the fields of linguistics and space science. It examines the intricacies of language within the context of NASA news articles, providing valuable insights and knowledge for effective science communication. The study also explains the involvement of the field of linguistics, especially morphology, in the creation of space science-themed news articles.

***Keywords:** Linguistic Study, Morphological Analysis, Morphological process, NASA news article, Word formation*

INTRODUCTION

Communication is the formalized process of exchanging thoughts, ideas, and feelings with others, involving a designated sender and a structured channel through which the message is conveyed to the intended receiver. The human communication system can be divided into three parts, namely speech, writing, and signing. Speech communication involves the use of spoken language, considering semantics, phonology, and syntactic use (Kaharuddin, 2021). While sign and gesture communication systems involve using visual signals or movements to convey messages without spoken words, the last part is communication through writing, using writing and text as a medium for readers.

Language acts as a tool for communicating with others, Zsiga (2006) also states that language as a limited set of components and rules that enable speakers to build sentences to accomplish specific communication tasks.

Understanding language more deeply is a positive pursuit that enables us to comprehend the origin of sentences or words. According to Amori (2021), linguistics is a science that studies language, with microlinguistics emphasizing internal structure and macrolinguistics exploring language's connection to the external world and its applications in social life. Macrolinguistics is the branch of linguistics that investigates how language interacts with external factors (Vocroix, 2021) This field scrutinizes the influence of societal, cultural, historical, economic, and political elements on language dynamics. By exploring language from a global perspective, macro linguistics seeks to unravel the complex web of interactions that shape linguistic phenomena on a large scale. It

encompasses the study of language evolution, language policies, language acquisition in diverse cultural settings, and the societal implications of linguistic diversity. In essence, macro linguistics endeavors to provide a comprehensive understanding of how language is entwined with the multifaceted aspects of the world in which it is embedded. Examples of macro linguistics involve fields such as sociolinguistics, historical linguistics, logic, philosophy of language, and language evolution.

Furthermore, microlinguistics focuses on the examination and analysis of the internal structure and components of language, Parts of microlinguistics include phonetics, phonology, morphology, and syntax.

August Schleicher (1859) states that Morphology as a sub-discipline of linguistics. morphology investigates the connection between meaning and form, both within individual words and among words (Lardiere, 2006). It involves analyzing and understanding the smallest units of meaning, known as morphemes, and how they combine to create words. Morphology explores the rules and patterns governing the construction of words, including processes such as affixation (adding prefixes or suffixes), inflection (changing the grammatical form of a word), and derivation (creating new words from existing ones).

Construction Morphology is a useful tool for analyzing word formation processes in various languages and phenomena, focusing on morphological constructions and their systematic relationships with meaning (Booij, 2012). Fundamentally, morphology engages in the examination of morphemes, which are the smallest meaningful grammatical units within a language (Hovers, J. L., & Vynkovicz-Mytel, N, 2020). In morphology, morphemes are typically divided into two main types: free morphemes and bound morphemes.

A free morpheme is a standalone unit of meaning that can function as a word on its own. "Cat", "Book", and "quick" are the examples of free morphemes. on the other hand, a bound morpheme is a unit of meaning that cannot stand alone as a complete word and must be attached to a free morpheme. for example "Furious-" in "furiously," where "-ly" is a bound morpheme. Cao (2023) argues that Bound morphemes can be categorized into derivational morphemes and inflectional morphemes based on the distinct roles they play within words.

Derivational morphemes play a creative role by forming new words or altering the grammatical category and meaning of a base word. For instance, the addition of "-ness" to "happy" transforms it into "happiness," changing the adjective to a noun. On the other hand, inflectional morphemes serve a grammatical function, modifying existing words to convey aspects like tense, number, or gender without creating entirely new lexical items. For example, adding "-s" to "read" for "reads" indicates the third person singular form.

Morphology and word formation are closely interconnected fields in linguistics, sharing a symbiotic relationship that illuminates the intricacies of language structure and evolution. Morphology studies the internal structure of words, the smallest units of meaning, or morphemes, and their arrangement. However, word formation is actively involved in the creation of new words, using morphological processes such as affixation, compounding, and conversion. Morpheme analysis in morphology provides a basis for understanding how words are structured, while word formation applies these principles to generate new words.

