NAIST-IS-DD9861017

Doctoral Dissertation

An Educational Technological Study on Computational Supports for Learning Linguistic Styles

Kiyota Hashimoto

October 28, 2010

Department of Information Processing
Graduate School of Information Science
Nara Institute of Science and Technology

A Doctoral Dissertation
submitted to the Graduate School of Information Science,
Nara Institute of Science and Technology
in partial fulfillment of the requirements for the degree of
Doctor of Engineering.

Thesis Committee:

Professor Yuji Matsumoto	(Supervisor)
Professor Ken-ichi Matsumoto	(Co-supervisor)
Associate Professor Masashi Shimbo	(Co-supervisor)

言語スタイル習得の計算機支援に関する教育工学研究*

橋本喜代太

内容梗概

外国語学習ならびに高度な母語学習での発信能力育成は現代社会で欠かせないが、その際、何を伝えるかだけでなくどのように伝えるかを適切に習得する必要がある。特にジャンルや目的、状況に合わせて適切な語彙選択を行ない適切で一貫した文体を使用する、つまり、適切な言語スタイルを駆使することは文語・口語いずれでも重要であるが、細分化されたさまざまな言語スタイルすべてを対面教育のみでカバーすることは不可能であり、学習者のさまざまなニーズに合わせて発見的な学習を支援する計算機支援が求められている。この問題意識に基づき、本研究では教育工学の視点から言語スタイルの発見的習得を支援するための計算機支援について多面的に研究を行なった。

まず、こうした研究開発の前提となる言語スタイルならびにその教育・習得について言語学・語学教育の観点からまとめた上で、SECI モデルを応用した個人の学習サイクルモデルを考案し、メタ認知誘発支援として言語スタイル習得においてはとりわけ言語スタイルを構成する要素並びに言語スタイルを決定する要因の双方について課題認識過程を支援する必要があることを論じた。

その具体的な計算機支援方法を開発するため、ジャンルに応じた正例使用習得の支援、ジャンルに反する負例発見の支援、言語スタイルを決定する要因を整理し、適切な言語スタイルを構成する要素を利用するための総合的な支援の 3 方法を提案し、計算機支援としての具体的な実装とその効果について検討した。まず、ジャンルに応じた正例使用習得の支援につい

*奈良先端科学技術大学院大学情報科学研究科情報処理学専攻学位論文, NAIST-IS-DD9861017, 2010 年 10 月 28 日.

ては、ジャンルに応じた言い換え表現を対として習得する必要性があることを示し、その具体例として日本語の擬態語・擬音語表現とその専門用語の言い換えの必要性に着目した学習支援システムを構築し、その有用性を検証し、試用者らから高い評価を受けた。ジャンルに反する負例発見の支援としては、学習者個々人のニーズに合わせた模範スタイルと非模範スタイルをコーパスに基づき動的に検出し、その結果に基づいて言語スタイルの一貫性の破綻や不備を指摘する発見的学習支援システムを構築し、考察を行なった。言語スタイルを決定する要因を整理し、適切な言語スタイルを構成する要素を利用するための総合的な支援としては、プレゼンテーションの作成・準備に関する習得支援システム全体についての設計について議論し、修辞構造オントロジー並びにマルチメディア学習者コーパスを構築した上で、特に論理構成構築支援を重視したシステムのプロトタイプ構築を行なった。

このように言語スタイルの諸点について、それぞれの特徴に応じた支援方法のありようとその必要性を明らかにし、言語スタイルの適切な使用に関する学習支援システムの設計・構築を行なうことによって、効果的な計算機支援についてありうべき方向性と可能性を提案した。

キーワード

教育工学，言語学習，言語スタイル，文体，学習支援システム

An Educational Technological Study on Computational Supports for Learning Linguistic Styles *

Kiyota Hashimoto

Abstract

It is indispensable in today's world to cultivate advanced communicative ability both in one's own native language and in foreign languages, and for that purpose, not only what is communicated but also how it is communicated should be properly mastered. More specifically, whether it is written or spoken, it is important to use appropriate words and phrases, and to employ the proper linguistic style consistently and coherently in order to suit themselves to the target genre, the purpose, and the situation. However, linguistic styles vary according to many related factors, and it is difficult to teach all of them only in ordinary classes, which is why computational supports are in need for facilitating and improving the heuristic learning of linguistic styles with reference to individual learner's needs. Based on this assumption, supports for heuristic learning of linguistic styles are investigated from the educational technological viewpoint.

To begin with, linguistic styles and learning models are discussed. In particular, a new model of learner's learning cycle is devised based on the SECI model, and it is demonstrated that the supports at the process of task awareness are the most necessary both on linguistic style factors and corresponding linguistic style elements.

In order to pursue the computational supports for learning linguistic styles, three supporting methods are proposed: a support to promote the positive monitoring of the right choices according to genres, a support to promote the negative monitoring

.*Doctoral Dissertation, Department of Information Processing, Graduate School of Information Science, Nara Institute of Science and Technology, NAIST-IS-DD9861017, October 28, 2010.

of the inappropriate choices against a genre, and a comprehensive support with which a learner makes an appropriate consideration on linguistic style factors, and decides the corresponding linguistic style elements. As a support to promote the positive monitoring of the right choices according to genres, a prototypical learner support system for Japanese mimetic expressions with a particular reference to their paraphrases is proposed and evaluated. As a support to promote the negative monitoring of the inappropriate choices against a genre, a heuristic learning support system to notify learners of style inconsistencies and anomalies using multiple corpora is proposed and the accuracy is investigated. As a comprehensive support, a large-scale learner support system for preparing a presentation is designed, and based on the constructions of rhetorical structure ontologies and multimedia learner corpus of basic presentation, a prototype system is constructed with a particular emphasis on the support to realize appropriate logical organizations.

With these investigations, this study demonstrates support methods for each aspect of linguistic style, and shows the plausible direction of computational learner support through designing and realizing three learner support systems on the appropriate choice of linguistic style according to genre.

Keywords:
educational technology, language learning, linguistic style, stylistics, learner support system

Acknowledgements

It's just been tough these twelve years. Back in 1998, when I came to NAIST as a doctoral student, I was already an assistant professor of linguistics at Seiwa College (which, alas, was merged into Kwansei Gakuin in 2009). In 2000, when I was at the final year, I moved to Osaka Women's University where I was in charge of Information Education Center as well as linguistics classes. I was intended to write my thesis soon, but in the summer of 2002, Osaka Prefecture launched a plan to merge Osaka Women's University into Osaka Prefecture University in 2005. Now, another university reform is going on. During all these years, tons of administrative and clerical work has been always with me. Many pressed on me for a degree whereas few cared about my study. Yes, that happens everywhere, not just on me, and a few wonderful people gave me a hand. I write this acknowledgment to thank these gracious people.

First, I owe deepest gratitude to Prof. Yuji Matsumoto, my supervisor. Since I first met him some time in the fall of 1997, he has always kept his gate open for me, has given me insightful comments on my work, and has let me be aware of various ideas that otherwise would not have occurred to me. He has been the model as a researcher to me, and, his every behavior taught me what a splendid researcher should be, though I regret to say I haven't become one yet.

Second, I owe much gratitude to Kazuhiro Takeuchi for his invaluable support and friendship. He spared me an innumerable number of hours for discussing any research topics, from just a flash to critical foundational concepts to technical details.

Two co-supervisors, Prof. Ken-ichi Matsumoto and Associate Prof. Masashi Shimbo gave me invaluable, useful advice to make this thesis better. Their helpful as well as insightful comments have been exceptionally encouraging to me.

My special gratitude goes to Prof. Hiroshi Tsuji who has been the only colleague to substantially help me pursue my study. In these two years, he never failed to urge me to get a degree like many others, but unlike the many others, he constantly gave me various kinds of useful advice, and made efforts to keep me away from trifles. Without him, I would have been bogged down with trivial nitty-gritties and might have lost positive attitudes.

Some more around me have been irreplaceable. A lasting friendship with Toshio Morita, since we went on to the same junior high, has made me what I am as an academic student. Fumi-aki Miura, since undergraduate days, has always shown me deeper views not only on computational issues but also on societal issues related to me. Akira Ohtani, another survivor at NAIST, has been always frank with me, and never failed to keep me back to what I should do. Koji Yoshida, since the good old days of KATL, Kansai Association of Theoretical Linguistics, has been one of the most important academic friends.

I also say thanks to the following people for what they've done for my life: SUIKO Masanori, Tatsuo Nishida, Akihiro Sato, Kazuhiko Yoshida, for their splendid mentoring; Kosei Minamide, Hiromi Nagao, Isao Santo, Kazuhisa Seta, Lawrence Schourup, for their colleagueship; David Pesetsky, Shigeru Miyagawa, Norvin Richards, Timothy Sundell, Lisa Bastoni, Danielle Miraglia, for their kindness and generosity since

my stay at MIT as a visiting researcher in 2004-2005; Toshiyuki Sadanobu, Hiro-aki Kitano, Yoshiki Nishimura, Ken-ichi Mihara, Ayumi Ueyama, Hiromu Sakai, Makoto Nagao, Jun-ichi Tsujii, Yasuharu Den, Masayuki Asahara, Ken-itchi Tamano, Noriko Ohga, to name just a few, for various reasons that would require more pages than this thesis itself if I wrote them in detail.

Finally, I would like to thank my wife Hiromi and two daughters Yuka and Waka for putting up with my poor behaviors as a family member and supporting me.

All right, not a few people are listed above, which indicates that I am lucky and happy enough. Herodotus wrote, "*Nemo ante mortem beatus*."

Non. Dum spiro, spero.

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

No one uses language in one way. Just a morning greeting can be expressed in a great number of ways by a single person, according to the situation, the purpose, the person to whom he or she speaks, and so on:

おはよう（e.g., to a family member)
おはようさん（e.g., to a colleague)
おはようございます（e.g., to his or her boss)
やあ（e.g., to a friend)

In other words, every one of us employs language, be it spoken or written, in ways suited to various contexts, and the features with which language is employed for a particular context compose a *linguistic style*. Linguistic style is both private and social, but the private aspect is basically subject to social norms: that is, social norms, though too often implicit, require a particular linguistic style for a particular context, and the private aspect is allowed just as a trivial variant of it.

