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РАЗДЕЛ III. ПРИКЛАДНАЯ ЛИНГВИСТИКА
SECTION III. APPLIED LINGUISTICS

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Strategies used in the translation of scientific texts to fill the lexical gap

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Abstract
The present study is aimed at exploring the strategies used in translating scientific texts to overcome challenges which translators faced for selecting suitable Persian chemistry equivalents. For this purpose, a two-volume book in polymer chemistry was investigated. The study was conducted qualitatively, with a text analysis design. The research materials included 65 technical words selected from among the glossary of the book. There are, however, numerous translation strategies applied in translating this book, from which only five most common were selected, including loan word, loan translation, loan blend, loan rendition, and loan translation and rendition. The analysis of the selected technical words showed that loan word translation with 33.33% was the most common, and loan word rendition with 4.76% was the least applied strategy. Therefore, the straightforward implication of the research would be institutionalizing some of common strategies to the experts in polymer chemistry-field for adopting appropriate Persian equivalents.
Key words: lexical gap, loan words, scientific text, translation strategy
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Introduction

Translation has been increasingly developing due to the improvement of international trade, growing migration, globalization and enhancement of the mass media and technology. Translators have attempted to interpret concepts and speech in a variety of texts; they have had a crucial role as bilingual or multi-lingual intermediates of concepts. Most translation theorists agree that translation is understood as a transfer process from a foreign language – or a second language – to the mother tongue. However, market requirements are increasingly demanding that translators transfer texts to a target language that is not their mother tongue, but a foreign language. This is what Newmark (Newmark, 2001) called as service translation.

The research objectives include:

• To explore different type of translation strategies to cope with lexical gaps.

• To identify the least and most frequent strategies used in translating this scientific book.

Based on what was stated above, the following research question was addressed in this study:

• What are the most appropriate translation strategies used to fill the lexical gap in scientific texts?

No two languages are completely similar, and there exist many differences in various parts of languages such as lexical which brings about the lexical gap. The difference between two languages stems from many factors, including the dynamicity of one language, linguistic characteristics and outer reasons like the financial and technological developments. From among languages, English is a very dynamic one which has been receiving a wide range of scientific words. The term *equivalent* "refers to two or more entities being of equal value, corresponding value, or having same use or function as something else" (House, 2009).

The three common categorizations of texts addressed by Newmark (Newmark, 1988). The scientific or academic text can be counted as the informative group based on the mentioned categorization. One of the most common ways of solving problems caused by the absolute lexical gap is applying the loan processes in translation. Based on Bateni (Bateni, 2010), all changes in X language which are done based on grammar and lexes in Y, Z and other languages are called loan processes.

"Introduction to polymer compounding: raw material and recycled polymer. Properties and application". This book is a scientific and academic text which is written by Natamie (Natamie, 2015). It is an applicable book for those chemistry students whose field of study is polymer. The book is originally written in English translated into the Persian by the researcher as the MA thesis. Although the text is simple, it is full of new scientific words which are not usually translatable.

The lexical gap, the translator's problems and challenges arising when there is not any suitable counterpart or equivalent for a concept in the target language – these lexical items are of two types, including the relative and absolute lexical gap (Bateni, 2006).

2. Theoretical background

The Topology of Lexical Gaps starts with the work by Chomsky (Chomsky, 1965) Chomsky & Halle (Chomsky & Halle, 1965). Words that do not exist but could be reasonably expected to exist are the accidental gaps and words that are not even expected to exist since they violate the rules of what is a "good" word named as the systematic gaps. It is common to talk about lexical gaps rather referring to non-existing words, because they are indications of "holes" in the lexicon of the language that could be filled.

Discussing words, especially those established parts of the vocabulary, is the issue which has been considered by linguists. Newmark (Newmark, 1988) suggested different ways for translating scientific texts. First, in order to comprehend and assess its degree of formality, it is crucial to read the text objective, the potential cultural and professional differences between the readership and the

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original one. The translator is also required to pay attention to all factors from every word to every figure, letter and punctuation mark. Specialized terminology should be used as a significant device for translators of scientific texts. According to Sofer (Sofer, 1999), the first part of technical translation is its specialized terminology which is transferred.