According to Bauer (1983) word-formation is the creation of intricate linguistic forms. Word formation is the linguistic process through which new words are created or existing ones are modified within a language. This process involves various mechanisms,

including affixation (adding prefixes, suffixes, or infixes), compounding (combining existing words), conversion (changing the grammatical category of a word), and other lexical and structural changes. There are several types of word formation, each with its own set of rules and principles. Derivation is a morphological process in linguistics that involves creating new words by adding affixes (prefixes, suffixes, or infixes) to existing words, thereby altering their meaning or grammatical category. It is a common mechanism for expanding a language's vocabulary and expressing nuanced concepts. The resulting derived word often retains a connection to the original word's root or base, but the addition of affixes imparts additional meaning or modifies its grammatical function. for example "misunderstand" is formed by adding the prefix "mis-" to the base word "understand," altering the meaning to convey a lack of comprehension or a mistake in understanding.

Inflection, in linguistic terms, refers to the modification of a word's form to convey grammatical information such as tense, number, gender, case, mood, or person. Unlike derivation, which involves creating new words by adding affixes, inflectional changes do not alter the fundamental meaning or category of the word. Instead, inflections serve to indicate various grammatical features within a sentence or a phrase. Inflectional morphemes, such as verb endings for different tenses (e.g., -ed for past tense in English) or noun endings for plural forms (e.g., -s in English).

Compounds are constructed by combining multiple roots, although they can also be formed from derived words (Anderson et al., 2022). Compounding is a word-formation process in morphology where two or more words are combined to create a new word with a specific meaning. In compound words, the individual components retain their original meanings, and their combination results in a word that often represents a more specific concept. example for compounding is "Butter" + "fly."

Clipping is a linguistic process in which a word is shortened by removing one or more syllables. This typically results in a shortened form or abbreviation of the original word. Clipping is commonly used in informal language, and the clipped words often retain enough of their original structure for easy recognition and understanding. for example "phone" from "telephone" and "ad" from "advertisement."

Borrowing, in linguistic terms, refers to the process by which one language takes words from another language and incorporates them into its own vocabulary. Hacken & Panocová (2020) are of the opinion that borrowings and word formation interact to create new names, and existing rules can be used to counteract borrowings or integrate them into the language's lexical and grammatical system. This can occur for various reasons, such as cultural exchange, trade, technological influence, or other interactions between communities speaking different languages. for example: "pizza" from Italian, or "karaoke" from Japanese.

Aronoff & Fudeman (2011) give the explaination that acronyms are created by combining the initial letters of a sequence of words to generate a new term. added to this Bauer (1983) stated that an acronym is a term formed by selecting the initial letters of the words within a title or phrase and then combining them to create a distinct, new word. (e.g., NASA, UNESCO, UNICEF, and RADAR)

An initialism is formed by using the initial letters of a phrase or a set of words, and these letters are pronounced separately, not as a single word. In morphology, which is the study of the structure and formation of words, initialism represent a specific way in which words or phrases are abbreviated. for example "FBI", "CEO" and "USA."

Research on word formation is an important thing to do, as it can add expertise in knowing the process of word formation and acquisition. Examining word formation allows researchers to uncover cultural and historical influences on language. Words often reflect the values, technological advancements, and societal changes of a particular time and place. also Knowledge of word formation is beneficial for language educators and learners. Understanding word construction rules can aid in vocabulary building, language proficiency, and effective communication.

This research is related to previous studies that explore word formation. The first research is from Nur'aini, Triana & Fogli (2021) entitled "The Analysis of Word Formation in Movie "Wonder" and Its Application in Teaching vocabulary" in this study they found 148 word formations which were classified into 10 types of word formation, namely: 53 of compounding (36%), 5 of coinage (4%), 23 of borrowing (16%), 2 of blending (1%), 8 of clipping (5%), 3 of backformation (2%), 5 of conversion (4%), 2 of acronyms (1%), 45 of derivation (30%), and 2 of multiple processes (1%)

The second research is from Larasati & Pariyanto (2022). their research is entitled "An Analysis of Word Formation Processes on Cosmetic Product Descriptions in U.S Celebrities' Beauty Brands", the object of their research is cosmetics and beauty brands from U.S celebrities such as Fenty Beauty, Rare Beauty, Kylie Cosmetics, and Florence by Mills. in the study they found 125 word-formation processes including derivation (42), conversion (29), multiple processes (17), compounding (16), clipping (8), borrowing (7), acronym (3), coinage (2), and blending (1).