Intermediate and advanced language learning, particularly like

that of LSP (Language for Specific Purposes) must then be sensitive to style variations. Indeed, many guidebooks on a specific English, e.g., that of science and technology, contain dos and don'ts: e.g., Don't use contracted forms; Use simple sentences, and so on. Some of them, like the former one, might be easy to follow, but others of them, like the latter one, are so subjective and vague that the required standards are not explicit enough for most learners. To make matters worse, as we will see in Chapter 2 and 4, style variations are in fact very subtle and intricate. For example, "scientific English" is usually considered to be a genre and to have a dedicated style, and there are in fact numerous textbooks and references published on it. However, anyone will easily know that "scientific English" is decomposed into numerous sub-genres according to the targeted academic field, the targeted audience, and the author's intentions. Thus the satisfactory level of style sensitivity is required but is hard to achieve for most language learners.

Traditionally, education for linguistic styles has been ad hoc and private. It has been ad hoc in that teachers and instructors heavily rely on their personal experiences; and it has been private in that a large part of education has been achieved via personal corrections of learners' writings. These two facts directly relate to the problems of education for linguistic styles: quality is not always guaranteed and it takes time and cost. So it is desirable, and in fact necessary, to offer educational technological assistances to better the situation.

Triggered by this current situation, this study tries to make a small contribution to the education for linguistic styles by constructing learner models and developing prototypical learner support systems for some linguistic stylistic aspects. In particular, I propose a private learning cycle model based on the SECI model, and a metacognitive awareness model for linguistic style. In order to pursue the computational supports for learning linguistic styles, three supporting

methods are proposed: a support to promote the positive monitoring of the right choices for a particular genre, a support to promote the negative monitoring of inappropriate choices against a particular genre, and a comprehensive support with which a learner makes an appropriate consideration on linguistic style factors and decides the corresponding linguistic style elements.

With these investigations, this study demonstrates support methods for each aspect of linguistic style, and shows the plausible direction of computational learner support through designing and realizing three learner support systems on the appropriate choice of linguistic style according to a particular genre.

The rest of the organization of this thesis is as follows.

Chapter 2 discusses linguistic style and learning models as a foundational premise of this study, and presents an educational technological learning model for language learning.

Chapter 3 presents, as a learner support for lexical choices sensitive to the targeted genre, purpose, and situation, a prototypical learner support system for Japanese mimetic expressions with a particular reference to their paraphrases.

Chapter 4 discusses and presents a heuristic learning support system to notify learners of style inconsistencies and anomalies using corpora.

Chapter 5 discusses style consistency from the viewpoint of logical organizations of text. Rhetorical Structure Theory is critically investigated and a couple of improvements are presented. In so doing, ontologies related to Rhetorical Structure are constructed and their educational utilization is discussed.

Chapter 6 presents a prototype of a comprehensive learner support system for informative presentation. Learning presentation is more and

more focused on in contemporary higher education, and computational supports are indispensable due to a couple of reasons. Here, we have constructed an educational technological model of presentation preparation, and implemented a prototype based on existing successful teaching examples.

Chapter 7 is a concluding remark and discusses further and future issues.

Chapter 2

Learning Models on Learning Linguistic Styles

2.1. Introduction

In this chapter, we review and discuss educational and linguistic aspects related to this study: learning models and linguistic styles. As this study pursues applications of computational resources to education, they must be compatible with educational theories and be based on some learning models.

2.2. Metacognition and learning

2.2.1. Metacognition

What do we learn when we learn something? What do we do when we do what we have learnt? What is a better way to learn something? These three questions are what the study of education and learning have tried to answer. Educational technology, which is to employ some technological efficacies for better teaching and learning, is no exception: any attempt in the field of educational technology assumes some learning theories for these questions and tries to facilitate or improve some aspects of learning.

Education and learning has been intrigued, inquired, and investigated for a long time, perhaps since before Socrates and Aristotle, but scientific researches in a modern sense have been done in these several decades. At their early stage, learning had been investigated from a viewpoint of behaviorism. Behaviorism basically assumes a learner is essentially passive, responding to environmental stimuli. The learner starts off as *tabula rasa*, a clean slate, and behavior is shaped through positive and negative reinforcement. Both increase the probability that the antecedent behavior will happen again. In contrast, punishment (both positive and negative) decreases the likelihood that the antecedent behavior will happen again. "Positive" indicates the application of a stimulus; "Negative" indicates the withholding of a stimulus. From this perspective, the most important facet of learning is not learning but teaching: if a good teaching method were well practiced, learning would be successful. However, the so-called cognitivist revolution replaced behaviorism in 1960s as the dominant paradigm in learning theories. Cognitivism has focused on the inner mental activities: mental processes such as thinking, memory, knowing, and problem-solving has been more intrigued. From this perspective, learning is more heavily related to what the learner actually does when they are learning. In other words, learning was redefined as the process of changing the learner's schemata.

Changes in the learner's schemata may be done consciously and unconsciously. Conscious changes in the learner's schemata is considered to involve metacognition.

Metacognition is often defined as knowing about knowing, or thinking about thinking. Originally, the concept of metacognition was proposed by John H. Flavell. Flavell (1979) defined metacognition as knowledge and cognition about cognitive phenomena, and has elaborated this definition by specifying classes of phenomena that

constitute monitoring and control of cognition. One can think of what one knows (i.e., *metacognitive knowledge*); one can think of what s/he is currently doing (i.e., *metacognitive skill*); and one can think of what his/her current cognitive or affective state is (i.e., *metacognitive experience*). Metacognitive knowledge, skill, and experience change during the learning process, and the learner's control and monitoring of these affects the learning achievements.

Nelson and Narens (1990) elaborated this metacognitive process based on the following three assumptions:

1. The cognitive processes are split into two or more specifically interrelated levels. Let us call them *meta-level* and *object-level*.
2. The meta-level contains a dynamic model of the object level.
3. There are two dominance relations, called "control" and "monitoring," which are defined in terms of the direction of the flow of information between the meta-level and the object-level.

These three assumptions constitute their metacognitive model diagramed as in Fig. 2.1. The theory consists of a basic structure containing two interrelated levels: the meta-level and the object-level. The meta-level is dynamic in that it works by assessing the present situation state by state, and is guided by introspection. The object-level includes the learner's actions and behaviors, and describes the external state of the present situation. During metacognitive monitoring, the meta-level is informed of the present state by the object-level, and, in turn, during metacognitive control, the meta-level modifies the object-level.

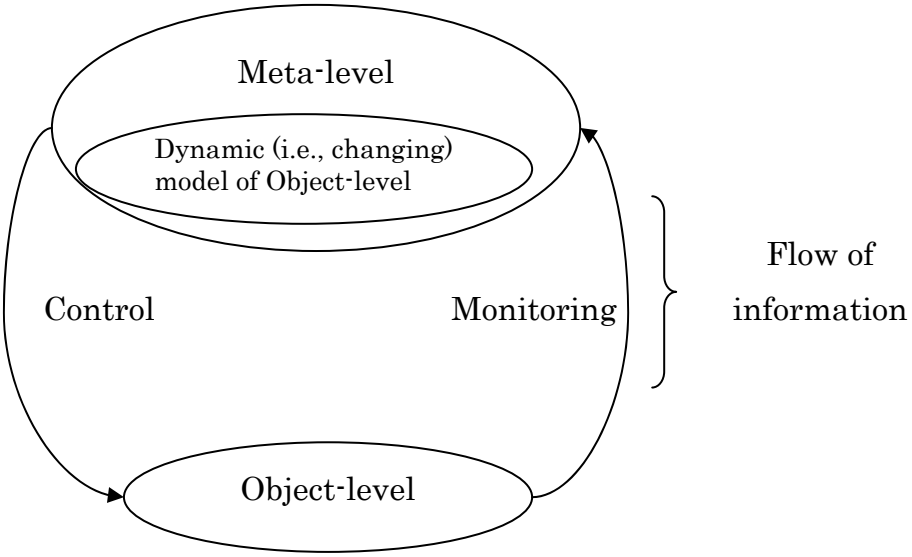


Fig. 2.1　Meta-level and object-level of metacognition and the relationship between them (Nelson and Narens 1990)

Let us restate this in a more concrete way. Usually, the meta-level corresponds to the metacognitive knowledge, and the object-level corresponds to what the learner actually does. When learning something, the learner assumes a model of what s/he will or should do for the learning, which is initially based on the previous learning experiences or the instructions from outside. With this model, the learner executes the actual learning processes; in other words, the meta-level controls the object-level. At the same time, by monitoring the actual learning processes, the meta-level obtains the state-of-the-art information of the actual learning processes, which may change the control and/or the present model of the object-level. This is a typical application of the metacognitive model. Note, however, that the model in Fig. 2.1 can be applied to various phases of metacognitive processes. In fact, Nelson and Narens (1990) applied this model to the relationship between memory and meta-memory, which we will not pursue here.

As we have seen above, metacognition is very much related to learning. Particularly, the process of skill learning, of which intermediate and advanced language learning is an example, constantly contains metacognition in dual, though intertwisted, ways. Consider learning to write, for example. Writing is a skill, and the writing process contains various metacognitive elements particularly for linguistic styles. Who is the supposed reader and what will they know about what is to be written? What is the purpose of the writing and will the passage being written successfully contribute to the purpose? Is the linguistic style chosen suitable to the supposed reader and the purpose? Is the linguistic style consistent? A weak metacognitive ability may fail the control of some or all of these metacognitive elements. When learning to write, the learning process not only contains these metacognitive elements but also the metacognitive processes that monitors the awareness of these

metacognitive elements. A weak metacognitive ability may also fail this awareness monitoring, and strengthening one's own metacognitive ability for writing is an important part of learning to write. In short, it can be assumed that the learning process should contain strengthening one's own metacognitive ability for the targeted learning object. If this is the case, any learner support system should have some devices to activate and strengthen the metacognitive abilities required for the skill to be learned.

In order to do so, it is necessary to make clear the metacognitive model of the targeted learning object. But before going on, let us review a broader learning model, self-regulated learning.

2.2.2. Self-regulated learning

From a cognitivist viewpoint, a successful learner is not the one who completely obeys the instructions given to him/her, but the one who controls him-/herself. In other words, a successful learner is self-regulated. However, self-regulated learning strategies vary according to the targeted learning object, and thus learning to be a self-regulated learner for a particular learning object is also important when learning something.

