

A Research on the Characteristics and Translation Strategies of Popular Science English

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Abstract: Popular Science English (PSE) plays a pivotal role in disseminating knowledge to diverse audiences, bridging the gap between scientific discourse and the general public. Recognizing the intricate linguistic features of PSE, including specialized terminology, scientific narrative styles, and the need for accessibility, this study identifies multifaceted challenges in translation, such as managing cultural nuances, dealing with technical jargon, and maintaining the engaging style. Then, drawing upon thorough analysis and a wealth of examples, this research unveils a range of translation strategies to facilitate the conversion of PSE from source language to target language.

1. Introduction

Popular Science English (PSE) is a fascinating and critical genre that serves as a bridge between the intricate world of science and the curious minds of the general public ^[1]. With a primary mission to make science accessible, comprehensible, and engaging to non-specialist readers, PSE publications span a vast array of topics, from astronomy to biology, from physics to environmental science ^[2]. Through clear and captivating language, PSE not only imparts scientific knowledge but also instills a sense of wonder and curiosity ^[3].

Besides, PSE exhibits distinctive linguistic features, including the use of specialized terminology, a clear logical structure, an inspiring narrative style, and a precise target audience ^[4]. These features render PSE a unique discourse that demands specialized translation strategies to maintain the accuracy and appeal of the content. In this way, translation of PSE across languages and cultures presents translators with numerous challenges. Managing cultural nuances, accurately translating technical jargon, conveying scientific concepts effectively, and preserving the engaging style of PSE are among the complexities that translators must navigate. Therefore, this research endeavors to delve into the linguistic characteristics of PSE, the multifaceted challenges that arise in the process of translating PSE content, and finally propose a range of practical translation strategies tailored to address these challenges, ensuring that the essence of PSE is conveyed effectively from the source language to the target language.

2. Characteristics of PSE

The characteristics of PSE, which is a specialized form of English used for conveying scientific knowledge and information to a general audience, include the following.

The first characteristic of PSE is its simplified language ^[5]. PSE uses simplified language with clear and straightforward vocabulary and sentence structures. It avoids complex technical terms and jargon, making it more accessible to a wide range of readers.

The second one is audience-centered. It is primarily aimed at non-specialists, such as general readers, students, and individuals interested in specific topics. The language and explanations are tailored to meet the needs of this diverse audience.

The third is vivid metaphors and examples ^[6]. To effectively convey scientific concepts, PSE often employs vivid metaphors, analogies, and real-world examples to help readers better grasp abstract scientific principles. This makes the science content more engaging.

The fourth is visual aids. PSE is more often than not accompanied by charts, illustrations, and images to visually represent information and enhance the understanding of complex scientific concepts. Visual elements can make the content more engaging and informative.

The fifth is popularity and accessibility. The primary goal of PSE is to make science knowledge more widely accessible. It emphasizes the importance of conveying scientific concepts in an approachable and engaging manner rather than strictly adhering to academic norms.

The sixth is avoidance of technical jargon. PSE usually avoids or explains technical jargon, ensuring that readers are not overwhelmed by unfamiliar terminology ^[7]. When technical terms are used, clear definitions and explanations are provided.

The next is interactivity. Popular science materials may include questions, quizzes, case studies, or interactive elements to encourage active reader participation and test their comprehension of the scientific knowledge presented.

The last is practicality. PSE frequently focuses on real-world applications and problem-solving to demonstrate the practicality of scientific knowledge. This helps readers see how science can be relevant to their everyday lives.

In short, PSE is characterized by its simplified language, audience-centric approach, use of vivid examples, and its mission to make science knowledge more accessible. It aims to make science more engaging and understandable for a broader audience, playing a crucial role in popularizing science and fostering greater scientific literacy.

3. Challenges of PSE Translation

Translating PSE into other languages can pose several challenges, which can be shown as the analyses below.

The first challenge is the translation of technical terms and concepts. Generally speaking, PSE regularly contains numerous technical terms and complex scientific concepts that require accurate translation while maintaining precision and comprehensibility ^[8].

The second one is cultural differences. In other words, scientific concepts and examples may be understood differently in various cultural contexts. Translations need to consider the cultural differences of the target audience to ensure accurate communication of information.

The third is preserving vividness and appeal. PSE generally emphasizes vivid metaphors, examples, and storytelling. These elements may be challenging to fully retain in translation, as they may be less effective or engaging in the target language.