The third research is from Indrian (2022) entitled "A Morphological Analysis of Word Formation Process Used in Mobile Application Names" in this study researcher found 4 types of word formation, namely blending, compounding, derivation, and multiple processes.

The fourth research is from, Pratama, wijaka, & prastikawati (2021). their research is titled "Word Formation Analysis Found In English Slangs Used By Justin Bieber On Instagram." in the study they found (1) Clipping, (2) Blending, (3) Acronym, (4) Borrowing, (5) Derivation, (6) Coinage, and (7) Multi Processes.

The fifth research is from Fitria (2022) entitled "Analysis Of Word Formation Process In Online Shop's Terminologies." In the study, researcher found 4 types of word formation, namely derivation, compounding, acronym and clipping.

This research takes news examples from the Nasa news website, The term "NASA news" refers to the latest information, updates, and announcements from the National Aeronautics and Space Administration (NASA). This news encompasses a wide range of topics related to space exploration, scientific discoveries, missions, technological advancements, and other developments within NASA's scope of activities. NASA regularly releases news releases, press briefings, and updates to keep the public informed about its initiatives, achievements, and scientific findings in the field of space exploration and aeronautics.

The objective of this study is to analyze, increase knowledge, and investigate the word formation phenomenon found in NASA space science-themed news articles.

METHOD

This research used descriptive qualitative method, According to Tewksbury (2009) descriptive qualitative methods in research focus on understanding the meanings, traits,

and defining characteristics of events, people, interactions, settings/cultures, and experiences. The data for this study were extracted from NASA news articles, specifically focusing on themes related to outer space, planets, galaxies, and space missions. NASA, being a renowned source for space-related information, provides a rich corpus for investigating word formation morphology in a specialized domain. The significance of this study lies in revealing how specific morphological processes contribute to the communication of complex scientific concepts. By examining linguistic patterns in the context of space-related news, this research not only contributes to our understanding of word formation in specialized domains, but also provides insight into the language used to convey complex scientific information to the public.

In collecting data, the researcher used a systematic approach. Initially, the researcher searched for news on the NASA web page and selected an article based on personal judgment of appropriateness and quality. Subsequently, the researcher proceeded to examine word formation in each word of the chosen news article. Following this analysis, the researcher categorized the words into six parts of word formation, including derivation, inflection, compounding, initialism, borrowing, and acronym.

RESULTS AND DISCUSSION

Result

After Conducting Research On Nasa News Article, The Researcher Has Found Various Kinds Of Word Formations Contained In The Article. The Data Can Be Seen In The Table Below.

Table 1: Type of word formation process found in NASA News Article

NO	Type Of Word Formation Process	Total of Data
1	Derivation	17
2	Inflection	46
3	Compounding	11
4	Acronym	2
5	Borrowing	4
6	Initialism	1
Total		81

Discussion

The table above has presented a detailed breakdown of the various types of word formation found in the NASA news article. According to the classification by Becker, A. and Bieswanger, M. (2006), word formation can be divided into several distinct categories. These categories include derivation, which involves the addition of prefixes or suffixes to a base word to create a new word; inflection, which changes the form of a word to express different grammatical functions; compounding, which combines two or more words to form a new word; back formation, which creates a new word by removing a supposed affix from an existing word; blending, which merges parts of two words to create a new word; and clipping, which shortens a longer word to create a more concise form. Each of these

types of word formation plays a crucial role in the development and evolution of language, as evidenced by their presence in the article.

1. Derivation

Derivation refers to the process of forming new words by adding affixes, such as prefixes or suffixes, to a base or root word. This method is fundamental in expanding the vocabulary of a language, allowing for the creation of a wide array of words from a single root. In derivation, the meaning of the original word is modified or extended, often resulting in a word that belongs to a different grammatical category. For example, the adjective "happy" can be transformed into the noun "happiness" by adding the suffix "-ness." This process not only changes the word's grammatical function but also nuances its meaning. The root word "happy" denotes a state of joy or contentment, while "happiness" refers to the state or quality of being happy. Similarly, the prefix "un-" can be added to the adjective "happy" to form "unhappy," which negates the original meaning, signifying a state of not being happy. Through derivation, language becomes more versatile and capable of expressing complex ideas and nuances.