Self-regulated learning has been an important issue in educational and psychological fields for a couple of decades. A number of researchers tried to define self-regulated learning, and among them Zimmerman's theory is best known. Zimmerman (2000) defines self-regulation as self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals. Schunk and Zimmerman (1997) state that academic self-regulation processes include planning and managing time; attending to and concentrating on instruction; organizing, rehearsing, and coding

information strategically; establishing a productive work environment; and using social resources effectively. The psychological dimensions of self-regulation are considered to involve motivation, strategies, self-awareness of performance outcomes, and sensitivity to environmental and social settings (Zimmerman and Risemberg 1997).

A simple model of self-regulated learning consists of cognition, metacognition, and motivation, as shown in Fig. 2.2.

Self-regulated learning is particularly important for intermediate and advanced language learning not only because (mostly) adult learners are more analytical to their learning than younger children but also because the targeted learning object may not be taught in classroom. Successful self-regulated learning is considered to have the following features.

First, the self-regulated learner believes that self-regulated learning can in fact facilitate learning and determine the success of their learning. Without this belief, the learner cannot plan his/her learning activities, regulate his/her learning process, evaluate his/her learning results and adjust his/her learning activities repetitively.

Second, the self-regulated learner can employ metacognition, motivation, and the environment around him/her to learn systematically. The learner has acquired a number of general, detailed, and specific strategies. The learner know how, when, and where to employ those strategies to bear the most efficient results.

Third, self-regulated learning is a continual cycle. In this cycle, the learner first sets the goal, then tries to achieve the goal by employing various strategies. During the learning process, the learner always monitors the process, and if the learner finds any obstacle, s/he tries to exclude or correct it, and a next learning process proceeds.

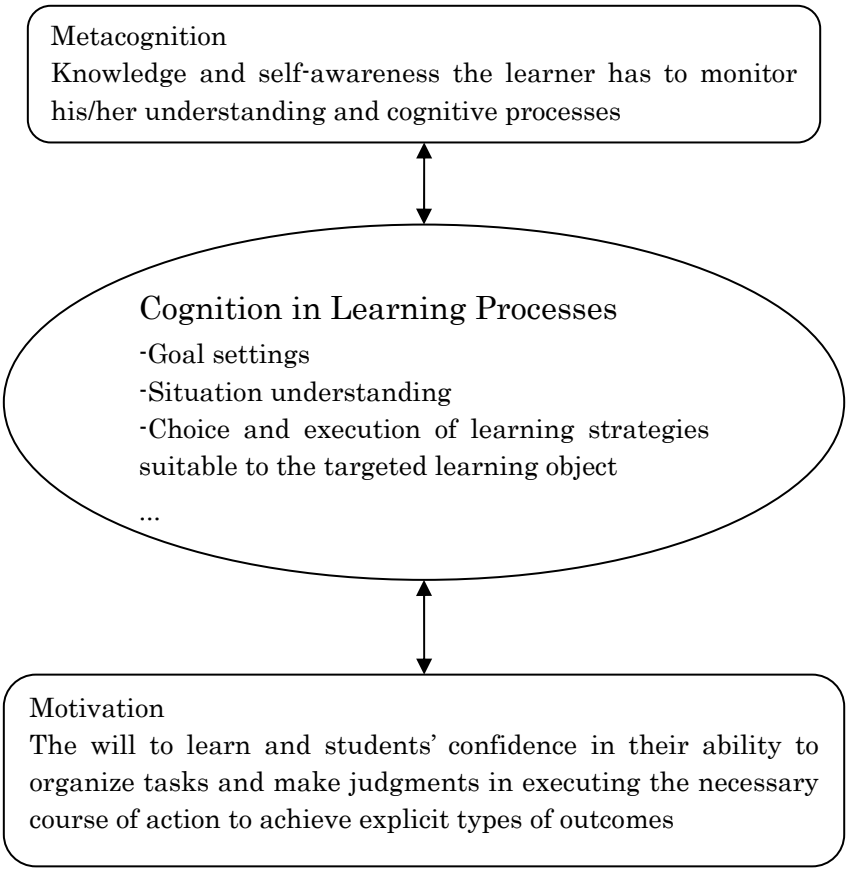


Fig. 2.2. A simple model of self-regulated learning

Fourth, the self-regulated learner can take advantage of the situation around him/her when s/he encounters some difficulties.

Fifth, self-regulated learning is a volitional process that needs time and effort, but, as stated in the first point, the learner believes that the more self-regulated, the easier it is to learn.

Then, a learning support through computational resources should foster or strengthen these properties as well as facilitate the targeted learning, though the motivational aspect is beyond the scope of this study.

We have reviewed metacognition and self-regulated learning. Both concepts involve dynamic cycles in which metacognition constantly forces revisions of learning strategies and learning processes. To investigate this cycle, let us review the SECI model in the next subsection.

2.2.3. SECI Model

The SECI model was originally proposed by Nonaka (1994), Nonaka and Takeuchi (1995), and Nonaka and Konno (1998), as a model of knowledge management and creation in organizations.

Nonaka and others assume that the knowledge creation in an organization is the process in which knowledge is recognized and transmitted in tacit and explicit ways. The process works by different linking process of these two types of knowledge in the organization. Knowledge creating process is a continuous, self-transcending process. As knowledge is created among individuals or between individuals and the environment, individuals transcend the boundary between the self and the others. According to Nonaka and others, there are four types of knowledge creating process: socialization, externalization, combination, and internalization. The conceptual image is shown in Fig. 2.3.

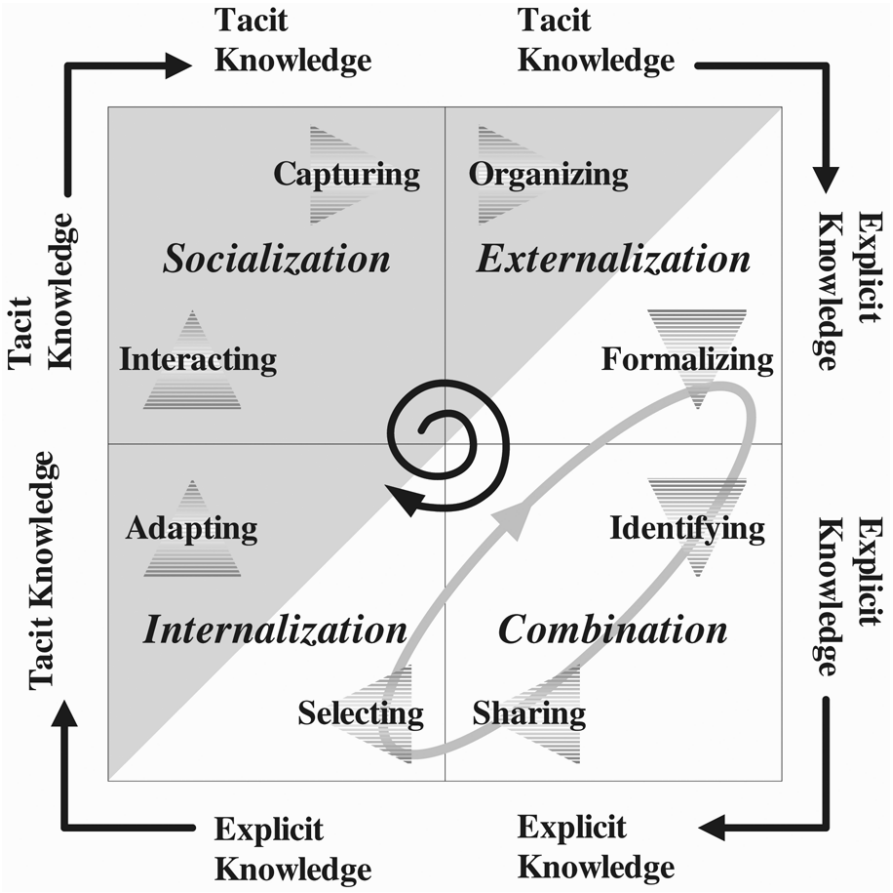


Fig. 2.3. SECI model

(adapted from Umemoto, Endo and Machado 2004)

Socialization focuses on tacit to tacit knowledge linking. Tacit knowledge goes beyond the boundary and new knowledge is created by using the process of interactions, observing, discussing, analyzing, spending time together or living in same environment. The socialization is also known as converting new knowledge through shared experiences. An organizations gain new knowledge also from outside its boundary like interacting with customers, suppliers and stock holders. This occurs in traditional environments where a son learns the technique of wood craft from his father by working with him (rather than from reading from books or manuals).

Externalization focuses on tacit to explicit knowledge linking. It helps in creating new knowledge as tacit knowledge comes out of its boundary and becomes collective group knowledge.

Combination is a process where knowledge transforms from explicit knowledge to explicit knowledge. For example, the finance department collects all financial reports from each department and publishes a consolidated annual financial performance report. Creative use of database to get business report, sorting, adding, categorizing are some examples of the combination process.

By internalization, explicit knowledge that is created using tacit knowledge and is shared across the organization is again internalized by individuals. When this tacit knowledge is read or practiced by individuals then it broadens the learning spiral of knowledge creation. An organizations tries to innovate or learn when this new knowledge is shared in the socialization process. An organizations provides training programs for its employees at different stages of their working with the company. By reading these training manuals and documents employees internalize the tacit knowledge and try to create new knowledge after the internalization process.

Though the SECI model is criticized by Gourlay and Hill (2004)

and others, it is now considered to be a dominant model of organizational knowledge management and creation. Moreover, learning and knowledge management can be considered to be similar in terms of input, outcome, processes, activities, components, tools, concepts, and terminologies and thus the SECI model has been employed as a learning model (Bryceson 2007, Chatti et al 2007). The SECI model is originally applied for learning in a group, but its foundational idea can be applied to individual learning processes in which tacit-tacit knowledge transmission is done unconsciously; tacit-explicit and explicit-explicit knowledge transmissions are done consciously; and explicit-tacit knowledge transmission is done either consciously or unconsciously.

Let us pursue the possibility of the application of the SECI model to private learning. First, tacit-tacit knowledge transmission in private learning is knowledge transmission without conscious awareness, or unconscious habitualization. From time to time, learners just do almost mechanically what is told them to do. Through the process, they sometimes successfully acquire something, but mostly they just come to know how to do something in a single way and are likely to be poor at abstraction and adaptation. This is what cognitivists have argued about against behaviorism.