Based on Trask (Trask, 1993), the term refers to "the absence of a hypothetical word which would seem to fit naturally into the pattern exhibited by existing words" (Trask, 1993: 157). Lehrer (1974), as a semanticist, believes that the term 'lexical gap' is multiply ambiguous in the sense that it has been used to all types of instances where a word, in one way or another, is missing (p. 95). mentioned that when a language expresses a concept with a lexical unit whereas further language expresses the same concept with a free combination of words, lexical gap occurs. Lyons (Lyons, 1977), see also Kiekema 2009, claims that lexical gaps are imputed to unlexicalized concepts across languages explains lexical gaps as slots in modeling (Kiekema, 2009:303). Among Chinese linguists, Wang (Wang, 1989) mentions that free-linguistic symbols are lexical gaps and Fan (Fan, 1989) defines the lexical gaps "empty spaces in a lexeme cluster".

Chomsky (Chomsky, 1965) and Li (Li, 2007) gave some recommendations to define lexical gaps. It is argued that although Chomsky's defining criteria is basically offered to make clear lexical gaps in English, they are also appropriate to the definition of lexical gaps in Chinese and other languages.

2.1 Background of the Study

By increasingly developing the technology and widespread inventions, accordingly, the language of science must be developed in different languages, therefore, technical translation is a very significant issue. In line with the mentioned matters, Heshmatifar and Biria (Heshmatifar, Biria, 2015) carried out a research, exploring the translation strategies used for rendering the economic terms from English to Persian. They found that most of the frequently-used strategies for translating a scientific text are literal translation and calque. Heidari and Pezeshki (2015) published an article entitled "Strategies used in translation of scientific texts to cope with lexical gaps". They found that loan translation had the highest rate of usage (68.5%) among other techniques, and in scientific contexts it is widely preferred. Al-Ghazali (Al-Ghazali, 2012), carried out a research entitled "Lexical gaps in Arabic-to-English translation". He claims translations of Quranic ayahs under study has indicated that lexical gaps are so challenging in religious translation to overcome unless appropriate translation techniques are applied to process them. Lach (Lach, 2010), carried out a research in this regard too and found that some mechanisms which are frequent at the fourth grade decrease their presence, basically borrowing, and some other tend to increase, mainly L2-based mechanisms as linguistic proficiency, awareness and cognitive development increase. Haydary Tabrizy (Haydary Tabrizy, 2007), carried out a research in which different strategies of borrowing in translation were evaluated. He found that finding a proper counterpart is not an easy task. Not only translator needs the knowledge of linguistic, communicative, pragmatic, discourse and grammar of the target language, but also all mentioned factors must be met for the source language. He found that the most applicable strategy used in scientific texts is loan translation.

The research lays bridges on existing gaps in identifying the polymer chemistry-related translation strategies and identifying the most common strategies. Based upon this exploration, the researcher will be able to suggest the most frequently used strategies to the lexicographers in order to coin specialized terms as professionally as possible.

3. Methodology
Research Design

This research was conducted based on the qualitative approach, with a text analysis design.

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Material:

The data were collected from glossary of the two-volume book in polymer chemistry. This data with their translated equivalence of Persian consist of 65 specialized chemistry words which are mostly the names of devices and materials.

Procedure

Sixty-five specialized chemistry words were selected so as to assess the translation strategies used in such texts. The words were categorized based on the specified strategies such as loan word, loan translation, loan blend, loan rendition and loan translation and rendition. After identifying each strategy, the data were tabulated into the table. Table 1 includes categorizing strategies and Table 2 contains strategies, frequencies and percentages which they were yielded numerically. Comparing the frequency and percentages determining the most and the least applicable strategies, it is worth noting that sometimes the translated scientific words include two or more strategies and translator was urged to use a multimethod.

4. Results and Discussion

Table 1

Translation Strategies

Loan word	Loan blend	Loan rendition	Loan translation and rendition	Loan translation
Titanium dioxide	Electromagnetic shielding	Reactors	Recycled	Water bath
Thermodynamic	Free-radical	Coating	Technology	Blender
Enthalpy	Carbon black	Kneader	Water ring pelletizer	Thermoplastic
Rheology	Wood plastic composite		pinned stirring-type screw tips	Hydrophilic
Resin	Antimicrobial		Degassing	Morphology
Tension	Polymerization		Devolatilisation	Hydrophobic
Acrylic	Decomposing polymer			Hot air blower
Polypropylene	Batch Mixers			Pellet dryer
Extrusion	Single-screw Extruder			Ultraviolet
Polyethylene	Macromolecular			Tensile strength
Polyester	Particulate solid mixer			Plasticizer
Peroxide	Vented extruder			Mineral fillers
Matrix	Char polymer			Isothermal
Master batch	Side feeder			Laminar Mixing
Gelation				Microstructure
Formulation				shear stress
Comonomer				
Calcium carbonate				
Alloy				
Polystyrene				
Hydrolysis				

As Table 2 shows, lexical items were divided into 5 parts and each strategy is placed in a column. There are five strategies like loan word, loan rendition, loan blend, loan translation and rendition and loan translation.