Table 2: Derivational Process

NO	Words	Type of word formation	Process of word formation
1	Furiously (adv)	Derivation	Furious + suffix (-ly)
2	Unexpected (adj)	Derivation	Expected + prefix(un-)
3	Immeasurable (adj)	Derivation	Measurable + prefix (im-)
4	quickly (adv)	Derivation	quick + sufix (-ly)
5	usually (adv)	Derivation	usual + sufix (-ly)

The table presented above illustrates the presence of five derivational word formations within the NASA news article. These include the words: "furiously," "unexpectedly," "immeasurably," "quickly," and "usually."
- In the first word, "furiously," the root word is "furious" (adj). The addition of the suffix -ly transforms the word class from an adjective (furious) to an adverb (furiously).

- The second word, "unexpected" (adj), originates from the root word "expected." The inclusion of the prefix un- imparts a meaning opposite to that of the root word, changing it to "unexpected.

- In the third word, "immeasurable," the root is "measurable," and the prefix im- is added, indicating the opposite of the root, resulting in the term "immeasurable."

- The fourth word, "quickly" (adv), has its roots in the adjective "quick." The addition of the suffix -ly transforms it into an adverb, changing from "quick" to "quickly."

• Finally, in the fifth word, "usually" (adv), the root word is "usual." The addition of the suffix -ly alters the word class from an adjective (usual) to an adverb (usually)

2. Inflection

Inflection is a fundamental aspect of grammar, encompassing the nuanced alterations in the form of words to convey various grammatical meanings within a sentence. This intricate process involves the modification of nouns, adjectives, verbs, and other parts of speech to signify distinctions in case, gender, mood, number, or voice. Through inflection, words undergo structural changes that serve to articulate specific grammatical categories, thereby enhancing the clarity and precision of communication within language. These modifications enable speakers and writers to articulate subtle nuances in meaning, adjust to contextual requirements, and accurately convey the relationships between elements in a sentence. Thus, inflection plays a pivotal role in shaping the grammatical structure of language, facilitating effective communication and expression of ideas.

Table 3 : Inflectional Process

NO	Words	Type of word formation	Process of word formation
1	discovered (verb)	Inflection	discover + suffix (-ed)
2	galaxies (n)	Inflection	galaxy + suffix (-s)
3	smaller (adj)	Inflection	small + suffix (-er)
4	dominating (v)	Inflection	dominate + suffix (-ing)
5	stars (n)	Inflection	star + suffix (-s)

In the table above, it is apparent that there are five words featuring word formation inflection. These words are: "discovered," "galaxies," "smaller," "dominating," and "stars."

• The first word, "discovered," stems from the root word "discover" (v1). The addition of the suffix -ed transforms the verb "discover"(v1) into the past tense form "discovered" (v2).

• In the second word, "galaxies," the root is "galaxy" (singular), and the suffix -s is appended, converting the singular form "galaxy" to the plural form "galaxies."

• The third word, "smaller," is derived from the adjective "small". The addition of the suffix -er signifies the comparative form of comparison, changing "small" to "smaller".

• For the fourth word, "dominating," the root is "dominate" (v1). The inclusion of the suffix -ing transforms the verb "dominate" (v1) into the progressive verb form "dominating."

• Finally, in the fifth word, "stars," the root is "star" (singular), and the suffix -s is added, altering the singular form "star" to the plural form "stars.

3. Compounding

Compounding is a fundamental process in language where two or more words or morphemes are combined to create a new word. This linguistic phenomenon serves as a vital tool for expanding vocabulary and expressing nuanced concepts. In compound words, there are typically at least two base words involved, which can be either free morphemes, capable of standing alone with meaning, or bound morphemes, units requiring attachment

to free morphemes to convey meaning. For instance, in "bookcase," both "book" and "case" are free morphemes, whereas in "unhappiness," "un-" and "-ness" are bound morphemes. The process of combining these base words can occur through adjacency, hyphenation, or solidification, resulting in compound words like "toothbrush," "mother-in-law," or "notebook." Moreover, compound words exhibit diverse semantic relationships between their components, including descriptive, attributive, and appositional connections. Through compounding, language users can creatively form new words to articulate complex ideas and enrich communication.