Second, tacit-explicit knowledge transmission is the process in which the learner becomes aware of the learning object and their learning situation, or externalization of the unconscious cognition into meta-cognitive consciousness. This process is naturally important when learning a brand new thing for which no prior knowledge is assumed. It is also important when learning knowledge or skills that are composed of various kinds of different details, since such knowledge and skills are difficult to formulate and the learner is expected to always try to get aware of newly noticed details, which is the case with linguistic style.

Third, explicit-explicit knowledge transmission is the process in which new findings and existing knowledge are connected through meta-cognition. Lastly, explicit-tacit knowledge transmission is the process in which the learner comes to fully master the knowledge or skill without constant conscious efforts to employ them. This learning cycle is graphically shown in Fig. 2.4.

2.2.4. Conclusion of 2.2

In this section, 2.2, we made a rough review of the concepts of metacognition, self-regulated learning, and the SECI model. Common in these three is the importance of metacognitive activities with which the learner controls and monitors his/her cognitive learning processes. Before proposing our learning model for linguistic styles, let us return to the learning object, linguistic styles.

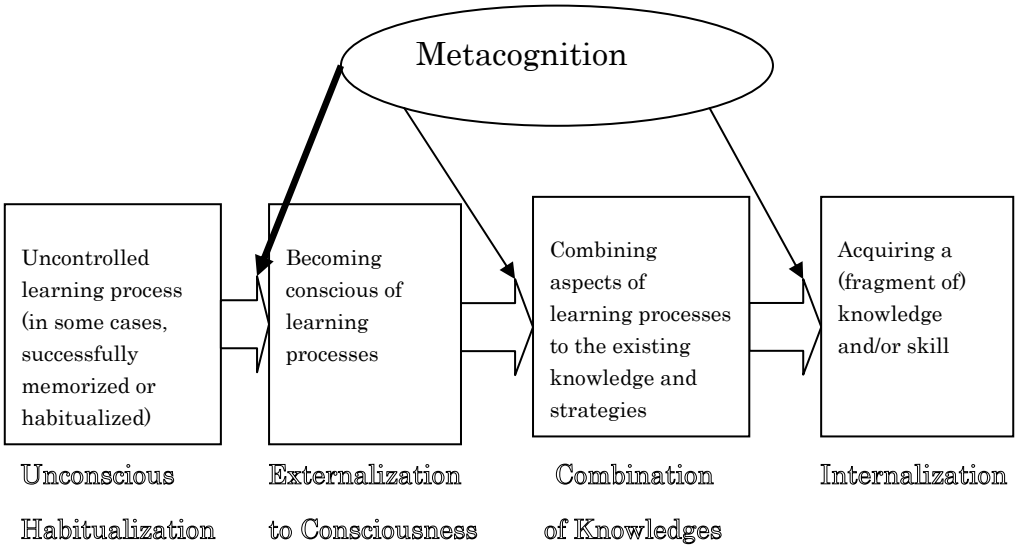


Fig. 2.4. A SECI-like model of individual's learning cycle

2.3. Linguistic Styles

2.3.1. What is *linguistic style*?

The phrase *linguistic style* may be interpreted differently by different people. In fact, the study of linguistic style, stylistics, has been focused on different properties of text, and the ordinary use of (linguistic) style is diverse. So, let us make clear what are to be dealt with as linguistic style in this study.

First, linguistic style can be roughly defined as preference or tendency of choices of linguistic elements supposed to be suitable to a particular purpose or situation. Classically, linguistic style was more related to literature. Each professional writer has his/her own linguistic style as part of his/her characteristics. For example, Hemingway has been considered to have a simple, direct, and plain style of writing while Faulkner to have a rich, complex, and sometimes loose style of writing. Stylistic differences among professional writers have attracted many researchers, and not only subjective but also statistical, objective studies have been conducted. This line of studies pursues to reveal linguistic styles as personal, individual properties.

On the opposite side, linguistic styles are often considered to be products of social, cultural agreements or preferences. For example, contracted forms like *don't* is a default form in colloquial English while it is not preferred in most written styles. Any Japanese know the distinction between polite forms (*desu/masu* style) and normal forms (*da/dearu* style). In this study, we will deal mainly with this type of linguistic styles.

Genre and register are concepts similar to linguistic style. Strictly, however, they are different from one another. Biber and Conrad (2009) describe the difference as follows:

> We use the terms register, genre, and style to refer to three different perspectives on text varieties. The register perspective combines an analysis of linguistic characteristics that are common in a text variety with analysis of the situation of use of the variety. The underlying assumption of the register perspective is that core linguistic features like pronouns and verbs are functional, and, as a result, particular features are commonly used in association with the communicative purposes and situational context of texts. The genre perspective is similar to the register perspective in that it includes description of the purposes and situational context of a text variety, but its linguistic analysis contrasts with the register perspective by focusing on the conventional structures used to construct a complete text within the variety, for example, the conventional way in which a letter begins and ends. The style perspective is similar to the register perspective in its linguistic focus, analyzing the use of core linguistic features that are distributed throughout text samples from a variety. The key difference from the register perspective is that the use of these features is not functionally motivated by the situational context; rather, style features reflect aesthetic preferences, associated with particular authors or historical periods. (Biber and Conrad 2009:9)

Other researchers may have different distinctions: for example, genre is regarded as topical (i.e., of science, of humanities, and so on) while register as purpose/reader-oriented (i.e., discussion for a limited number of professionals, description for a wide variety of ordinary people, and so on).

In this study, however, I will not make sharp distinctions among

linguistic style, genre, and register, and any explicit linguistic features dedicated to style, genre, and register will be called linguistic style elements. This is basically for convenience, for it is almost impossible to make distinctions among them when dealt with by computer. I will also use the term *genre* and *linguistic style* interchangeably so long as it will not make a serious confusion.

Now let us turn to a more realistic question: what constitute a linguistic style, and how is a particular linguistic style decided for a particular situation? Let us call the former *linguistic style elements* and the latter *linguistic style factors*. Linguistic style elements are actual instances found in a linguistic utterance or prose that reflect particular linguistic style factors chosen for the situation.

2.3.2. Linguistic style elements

As defined above, linguistic style elements are actual instances found in a linguistic utterance or prose that reflect particular linguistic style factors chosen for the situation. The most noticeable linguistic style element is vocabulary, or the lexical choice. Words and phrases are generally classified either as content words or as function words. As the distinction between polite and normal forms in Japanese tells, the choice of function words is more responsible for linguistic style, but the choice of content words is also responsible, though, as we will see later, they roughly reflect different linguistic style factors.

Another linguistic style element is grammatical patterns to be employed. Part of grammatical patterns coincides with the use of particular function words: for example, the frequent use of a relative pronoun *which* naturally represents the frequent use of non-restrictive relative clauses, and it is usually preferred in a formal written style. At the same times, the average sentence length, the average word length,

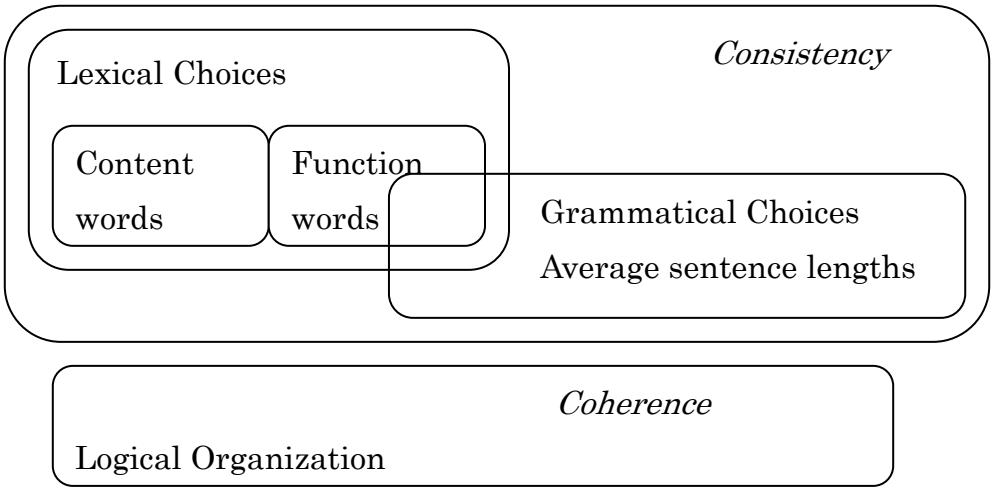


Fig. 2.5. Elements of linguistic styles (though not exhaustive)

and the proportion of content and function words are responsible for forming a particular linguistic style.

Lexical choice, grammatical choice, and average lengths share an important requisite: those choices must be consistent in an utterance or a prose. A mixture of lexical choices from different linguistic styles causes a textual inconsistency which may well degrade the whole utterance or prose.

From a different perspective, any text, be it an utterance or a prose, must be coherent: all the parts of it must contribute to the textual purpose. Coherence is basically achieved through the logical organization of the text.

In sum, any linguistic style should hold consistency and coherence. The former is achieved through lexical choices, grammatical choices, and average lengths while the latter through the logical organization of the text, as shown in Fig. 2.6. In this study, the issue of lexical and grammatical choices will be dealt with in Chapter 3 and 4, and the issue of logical organization in Chapter 5 and 6.

Before ending this subsection, one thing should be noted about consistency. As we saw, consistency holds through lexical choices, grammatical choices, and average lengths, and it means that, considering a vast number of possible linguistic styles, the constant explicit monitoring of every choice is very often difficult. Indeed the constant choice of the correct technical terms will be done with technical knowledge, since the number of technical terms in a field is relatively small. But non-technical terms, be they content words or function words, are not the case. In other words, constant metacognitive efforts to keep the right choices might go beyond learner's capacity, but it is relatively easy to make metacognitive efforts to detect an inconsistency, which is why Chapter 4 is about supporting inconsistency detection.

2.3.3. Linguistic style factors

Linguistic style factors are the motives of the choice of a particular linguistic style that consists of a set of suitable linguistic style elements. According to numerous guidebooks on writing and speech, linguistic style factors are related to the chosen topic, the chosen media, the targeted reader/audience, the purpose, and the intention, as shown Table 2.1.

First, the topical factor can be very much specific. In fact, the mere specification of the targeted topic as "science" does not help at all. As every aspect of our life is becoming departmentalized, so are topical factors. The topical factor is most related to the choice of content words.