The fourth is the translation of charts and illustrations. It is known that charts and illustrations in popular science materials may require redesign and translation to cater to readers from different languages and cultures. This can be a technical challenge.

The fifth is language structure and idioms. In different kinds of cultures, language structures and idiomatic expressions vary greatly between languages ^[9]. Translators need to ensure that the popular science content in the target language remains clear, fluent, and natural.

The sixth is the scale and units of measurement. Scientific data and units of measurement can be various across different countries and regions. It is crucial to ensure accuracy and consistency of units and scales in translation.

The seventh is adaptation to the audience. Popular science materials very often have different target audiences that may vary depending on the target language and culture. Translations need to be adjusted to meet the specific needs of the audience.

The last is language evolution. Scientific knowledge is continuously evolving, so popular science materials possibly require regular updates and re-translation to reflect the latest scientific discoveries and theories ^[10].

In a word, translating PSE calls for translators to possess a deep understanding of both the scientific content and the target language. They must also have excellent language skills to ensure accurate information dissemination while maintaining vividness and appeal. The challenge lies in balancing accuracy, cultural adaptability, and engagement.

4. Strategies of PSE Translation

Translating PSE involves several strategies to ensure accuracy and comprehensibility while retaining the appeal and clarity of the original text. Here are some common translation strategies.

4.1 Utilizing the Translation and Explanation of Terms

For technical terms, you can choose to either directly translate them or provide explanations. Sometimes, explaining the terms can aid reader understanding. In fact, accurately conveying professional terminology is crucial when translating articles or literature in the fields of Science, Technology, Engineering, and Mathematics (STEM) ^[11]. The following are some typical examples of PSE terms and their translations and explanations.

Example 1: *DNA*, which can be translated and explained as “*A molecule that carries most of the genetic instructions used in the growth, development, functioning, and reproduction of all known living organisms and many viruses.*”

Example 2: *Global Warming*, it could be interpreted as “*The long-term heating of Earth’s climate system observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily the release of greenhouse gases from burning fossil fuels, deforestation, and industrial processes.*”

These terms above play a key role in scientific research and technological development, and precisely understanding and passing on their meanings are momentous for the dissemination of popular science knowledge. In another word, utilizing the translations and explanations of terms aim to make complex scientific concepts more accessible to a wider audience in different languages while maintaining the scientific accuracy of the terms.

4.2 Using Equivalent Metaphors and Examples

In the course of PSE translation, using equivalent metaphors and examples can make the translation of PSE more accessible and relatable to a wider audience. That is, it is prominent to attempt to retain the vivid metaphors and examples from the original text but ensure they have a similar effect in the target language. Here are some cases.

Case 1: Original: “*The internet is like a vast web of interconnected information.*” ^{[12]”}

Translation 1 (Using Metaphor): “*The Internet is compared to a vast web of interconnected information.*”

Translation 2 (Using Equivalent Metaphor and Example): “*The Internet is like a huge global spider web, filled with various information and data, like the threads on each spider web, connecting people to various parts of the world.*”

In this case, the metaphor of the Internet as a web is used to convey the interconnected nature of the Internet. The second translation adds an example of how people are connected to various parts of the world, just as the threads of a spider’s web connect different points.

Case 2: Original: “*Photosynthesis is the process by which plants convert sunlight into energy.*”^[13]”

Translation 1 (Using Metaphor): “*Photosynthesis is considered as a kind of process that plants change sunlight into energy.*”

Translation 2 (Using Equivalent Metaphor and Example): “*Photosynthesis is like the energy production factories of plants, they are like solar panels, capturing sunlight and converting it into energy, just like our solar panels.*”

In this case, the metaphor of photosynthesis as a factory is used to illustrate how plants capture and convert sunlight into energy. The second translation provides an example by comparing this process to solar panels that capture and convert sunlight into electricity.

In the final analysis, these equivalent metaphors and examples above enhance the understandability of popular science texts, especially for readers who may not be familiar with the subject matter or when translating across different languages.

4.3 Adapting to the Audience

When it comes to the translation of PSE, it is a must to tailor the translation based on the cultural and knowledge level of the target audience. Some translations may require more explanations, while others may need to be more technical^[13]. Here are some instances of how PSE translations can be adjusted in accordance with the target audience’s culture and knowledge level.