Table 4: Compounding Process

NO	Words	Type of word formation	Process of word formation
1	space telescopes (n)	Compounding	space (n) + telescopes (n)
2	light-year (n)	Compounding	light (n) + year (n)
3	spacecraft (n)	Compounding	space (n) + craft (n)
4	gas-rich (adj)	Compounding	gas (n) + rich (adj)
5	follow-up (adj)	Compounding	follow (v) + up (adv)

In the table above, it can be seen that there are five words that include word formation compounding in NASA news articles, namely space telescopes, light-year, spacecraft, gas-rich, and follow-up.

- The first term, "space telescopes," results from the compounding of "space" and "telescope."
- The second term, "light-year," is a compound of "light" and "year."
- The third term, "spacecraft," is formed by combining "space" and "craft."
- The fourth term, "gas-rich," is a compound of "gas" and "rich."
- The fifth term, "follow-up," is the result of compounding "follow" and "up."

4. Acronym

Acronyms are a type of abbreviation formed by taking the initial letters of a series of words and combining them to create a new term. unlike initialisms, which are pronounced as individual letters, acronyms are pronounced as words. For example, "NASA" stands for "national aeronautics and Space Administration," and "scuba" stands for "self-contained underwater breathing apparatus." acronyms are commonly used in various fields, including technology (e.g., "wifi" for "wireless fidelity"), government (e.g., "UNESCO" for "united nations educational, scientific, and cultural organization"), and everyday language (e.g., "radar" for "radio detection and ranging"). they serve as convenient shorthand, making communication more efficient and concise. additionally, acronyms often become so ingrained in language that people may forget their original full forms, further highlighting their impact on language and communication.

Table 5: Acronym Process

NO	Words	Process of word formation

| 1 | NASA | **N**ational **A**eronautics and **S**pace **A**dministration |
| 2 | ESA | **E**uropean **S**pace **A**gency |

In the table above, it is observed that there are two words formed through acronym word formation, namely NASA and ESA.
- NASA is an acronym representing the National Aeronautics and Space Administration.
- ESA is an acronym representing the European Space Agency.

5. Borrowing

Jafaar, Buragohain & Haroon (2019) state that borrowing is a linguistic phenomenon where one language incorporates new elements, such as words or expressions, from another language. This process contributes to language change by introducing foreign forms into the vocabulary of the borrowing language.

Table 6: Borrowing Process

NO	Words	Origin of the words
1	Laniakea	Hawaiian
2	Beast	Old French, Latin
3	Galaxy	Greek
4	Behemoth	Hebrew

In the table above, it is observable that NASA news articles contain 4 borrowing word formation
- "Laniakea", originating from the Hawaiian language (immeasurable heaven).
- Comes from Old French "beste" (animal, wild beast), derived from Latin "bestia".
- Comes from the Greek "galaxias" (milky).
- Comes from the Hebrew "bəhēmōth" (beasts).

6. Initialism

An initialism is a type of abbreviation formed by taking the initial letters of a phrase or a group of words, and when spoken, each letter is pronounced individually, rather than as a single cohesive word. Unlike acronyms, which are pronounced as words, initialisms are pronounced letter by letter. For example, "FBI" stands for "Federal Bureau of Investigation," and each letter is pronounced as "eff-bee-eye." Similarly, "USA" stands for "United States of America," with each letter pronounced individually as "you-ess-ay." Initialisms are commonly used in various contexts, such as in government (e.g., "CIA" for "Central Intelligence Agency"), technology (e.g., "HTML" for "HyperText Markup Language"), and business (e.g., "CEO" for "Chief Executive Officer"). They serve as efficient ways to abbreviate longer phrases or names, especially in written communication, where brevity is often preferred.

Table 7: Initialism Process

NO	Words	Process of word

		formation
1	STScI	The Space Telescope Science Institute

In the table above, one word is included in the initialism word formation, namely 'STScI,' which stands for The Space Telescope Science Institute.

CONCLUSION

This study analyzes the word formation process found in NASA news articles. A total of 81 word formations were identified, consisting of 17 derivations, 46 inflections, 11 compounding, 2 acronyms, 4 borrowings, and 1 initialization. These findings not only contribute to our understanding of linguistic patterns in the context of space-related discourse but also highlight the richness and diversity of language used in communicating scientific information. This exploration of word formation in NASA news articles has implications for the study of linguistics and science communication.

The study of morphology, by more deeply recognizing these diverse forms of word creation and modification, will enhance our ability to interpret and communicate complex scientific concepts. This study serves as one avenue for future research efforts aimed at uncovering the intricate interactions between language and scientific discourse in the field of space exploration.

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