Second, the media factor is more related to the choice of function words, grammatical patterns, and average linguistic lengths. The most noticeable is the choice between spoken and written, but the media factor can also be much more specific.

Third, the targeted reader/audience also affects linguistic style. Linking to the targeted reader/audience is the factors of the purpose and the intention of the speaker/writer.

An interesting example to illustrate the importance of these factors is: *Molecular Biology of the Cell* (by B. Alberts et all, published by New York, Garland in 2007[5]) and *Essential Cell Biology* (by B. Alberts et all, published by New York: Taylor & Francis in 2009[3]) are both textbooks on cell biology by the same authors. The difference is that the former dedicated for graduate students of biology while the latter for undergraduate students of various majors, and the linguistic styles chosen by the two textbooks are strikingly different. So not only the first two but also the latter three factors are deterministic in deciding the supposed linguistic style.

Factors	Examples
Topical (Genre)	inorganic chemistry English literature ... (Note that the topical factor can be very much specific.)
Media	newspaper textbook oral presentation ...
Targeted reader/audience	laypeople professionals ...
Purpose	persuasion explanation ...
Intention	formal informal or friendly ...

Table 2.1. Linguistic style factors

2.3.4. Tacit and explicit properties of linguistic style factors and elements

In the previous two subsections, linguistic style factors and linguistic style elements are explained. Let us now turn to the nature of the relationship between them.

First, it is naturally assumed that the identification of the supposed linguistic style factors determines an appropriate set of linguistic style elements that constitute the surface linguistic style, as shown in Fig. 2.6. It is important, however, that not all of the linguistic style elements to be employed are explicitly learnt and known by the author/speaker. Then, what are those elements that can be explicitly learnt and known?

One of the most explicit linguistic style elements is about formality or colloquiality. Adult native speakers of Japanese know that Japanese has two major styles according to formality: *da/dearu* style and *desu/masu* style. In addition almost all of them know the distinction, for example, between *shite-shimatta* and *shichatta*. Likewise, adult native speakers of English know that the contracted forms like *don't* should not be used in a formal style of writing while they should be used in any kind of speech even if it is a formal one. Another explicit linguistic style element is about the use of technical terms, as part of lexical choices. It is apparently determined according to the targeted reader/ audience and the medium. Let us call those kinds of comparatively explicit linguistic style elements *major linguistic style elements*. Major linguistic style elements can be learnt and known, and *positive monitoring* with which one checks whether the right choices are done is possible and useful for keeping linguistic style consistency.

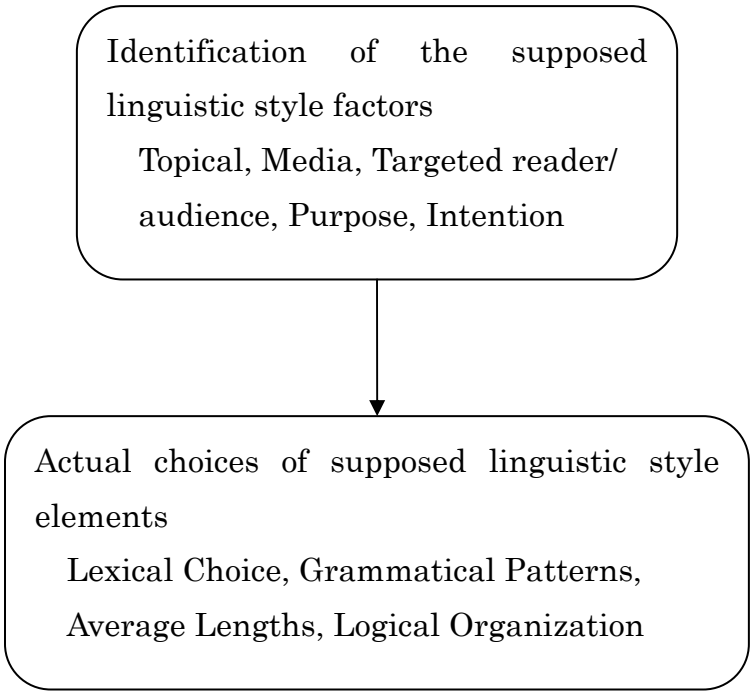


Fig. 2.6. Basic relationship between linguistic style elements and factors

On the other hand, bureaucratic expressions such as *shiteiru-tokorode-aruga*, for example, may not be recognized as such by all Japanese adults, with a result that they may be misused. Let us call those elements *minor linguistic style elements*. The difficulty in linguistic style lies in the fact that there are various kinds of minor linguistic style elements that are not always noticeable, and that linguistic style is ramified into innumerable types. Thus *negative monitoring* with which one checks whether there be wrong choices of linguistic style elements is needed. Negative monitoring is more difficult than positive monitoring for at least two reasons. First, negative monitoring depends more on impression and past reading experiences than on solid knowledge and reasoning. Second, as such, one may not know the right choices to the particular linguistic style explicitly. To make matters worse, one may not know the independence of a particular linguistic style. So it is important for any educational support to give the learner awareness on the independence of a particular linguistic style for their utterance goal and potential wrong choices of linguistic style elements dedicated to the linguistic style.

2.4. A meta-model of style-sensitive language learning

To conclude this chapter, let us propose a meta-model of style-sensitive language learning, as shown in Fig. 2.7. This is a meta-model in that every style-sensitive language learning model for a specific purpose must be compatible to this meta-model, and that the actual set of linguistic style factors and linguistic style elements vary according to the specific purpose.

In subsequent chapters, we will discuss and develop a prototypical learner support system to help some or all aspect of this model. In

chapter 3, positive monitoring of the right choices of technical terms is highlighted, and paraphrasing between ordinary expressions and corresponding technical terms is paid attention. In chapter 4, negative monitoring of consistency is highlighted, and by showing inconsistencies to the learner for externalization, enhancement of learner's metacognitive capacity of style sensitivity, particularly that of negative monitoring, is intended. In chapter 5 and 6, a comprehensive learner support system for learning and preparing a presentation will be discussed and proposed, which is compatible with the whole picture of this meta-model.

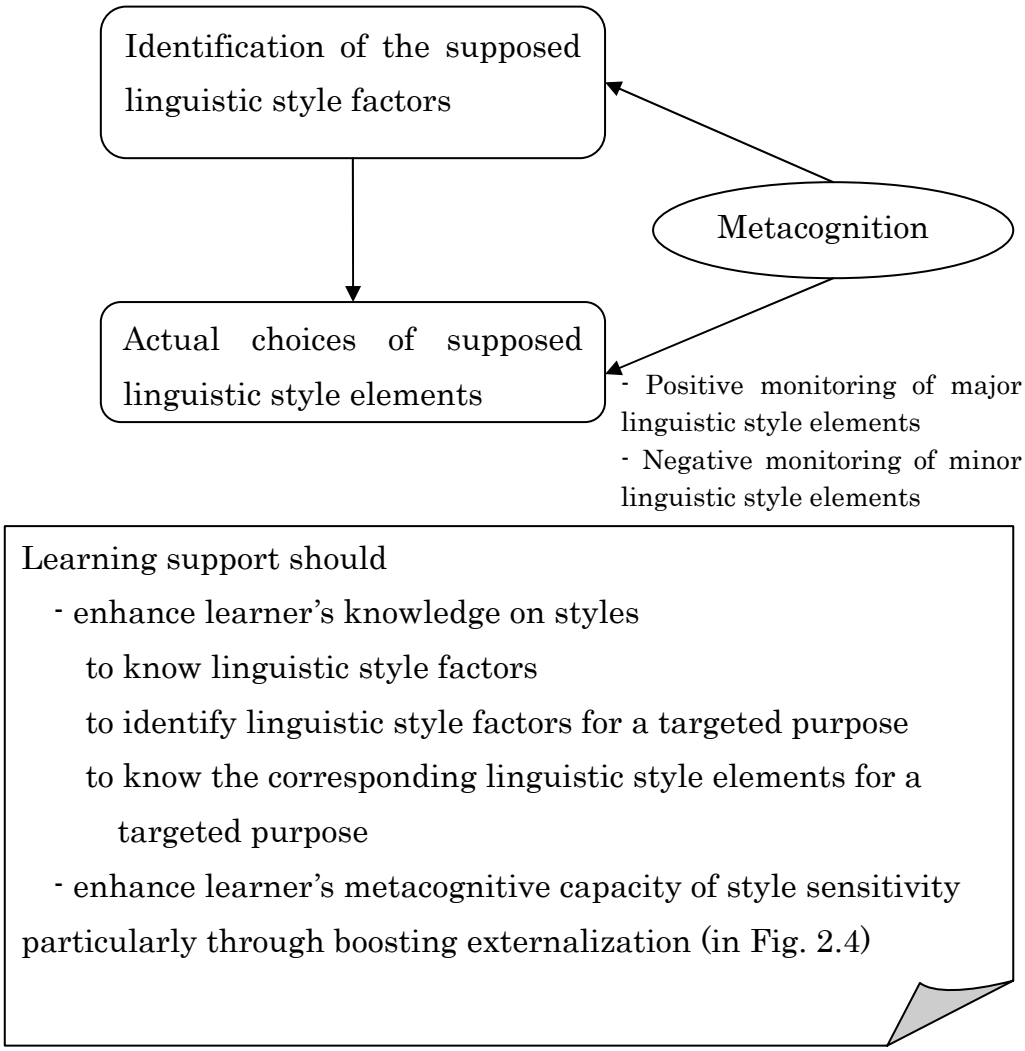


Fig. 2.7. Meta-model of style-sensitive language learning

Chapter 3

A Support for Learning Stylistic Paraphrasing

3.1. Introduction

In this chapter, we will investigate the implementability of a system to enhance positive monitoring of major linguistic style elements. A typical major linguistic style element is the appropriate use of technical terms of a particular genre, but there are many situations in which it is not enough at all just to know technical terms and their meanings because almost all of us meet different kinds of readers/ audience and have to use different linguistic styles for each of them. Take a salesman in a company for example. As a worker in a company, he has colleagues who have a professional knowledge on sales and their products. As a salesman, he has customers who may well lack such a professional knowledge. Naturally, he uses technical terms and jargons when talking to his colleagues while he uses more ordinary terms when talking to his customers. In other words, a worker *is* an interface between professional colleagues and non-professional customers, and

as such, a worker in almost all types of workplace has to use at least two different linguistic styles according to who he talks to. Thus, knowing a technical term may well mean knowing a technical term belonging to a particular linguistic style and its paraphrase belonging to another linguistic style. Note that "technical" does not mean that technical terms are more difficult to learn than more ordinary terms. In many cases, on the contrary, it is far more difficult to learn the corresponding paraphrases of ordinary terms than the technical terms because the former is likely to have a more semantic ambiguity.