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Table 2

Frequency, and the Percentage of the Strategies

Strategies	Loan blend	Loan rendition	Loan translation and rendition	Loan translation	Loan word
Frequency	15	3	6	16	21
Percentage	23.80	4.76	9.23%	25.39%	33.33%

As noted before, 65 scientific words were selected. In the first column, the loan word includes 21 words from among the total scientific words. This indicates that 33.33% is the highest percentage related to loan word, and the least frequency of 6 (4.76%) is related to loan rendition.

Lexical gap is an essential issue in technical translation. As Sofer (Sofer, 1999) maintains, under the special circumstances that the translation of a specific text includes vocabulary items associated with a scientific domain, it should be marked as technical translation. Therefore, it would be logical that the first considerable signal for technical translation is the existence of specialized terminology in a text. According to Newark (1988), "Technical Translation is a component of specified translation; It is differentiated from other kinds of translation by terminology, although terminology usually makes up about 5-10% of a text" (Newark, 1988:151).

From linguist's attitude a significant part of description of language is word. It is always relevant to note the words that are not part of the vocabulary which can be addressed as non-existing words. Gaps are indicating through the non-existing words. The vocabulary of all languages shows the lexical gap, e.g. the English noun *horse* as a hypernym, incorporates its denotation both *stallion* (male horse) and *mare* (female horse). There is, however, no such hypernym in the case of cows and bulls, which subsumes both cow and bull in denotation. The absence of such a hypernym is called a lexical gap (Vishwa Vidyapeetham, 2019).

Strategies applied for the analysis of the selected words are defined as follows:

Loan word: One of the most common sources of new words in English is the process simply labeled borrowing, that is, the taking over of words from other languages. (Yule, 1996) apparently, this is the simplest method in which translator transfer the words to the target language through transliteration. For example, polyester: پلی استر، polyester, rheology: رئولوژی rheology, and extruder: اکسترودر extruder (see Appendix). According to Newmark (1988), This strategy, however, in the categorization of translation processes is named naturalization (Newmark, 1988: 83), i.e. The machine/*mashin*/ماشین is a type of naturalization. In this process, first the SL word is adapted to the suitable pronunciation and morphology of TL (Newmark, 1988).

Loan translation: In this strategy translator borrows the structural models but do not transfer the original words from the source language (Bateni, 2006) For example: water bath: حمام آب، "*hamam aab*", hydrophobic: آبگریزی "*aab gorizi*", and ultraviolet: ماورا بنفش، "*mavara banafsh*"

Loan blend: In some cases, applying grammatical and phonetic structures of the target language on the regular loan words caused creating new terms that half of it is borrowed and the rest part is original (Bateni, 2006). The examples are as electromagnetic shielding: پوشش الکترومغناطیسی، "*poshesh el-ektromeghnatisi*", Hydrogen bounding: پیوند هیدروژنی، "*peivand hidrogeni*", free radical: رادیکال آزاد، "*radical azad*"

Loan Rendition: With this strategy, all parts of a term are not rendered word by word, rather the term will be analyzed and then considering one prominent feature or a special function, new equivalents will be made (Bateni, 2006). This strategy is called approximate loan translation (Gomez, 1997). As Hogg, black and Burchfield (2000) maintained, "therefore, all parts of SL would not

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be matched in loan rendition which is rarely used." (Burchfield, 2000: 315). For example: Kneader: ،خمیرگیر "*khamirghir*", and coting: ،عایق بندی "*ayeghbandi*"

Loan translation and rendition: The combination of loan rendition and loan translation creates a new strategy called loan translation and rendition. this process is done through translating one part and analyzing the rest (Haydari Tabrizy, 2007). For instance: recycled: ،بازیافتی "*bazyafti*", technology: ،فناوری "*fanavari*"

5. Conclusion

The most frequent type of strategy used in translating a text from the source to the target is loan word (Yule, 1996) and (Heidari Tabrizi, 2007). In comparison with the mentioned strategy, loan rendition is a special type of strategy in which the highest level of accuracy is needed and rarely used by novice translator (Hogg and et al., 2000); (Bateni, 2006). As Table 4.2 depicts, the loan word has the highest frequency and percentage which is in line with Heidari Tabrizi and Pezeshki (2015). The loan rendition takes the least number and percentage. Therefore, the loan word's strategy is the most common type for filling the lexical gap in this case. It seems that in technical sciences, which have a close relationship with new technology, in this case, the preferred strategies were the loan word which was 33.33% (Heidari Tabrizi and Pezeshki, 2015) and (Heshmatifar & Biria, 2015*)*. Strategies such as loan translation 25.39% and loan blend 23.80% were the next applicable methods in the scientific text.