Instance 1: Original Sentence: “*The Internet has revolutionized the way we communicate.*”^[14]”

Adjustment for Target Audience 1 (Tech-Savvy Audience): “*The Internet has fundamentally transformed the way we connect and communicate, reshaping the digital landscape.*” For an audience well-versed in technology, this adjustment includes terms like “digital landscape” to provide a more in-depth perspective and emphasize the profound impact of the Internet.

Adjustment for Target Audience 2 (General Public): “*The Internet has changed the way we talk to each other and share information, making the world a smaller place.*” For a more general audience, this adjustment simplifies the language and uses phrases like “changed the way we talk to each other” to make the concept easily relatable and comprehensible.

Instance 2: Original Sentence: “*Quantum entanglement is a phenomenon where two particles can be connected in such a way that the state of one instantly influences the other, regardless of the distance separating them.*”^[15]”

Adjustment for Target Audience 1 (Physics Enthusiasts): “*Quantum entanglement is a mysterious connection between particles that results in instantaneous changes in one particle affecting the other, no matter how far apart they are.*” This adjustment maintains some technical language for an audience with a deeper interest in physics.

Adjustment for Target Audience 2 (General Public): “*Quantum entanglement is like magic in the world of tiny particles. When two particles are linked, they can somehow ‘talk’ to each other instantly, even if they’re far, far away.*” For a general audience, this adjustment uses the metaphor of “magic” to simplify the concept and make it more engaging and relatable.

By adjusting the translation based on the target audience's culture and knowledge level, we can ensure that the message is well-received and understood by a wider range of readers, from experts to the general public.

4.4 Preserving the Tone and Voice

Preserving the tone and voice of the original text in the translation of PSE is important to maintain the author's style and ensure the translated content is engaging and relatable. Here are some examples:

Example 1: Original Text: *"In the world of microbiology, bacteria are the unsung heroes of life on Earth. These tiny organisms play essential roles in everything from nutrient cycling to human health."*^[16]

Preservation of Tone and Voice in Translation: *"In the realm of microbiology, bacteria take on the role of Earth's silent champions. These minuscule entities perform indispensable functions, from recycling nutrients to safeguarding human health."* In this example, the tone and voice are preserved by using descriptive language like "unsung heroes" and "silent champions" to convey the author's admiration for bacteria and their vital roles in a way that engages the reader.

Example 2: Original Text: *"The beauty of the night sky has fascinated humanity for millennia. It's a canvas of innumerable stars and celestial wonders, a sight that evokes a sense of wonder and curiosity."*^[17]

Preservation of Tone and Voice in Translation: *"The allure of the nocturnal heavens has captivated human beings for thousands of years. It's a tapestry adorned with countless stars and cosmic marvels, a spectacle that ignites a profound sense of awe and inquisitiveness."* In this example, the tone and voice are maintained by using expressive words like "allure", "captivated", and "profound sense of awe" to convey the author's sense of wonder and fascination with the night sky.

These examples demonstrate how preserving the tone and voice of the original text in translation can help maintain the authors' style, convey their passion, and engage the reader effectively. It's important for popular science texts to remain engaging and true to the authors' intended voice to inspire curiosity and interest in the subject matter.

4.5 Highlighting Key Points

Emphasizing important information and key concepts in PSE translation is decisive to ensure that readers can clearly understand the core content. Certain representative examples are listed below.

Example 1: Original Text: *"Water is essential for all known forms of life on Earth. It covers about 71% of Earth's surface and is vital for various biological processes."*^[18] In this example, the importance of water for life and its abundance on Earth's surface is emphasized in the translation to highlight key concepts.

Example 2: Original Text: *"In astronomy, a black hole is a region in space where the gravitational pull is so strong that nothing, not even light, can escape from it."*^[19] In this instance, the translation highlights the central concept of a black hole's extreme gravitational pull and its effect on light, making sure that the reader grasps the fundamental idea.

To sum up, by emphasizing important information and key concepts in translation of PSE, it is beneficial for readers to clearly understand the core content and essential concepts of popular science. This is especially important when simplifying complex ideas for a broader audience while maintaining accuracy and clarity.

4.6 Adjusting the Translation of Graphics and Illustrations

When dealing with graphics and illustrations, trying to maintain their original structure and information and making necessary adjustments to fit the target language and culture are significant. Namely, adjusting the translation of graphics and illustrations in PSE is essential to convey the same information accurately while making it accessible to a target audience. Here are some instances.