In order to pursue the way to support learning technical terms and its paraphrase, we will tackle with an issue: to help foreign workers to learn to choose appropriate words and phrases according to the supposed reader/audience.

People learning Japanese as a second or foreign language, as those learning any foreign language, face a variety of difficulties in mastering Japanese. In particular, foreigners coming to Japan whose purpose is to be employed in Japan have far less time to learn Japanese compared to those who come to Japan for study, but they not only encounter a lot of Japanese expressions that are not or rarely taught in Japanese classes but also are supposed to understand what they really mean and paraphrase or summarize them. In other words, they have less time but need far more. As such, face-to-face Japanese classes are not enough, however well organized they may be, and an easily accessible online support system is needed to help not only learn Japanese systematically but look for expressions they encounter as new in their daily lives to obtain sufficient information for their jobs.

One type of expressions that foreign workers find difficulty with is Japanese mimetic expressions that emulate real sounds or sound-symbolically represent manners of activities. Mimetic expressions are often considered to be used only informally or

colloquially, but it is not the case. Oral instructions in factories often contain mimetic expressions. In particular, crafts-workers often rely on their sensitivity for measuring the completeness of a product, and they tend to use mimetic expressions. See below:

Chanto shiro 'Behave yourself orderly'
Kichitto tsukure 'Make it in a perfect way'
Gosotto toru 'Remove (something) completely or in the gross'
Paritto surumade kawakasu 'Dry something up as if it is well-starched'
Tsurutto narumade migaku 'Shine something up to the point that its surface has no flaws or irregulars at all'

In addition, more and more foreign workers have to communicate with people in general. For example, based on the Economic Partnership Agreements with Indonesia and the Philippines, Japan has been accepting hundreds of nurses and care workers as candidates. They are facing two language barriers: the difficulty of medical and other technical terms and the difficulty of patients' ordinary, often imperfect, utterances that often contain mimetic expressions to describe their symptoms and other sort of things. This is a typical situation in which one has to know the distinction between different linguistic styles.

However, as we discuss later, Japanese mimetic expressions are seldom or never taught in class. To make matters worse, most of the Japanese have difficulty explaining the meaning of mimetic expressions. So foreigners learning Japanese, particularly foreign workers in Japan, have very little chance to learn them.

Based on this recognition, we are planning, as a long-term project, to construct a comprehensive online support system to help foreigners to learn Japanese mimetic expressions and other expressions that are

rarely taught in class or are difficult to learn due to their semantic vagueness. As part of this project, this chapter reports our prototypical web-based online learning-support system for Japanese mimetic expressions, ONOMATOPENARAI. In developing this system, the key features to be considered is the importance of offering paraphrases suitable to multiple linguistic styles, and the promotion of metacognitive awareness.

3.2. Mimetic Expressions in Japanese

Any language has a group of expressions that emulate real sounds and/or sound-symbolically represent manners of activities. They are called mimetic expressions, mimic expressions, onomatopoeia, and other technical terms. The sound of mimetic expressions is considered to reflect what impression native speakers have for the sound. In particular, the sound of the first syllable plays a crucial part for the meaning of mimetic expressions. Thus, *kippari*, *sappari*, *suppari*, and *nopperi* bear very different impressions one another mainly because of the sound impression of the first syllable.

The number of mimetic expressions greatly differs among languages, and whether the group of mimetic expressions forms an independent vocabulary layer depends on languages. For instance, English has no independent vocabulary layer of mimetic expressions that are easily distinctive morphologically or phonologically (Kakehi 1983, Tamori and Schourup 1999), and English has a relatively small list of mimetic expressions that are unanimously recognized as so. On the other hand, Japanese has a clear, distinct layer of mimetic expressions from a phonological viewpoint,(McCawley 1968) and most of the mimetic expressions are formed systematically shown in Table 3.1.

Stem	Variation	
(C)V	(C)V + tto	satto
eg. Sa	(C)V[long] + tto	saatto
	(C)V(C)V + tto	sasatto
	(C)V(C)V[long] + tto	sasaatto
(C1)V1(C2)V2	(C1)V1(C2)V2N	kiran
eg. kirakira	(C1)V1(C2)V2 +tto	kiratto
	Reduplicated forms	
	(X = (C1)V1(C2)V2,	
	N = nasal, G = glottal	
	stop)	kirakira
	X X	(hikaru)
	X X N	kirakiran
	X N X N	kirankiran
	X G X	kirakkira(to)
	(C1)V1G(C2)V2 X	kirrakira
	X G X G	kirakkira(tto)
	(C1)V1[long](C2)V2N	kiirakira
	Collocated particles	
	to	kirakirato
	ni	kirakirani
	de	kirakirade
	Verbalization	
	suru	kirakirasuru

Table 3.1. Morphological patterns of Japanese mimetic expressions

Mimetic expressions are frequently used in Japanese, and just one-minute colloquial utterance contains more than one, usually several, mimetic expressions. As such, not only linguistic researches but also dictionaries dedicated to mimetic expressions for native Japanese have been published (Kakehi, Tamori, and Schourup 1996, Amamura 1974, Sasano 1978, Ono 2007, Shiraishi 1982, Yamaguchi 2003), one of which contains as many as 4,500 mimetic expressions.

However, Japanese mimetic expressions have not been taught systematically in class. For example, virtually no mimetic expressions appear in textbooks for beginners (Three-A Network 1998), and there has never been any systematic explanation or description in any textbook of Japanese for foreign learners. Two brief handbooks are published for foreign learners (Akusu 1994, Gomi 1989), but the number of mimetic expressions in them are fairly small (124 and 250). One of the authors asked twenty foreign students who has various backgrounds in learning Japanese if they had been taught mimetic expressions, and no one has any experience with mimetic expressions in class; all they did was to learn mimetic expressions one by one when they met them.

A couple of online systems for learning Japanese mimetic expressions have been proposed (Lo and Sugiura 1998, Mukarramah, Asaga, and Watanabe 2008, Nakabe, Asaga, and Watanabe 2007), but Lo and Sugiura (1998) has no extensive and extensible database, and the others (Mukarramah, Asaga, and Watanabe 2008, Nakabe, Asaga, and Watanabe 2007) have been on the way and has not been educationally evaluated until now. Independently, we have implemented a prototypical learner-support system for learning Japanese mimetic expressions with a particular emphasis on paraphrasing with technical terms, which we will report in the next section.

3.3. ONOMATOPENARAI

In this section, ONOMATOPENARAI, our prototypical web-based support system for learning mimetic expressions in Japanese, is reported.

3.3.1. The Overview

ONOMATOPENARAI is a prototypical learner-support system for learning Japanese mimetic expressions. As a prototype, it has more than one purposes: (1) to implement a simple but effective web-based learner-support system that plays a complementary role to face-to-face classes and can be used in workplaces, (2) to build a high-quality database of Japanese mimetic expressions, and (3) better understand learners' requirements for both the information provided and the user interface.

ONOMATOPENARAI is a web-based system. It is implemented on a Debian GNU/Linux 5.0 system with Apache 2.2.14 for the web server, MySQL 5.0 for the database, and PHP5.0 and Ruby 1.8 for coding. Currently, the system assumes the access from PC's but not from mobile phones. Though mobile devices are undeniably the easiest ones for everyday use, most of the foreign students and workers are found not to use them for Web crawling due to the relatively high charge for that use.

The functional overview of ONOMATOPENARAI is shown in Fig. 3.1:

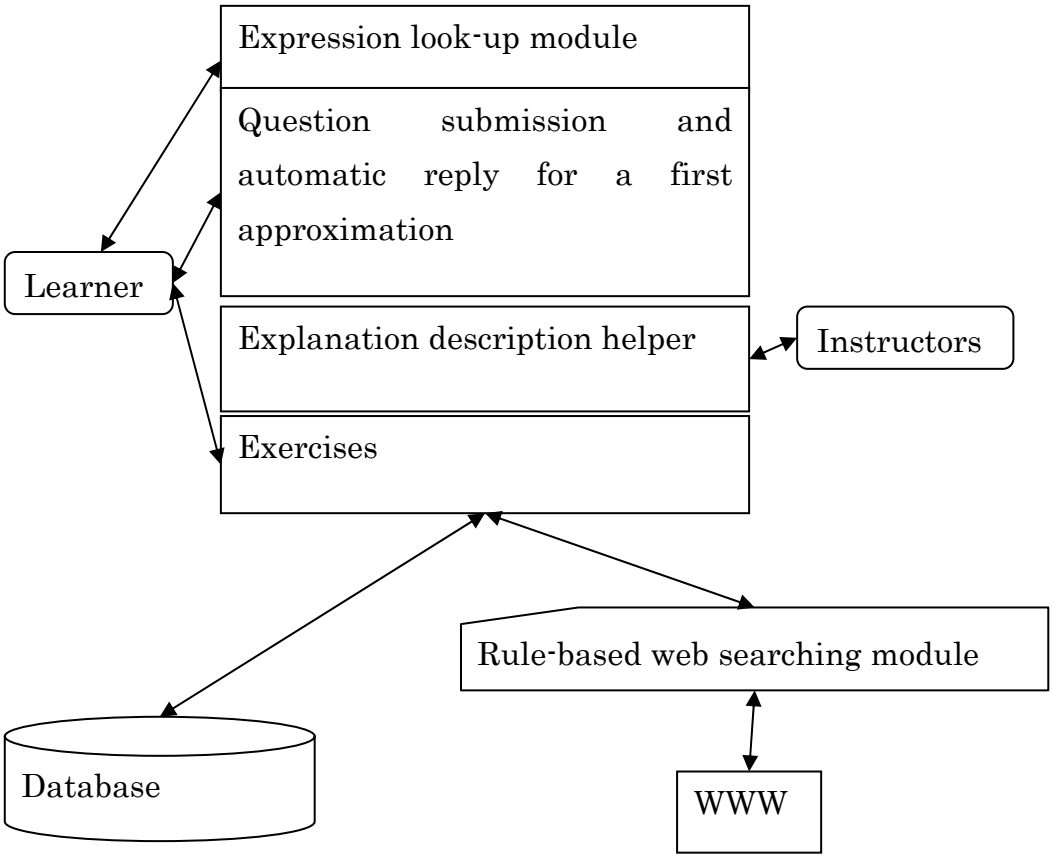


Fig. 3.1. The overview of ONOMATOPENARAI

As in Fig. 3.1, ONOMATOPENARAI has three modules from a learners' viewpoint: Look-up module for registered Japanese mimetic expressions, Question module for unregistered Japanese mimetic expressions, and Exercise module. Currently, approximately 100 mimetic expressions are registered in the database.