All texts have special translation challenges but this problem is dominant when the target language is not quite dynamic as it is in the source language. In fact, the field of modern and technical sciences is continually faced with rapid changes and inventions. Finding a suitable equivalence in developed countries is more simple than in developing countries.

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Appendix

Words	Translation	Transliteration
Water bath	حمام آب	Hammam ab
Wood plastic composite	کامپوزیت های چوب پلاستیک	Composite haye choob-pelastic
pinned stirring-type screw tips	پیچ چرخان با انتهای بسته	Pich charakhan ba antehaye baste
Water ring pelletizer	پلتساز حلقه آب	Pelletsaz halghe ab
Titanium dioxide	دی اکسید تیتانیم	Dioxide Titanium
Thermoplastic	گرمانرم	Garma narm
Thermodynamic	ترمودینامیک	Thermodynamic
Tension	تنش	Tanesh
Tensile strength	توان کششی	Tavan kesheshi
Talc	تلق	Talc
Vented extruder	اکسترودر منفذدار	Extruder manfazdar
Rheology	رئولوژی	Rheology
Resin	رزین	Resin
Recycled	بازیافتی	Bazyafti
Reactor	واکنش دهنده	Vakonesh dehande
Hot air blower	فن هوای گرم	Fan havaye garm
Polystyrene	پلی استایرن	Polystyrene
Polymerisation	پلیمر شدن	Polymer shodan
Polyethylene	پلی اتیلن	Polyethylene
Polyester	پلی استر	Polyester
Plasticizer	نرم کننده	Narm konande
Physical properties	خصوصیات فیزیکی	Khosusiat physici
Peroxide	پروکسید	Peroxide
Ultraviolet	ماورا بنفش	Mavara banafsh
Morphology	ریخت شناسی	Rikht shenasi
Mineral fillers	پر کننده های معدنی	Porkonande haye maadani
Microstructure	ریز ساختار	Riz sakhtar
Matrix	ماتریس	Matrix
Masterbatch	مستربچ	Masterbatch
Technology	فناوری	Fanavari
Macromolecular	درشت ملکول	Dorosht molecule
Isothermal	همدما	Hamdama
Reactor	واکنش دهنده	Vakonesh dehande
Hydrophobic	آب گریزی	Ab gorizi
Hydrolysis	هیدرولیز	Hydrolysis
Hydrogen bonding	پیوند هیدروژنی	Paivand Hydrogeny
Gelation	ژله ای	Gele ay
Free-radical	رادیکال آزاد	Radical azad
Formulation	فرمولاسیون	Formulation
Hydrophilic	آبدوستی	AB doosti

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Ethoxylated	اتوکسیله	Ethoxyle
Enthalpy	انتالپی	Enthalpy
Emulsion	امولسیون	Emulsion
Laminar Mixing	اختلاط لایه ای	Ekhtelat layeh ay
Electromagnetic shielding	پوشش الکترومغناطیسی	Poshesh Electromagnetic
Blender	مخلوط کن	Makhloot kon
Degassing	گاز زدائی	Gass zedaey
Cylinder	سیلندر	Cylinder
Comonomer	کومونومر	Comonomer
Batch Mixers	میکسر های پیمانه ای	Mixer haye paymane ay
Coating	عایق بندی	Ayegh bandi
Carbon black	کربن سیاه	Carbon siyah
Calcium carbonate	کربنات کلسیم	Carbonate Calcium
Antimicrobial	ضد میکروبی	Zed microbi
Alloy	آلیاژ	Aliage
Biodegradable Polymers	پلیمر های زیست تخریب پذیر	Polymer haye zist takhrib-pazir
Acrylic	آکریلیک	Acrylic
Kneader	خمیرگیر	Khamirgir
Devolatilisation	فرار زدائی	Fararzodayee
Hydrolysis	هیدرولیز	Hydrolysis
shear stress	تنش برشی	Tanesh boreeshy
Particulate solid mixers	میکسر های ذرات جامد	Mixer haye zarrat jammed
Side feeder	فیدر جانبی	feeder janebi
Char polymer	پلیمر نیمسوز	Polymer nimsooz

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