Example 1: Line Graph: “A *line graph illustrating the growth of greenhouse gas emissions over the past century.*” In this instance, the translation should appropriately describe the content of the line graph and the time period it covers.

Example 2: Bar Chart: “A *bar chart depicting the annual rainfall in different regions.*” The translation here could accurately convey the type of chart and the subject matter it addresses.

Example 3: Scientific Illustration: “A *scientific illustration of the water cycle.*” In this case, the translation need to specify the content as a scientific illustration and clarifies the topic.

Example 4: Map: “A *map of geological features in the area.*” Here, the translation ought to effectively communicate that the graphic is a map and provide information about its content.

Normally, when adjusting the translation of graphics and illustrations, it’s important to maintain clarity and conciseness while guaranteeing that the information remains faithful to the original but is also tailored to the target audience’s language and cultural context. This allows readers to better understand the visual content in the context of the popular science material.

4.7 Making Proofreading and Editing

Proofreading and editing PSE translations require a systematic approach to ensure accuracy and readability. Here’s a step-by-step guide on how to carry out proofreading and editing effectively.

1) Initial Review

-Read the entire translation carefully to understand the context, subject matter, and the target audience.

2) Proofreading

- Check for spelling, grammar, and punctuation errors.
- Ensure consistency in terminology and style.
- Verify the accuracy of dates, numbers, and scientific references.
- Look for typographical mistakes or formatting issues.
- Ensure the translation aligns with the original text's meaning and context.

3) Editing

- Focus on the overall structure and flow of the translation.

- Verify that sentences and paragraphs are coherent and logically organized.

- Ensure the readability of complex scientific concepts for the intended audience.

- Review the use of terminology, ensuring it is accurate and appropriate.

- Eliminate redundancy, ambiguity, or overly complex phrasing.

- Adapt the language and tone to the target audience, whether it’s scientific experts or the general public.

- Check for cultural and linguistic nuances that may need adjustment for the target language.

4) Review Visual Elements

- If the translation includes graphics, charts, or illustrations, make sure they match the text and provide accurate information.

- Verify that any labels, captions, or legends are clear and correctly translated.

5) Seek Feedback

- If possible, have someone else review the translation. Fresh eyes can catch errors or issues that you might have missed.

6) Final Review

- After making corrections based on proofreading and editing, read through the entire translation once more to ensure everything is in order.

It is notable that proofreading and editing are iterative processes. It may be necessary to go through several rounds of review to fine-tune the translation for accuracy and fluency. Additionally, understanding the target audience and the specific requirements of the translation project is critical for success in PSE translation.

All in all, these translation strategies that are mentioned above can help ensure the accurate translation of PSE while maintaining its appeal and adapting to different cultural and audience needs. Translators need to carefully consider these factors to achieve the best translation results.

5. Conclusion

In the course of this research, we have delved into the characteristics of PSE, challenges of PSE translation, and explored the translation strategies of PSE that can effectively convey its unique blend of scientific content and accessibility. This study has yielded the following valuable insights and conclusions that can guide the translation of PSE. First, PSE is diverse, catering to a wide spectrum of readers, from experts to the general public. It often employs a combination of scientific terminology, graphics, illustrations, and a narrative style that aims to provide clear, accurate, and engaging information. Second, translating PSE requires a high level of expertise and sensitivity to navigate the complexity of scientific content and the diversity of the audience. Overcoming these difficulties demands a deep understanding of the scientific field, the target audience, and the target language to provide high-quality translations. Third, to translate PSE effectively, seven types of key strategies should be employed, such as utilizing the translation and explanation of terms, using equivalent metaphors and examples, adapting to the audience, preserving the tone and voice, highlighting key points, adjusting the translation of graphics and illustrations, and making proofreading and editing.

In conclusion, translating PSE is a nuanced and multidimensional task that calls for careful consideration of various elements, from terminology and readability to cultural nuances and authorial style. A successful translation must strike a balance between maintaining accuracy and accessibility, ensuring that the message resonates with a diverse range of readers. This research provides valuable insights and guidelines for translators, helping bridge the gap between scientific knowledge and the public's understanding of it. It contributes to the dissemination of scientific information and the cultivation of scientific literacy, ultimately enriching the discourse between science and society.

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