3.3.2. Look-up Module

Learners can look up the mimetic expression whose meaning and usage they want to know from the top page of ONOMATOPENARAI. They can use either hiragana (きらきら), katakana (キラキラ), or Roman alphabets (*kirakira*). The system judges whether the input expression is already registered in the database or not, but for that purpose, two preprocesses are employed. First, as discussed in the section 2, Japanese mimetic expressions have variations derived from a single stem and foreign learners are often confused with word units, and the system creates possible variations and search for every one of them in the database. Second, the system tries to make near-sound expressions based on the predefined sound rules. Foreign learners of Japanese, particularly beginning ones, often misspell expressions due to the differences in sounds with their native language. For example, *berabera* is often misspelled as *bedabeda* by South-eastern Asians and others because the *r* sound of Japanese is a kind of flap and if the *r* sound of their native language is more like the *r* either in English or in Italian, they tend to recognize the *r* in Japanese as *d*. Similarly, Chinese often misspell *batabata* as *badabada* or *badabata* because the *t* in Japanese has less aspiration than the *t* in Chinese. Currently, the system has a small set of rewriting rules for this purpose, but we are planning to provide the multiple sets of rewriting rules according to the native languages of the learners.

Then, the system presents the possible candidates in the database, and if one of them is the very word the learner wants to know, he or she click the correct candidate, and the system presents the information as in Fig. 3.2.

The search result page has five types of information: the usages, the aesthetic evaluation like whether it is good or bad, the meanings, similar expressions of both ordinary and technical terms, and example sentences or utterances. All the descriptions and explanation are written in Japanese with the pronunciation for Chinese characters.

Fig. 3.2.　A sample view of registered expressions

3.3.3. Question Module

If the input expression has not been registered in the database or the explanation given to them is not sufficient to them, learners can submit the request for its explanation. This function is indispensible not because the size of the database is still small but because Japanese mimetic expressions are often newly invented or their meanings are changed or differentiated to a particular situation. The submission of their request is automatically notified to registered instructors and prompts them to add the explanation for it. After the explanation is added, the system notifies the learner who submits the request of the addition, but it takes time. As we can easily imagine, learners look up a mimetic expression on such a system as ours because they do have some difficulty doing something because they do not know its meaning. So, for this kind of system, some device for presenting them with some approximation of explanation.

For that purpose, we experimentally implemented a rule-based web searching module which enables learners and instructors to see example sentences with the input expression. The rules corresponds to two phases. First, a set of rules creates a set of retrieval keys by adding particles and verbal suffixes in order to restrict the search results: for example, if a learner wants to know the meaning of *guragura*, on the condition that it is not registered in the database, our rule-based web searching module first creates a set of retrieval keys like *guragurato*, *guragurasuru*, and *guraguraninaru*. Though mimetic expressions can be used without those particles and verbal suffixes, like *guragura yureru* ('shake'), mimetic expressions themselves as a retrieval key tend to explode the size of search results. Thus, the created set of retrieval keys are used for web search using Google. Then, the results

returned from Google are processed by the other set of rules. After tagged by Mecab, a Japanese morphological tagger, only the sentence including the combinations of the retrieval keys and predefined postpositions are chosen. See Table 3.2.

With the selected results, the number of sentences containing each combination is counted and two or three examples for each combination are presented to learners as in Fig.3.3.

Predefined combination N for noun, V for verb, X for mimetic expression	Example
N ga X-suru	Ha-ga guragura-suru (‘A tooth is loose’)
N wo X-suru	Kubi-wo guragura-suru (‘I shake my head’)
N ga X-ninaru	Ha-ga guragura-ninaru (‘A tooth is becoming loose’)
N wo X-to V	Kubi-wo guragura-to yusuru (‘I shake my head’)
X-to N wo V	Guragura-to kubi-wo yusuru

Table 3.2. Predefined combinations
of the retrieval keys and predefined postpositions

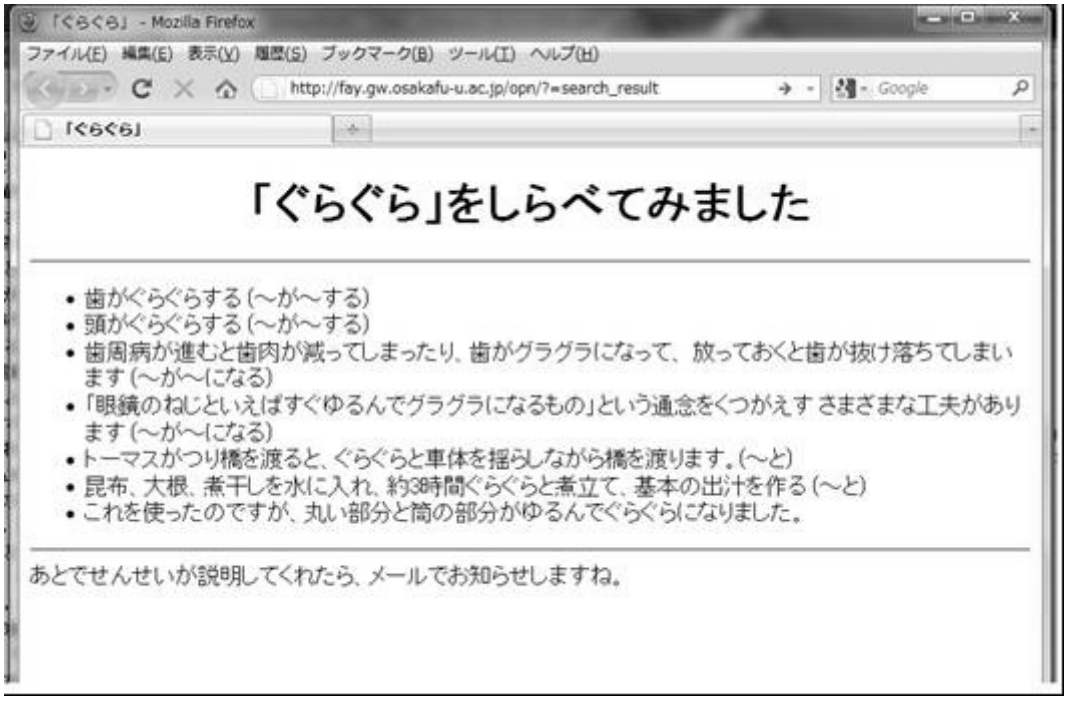


Fig. 3.3.　A sample view of search results for unregistered expressions

With this presentation, the learner may obtain the vague meaning of the input mimetic expressions. Some think that a similar method can be employed for Google image search in order to present not only text examples but also images symbolizing the mimetic expression, but our experiment indicates that it is not so because most of the searched images do not symbolize the searched mimetic expression.

The same web searching module is also employed for presenting examples to instructors when they write the description and explanation.

3.3.4. Exercise Module

In order for learners to check their understanding, the exercise module is implemented, but currently it consists only of two types of excises: to choose the correct similar expressions and to choose the correct paraphrase among the technical terms. A exercise set consists of ten questions automatically generated with the example sentences and utterances in the database; choices are also automatically generated randomly from the registered entry in the database.

3.3.5. A Rough Evaluation

We made an experiment for the rough evaluation of ONOMATOPENARAI by letting seven foreign students and workers who already passed the 1st or 2nd grade of Japanese Proficiency Exam use the system for ten days and made a questionnaire survey and interviews.

Six out of the seven answered that they had had an urgent need to know the mimetic expressions for their work, and the traditional dictionaries did not give them the sufficient information. All of the subjects had a favorable impression for ONOMATOPENARAI as an

easily accessible web-based support system for mimetic expressions. As for the look-up module, the aesthetic information and the paraphrases were considered to be particularly useful. On the other hand, beginning and early intermediate levels of learners said that the quick search results of the question module are sometimes effectless for understanding the meaning of the searched expression because the examples are too short or contains difficult words. The former is due to the use of Google which returns a vast number of results from Twitter and sites where fragmental utterances are widely used. They also said that text-based descriptions are sometimes difficult to understand.

3.4. Concluding Remarks

Currently, ONOMATOPENARAI has no module for a systematic learning of Japanese mimetic expressions, and much has to be done for general, practical use. For example, different levels of learners need different types of descriptions and explanation; they should be prepared both for beginners and for intermediate/advanced learners. The web searching module can be extended to automatically extract and present part of the aesthetic information. In addition, images and short videos symbolizing mimetic expressions will be effective particularly for beginning and early intermediate learners, though the cost for their preparation is clearly a bottleneck.

However, it has been found that there is a strong need for online Japanese learning support systems for mimetic expressions and others as a complement for a limited time of classwork, and the aesthetic information and phrases are particularly required. To meet these needs, as we discussed, it is essential to provide not only the explanation of mimetic expressions themselves but also their paraphrases in a more technical linguistic style their jobs requires them to use.

We are revising and extending ONOMATOPENARAI, and are planning to make another usability experiment with foreign nurses and care workers.

Chapter 4

Detecting Style Inconsistencies

4.1. Introduction

As discussed in Chapter 2, any kind of text expressions, from human utterances and writing to robotic utterances and text generation, require stylistic consistency suited to the targeted genres and the author's communicative purposes. The style of a particular genre contains at least suitable choices of words and phrases for the genre, the grammatical variations suited to it, and the sentential lengths and constructions, though the last is heavily influenced by the former two. The wrong choices in any aspect of the above may well lead to stylistic inconsistency, but the learner may well not know what is right and what is wrong, and negative monitoring does not work. Then the learner is likely to use a linguistic style that is most familiar to him/her, a variation of colloquial styles. Of course, even a beginner may use the correct major linguistic style elements if s/he is a native speaker of the language s/he uses, but even an advanced learner often has difficulty noticing minor linguistic style elements. Thus an automatic

detection tool is desirable for such wrong choices, particularly for learners. However, none of the existing grammar and style checkers implemented in commercial word processing software is sensitive to style variations. To make matters worse, a genre can be further classified into several subgenres mainly according to the author's communicative purposes, i.e., whether the text is intended for professionals or for people with little knowledge on that topic, etc., which means that a style checker sensitive to genre variations should be customizable by learners or instructors for their purposes.

The suitability of a text for a particular genre is basically measured by the degree of its similarity to the model set of texts of the genre and the degree of its dissimilarity to the contrastive set of texts out of the genre. In other words, a genre has its own linguistic style, and the set of linguistic style elements of the linguistic style can be extracted from the model set of texts of the genre contains by comparing it to that of another genre. Then, it is possible to detect style anomalies and show them to the learner for promoting negative monitoring.

In this chapter, we propose a method to visually point out potential stylistic inconsistency of a Japanese text from the targeted genre based on the similarity to the model set of texts of the genre, and the dissimilarity to the contrastively wrong set of texts for the genre. The overall process of our method is diagramed as in Fig.4.1.

The organization of this chapter is as follows: Section 2 describes the concept of genre and its stylistic consistency. Section 3 discusses style feature extraction and a basic visualization method, and Section 4 proposes improvements for visualization.

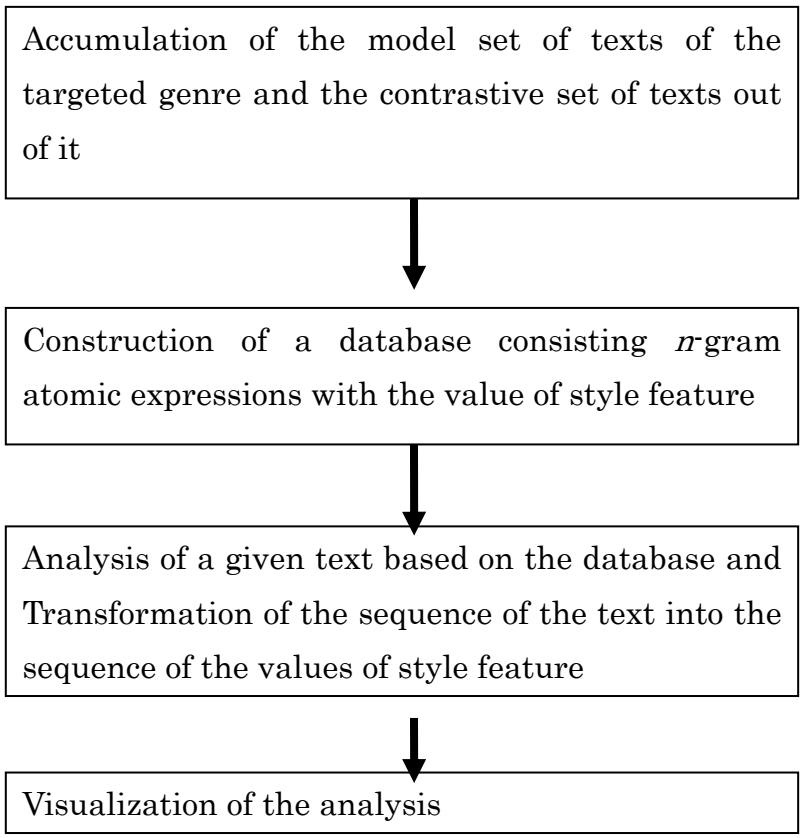


Fig. 4.1. Our proposed processes for visualization

4.2. Genre and Stylistic Consistency

Any text is classified into a genre. A genre is a set of criteria for a category of text, usually according to its topic and its method of publication. Therefore, a text may be categorized as belonging to the genre of biology according to its topic, or as a newspaper article because it is published in a newspaper. A genre is further divided into subgenres, part of which are sometimes regarded as linguistic registers, mainly according to their narrative aspects. The type of narration, or linguistic style, is strongly related to the targeted audience and the author's communicative purpose of the text, and stylistic consistency is required in a text, though deliberate inconsistencies do bring extra literary effects. (Schiffrin, Tannen, and Hamilton 2001)

Stylistic consistency constitutes the use of suitable words, grammatical expressions, syntactic word orders and complexities, average sentence length, and information flow, though not limited to them. Several studies have tackled style; in particular, it has long been pointed out that basic stylistic consistency is maintained by the restrictive use of functional expressions, particularly in the case of Japanese and other languages that have a rich variety of stylistic grammar forms.

a. Kore-wa hon-desu.
   this book be-pres.
   This is a book.
b. Kore-wa hon-da.

Both 'desu' and 'da' are auxiliary copular verbs and their difference is due to politeness, which in turn should be determined according to the

targeted audience and the author's communicative purpose. So the mixed use of 'desu' and 'wa' causes undesirable stylistic inconsistency and thus should be avoided.

However, finer-grained observations of various kinds of human texts have found that a text genre traditionally considered to hold one single style should be decomposed into several different linguistic styles according to their subtle differences of target audience and the author's communicative purpose. For example, we can easily distinguish a newspaper article from a newspaper editorial, or a textbook for graduate students from one for undergraduate or high school students, not just in terms of their contents, but also in terms of their linguistic style, though few of us can always make clear our criteria for this kind of distinction. Style has been studied mainly in the field of linguistics, literature, and education (for example, Strunk Jr. and White 2004, Williams 2008), but most studies are based on subjective, aesthetic judgments, and the finer-grained distinction of subgenres requires more objective, corpora-based analysis. In order to develop a tool detecting and visualizing style anomalies, we need a computational definition of 'expressions' that constitute a text, and a method to calculate the degree of similarity among texts.

4.3. Stylistic Feature Extraction and Visualization

Stylistic consistency does not only depend on the inner consistency in the text, but also on the appropriate choice of style for the textual purpose. In other words, the target audience and the author's communicative purpose determine the most desirable style. Then authors, with their limited reading experience, attempt to maintain stylistic consistency: i.e., they try to employ as many appropriate stylistic features as possible and try not to use inappropriate stylistic

features. Very often an author, particularly one who is learning to write, makes mistakes in his/her choice of appropriate expressions partly because the stylistic distinction is subtle and often unconscious, partly because authors unconsciously rely on their own judgment, which comes from their most accustomed style, namely an informal speech style, and partly because every one of us speaks and writes a number of different texts each of which has its own style. and authors tend to rely on their intuition, which only tells them that a particular stylistic feature may not suit the purpose.

With these points in mind, we first construct a set of textual corpora that consists of two or more subgenres and extract stylistic features of each subgenre. These sets roughly correspond to our reading experiences, but the larger size is naturally expected to contribute to a better detection of stylistic features. For the first approximation, let us consider that stylistic features of a subgenre are based on the use of preferable expressions for the subgenre and the lack of undesirable expressions for it. The definition of 'expression' may vary, but it should be noted that a large number of words, including misspelled ones, are found unregistered in dictionaries that any morphological taggers use, that our current target language, Japanese, still has some serious problems in tokenization, and, most importantly, that the mere frequency of a word or a phrase without regard to its context does not reflect the precise tendency of the use of the word in a subgenre because a word usually has more than one meaning and usage, each of which is differently preferred or avoided in different subgenres. So here, we define an atomic expression as an *n*-gram character string. *N*-gram character extraction is a simple way to extract atomic expressions, and successfully contains the contextual information when *n* is large enough, though too large *n* naturally causes too many low frequencies. A sample of a string of *n*-gram atomic expressions is shown in Fig. 4.2.

The determination of the proper (range of) *n* is a heuristic issue, and we first adopt the range of n as two to four, mainly because most Japanese words consist of one or two characters.

To conduct the first experiment, we used a dumped file of Japanese Wikipedia and a sample of 2ch BBS (http://www.2ch.net/) as sample contrastive data sets, the sizes of which are shown in Table 4.1.

The frequency of each atomic expression in Wikipedia and 2ch classifies them roughly into three classes: (a) atomic expressions frequently used in Wikipedia but not frequently used in 2ch, (b) atomic expression frequently used in both data, and (c) atomic expressions not frequently used in Wikipedia but frequently used in 2ch. This classification means that the class (b) consists of rather neutral atomic expressions, whose use may well not characterize a text as either of the two, while the class (a) and (c) are to be considered to be stylistic features for Wikipedia and 2ch, respectively. The scatter diagram of 2- to 4-gram expressions is shown in Fig.4.3.

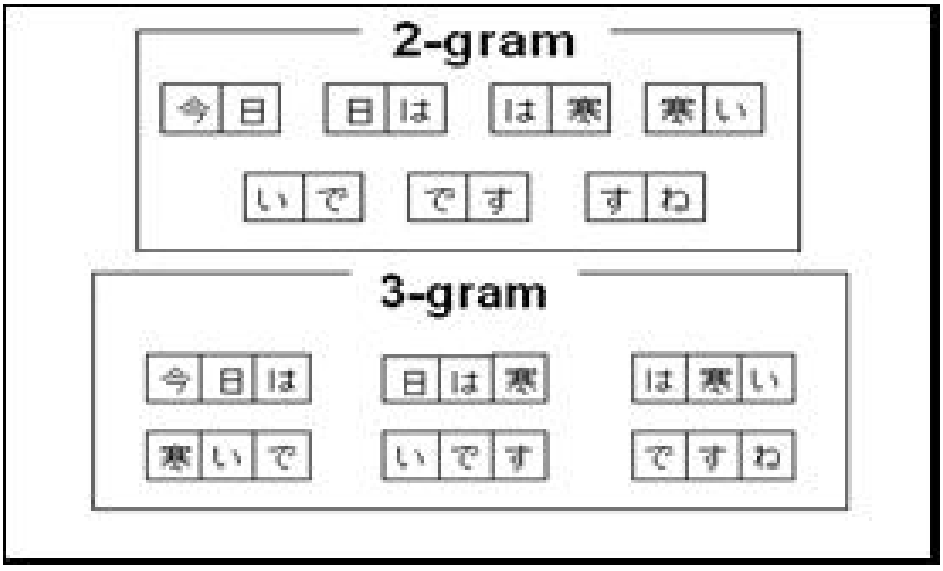


Fig.4.2. n-gram sample expressions in a Japanese equivalent of 'It is cold today'

Data	Number of characters
Wikipedia	161,223,892
2ch	108,031,243

Table 4.1. Data set

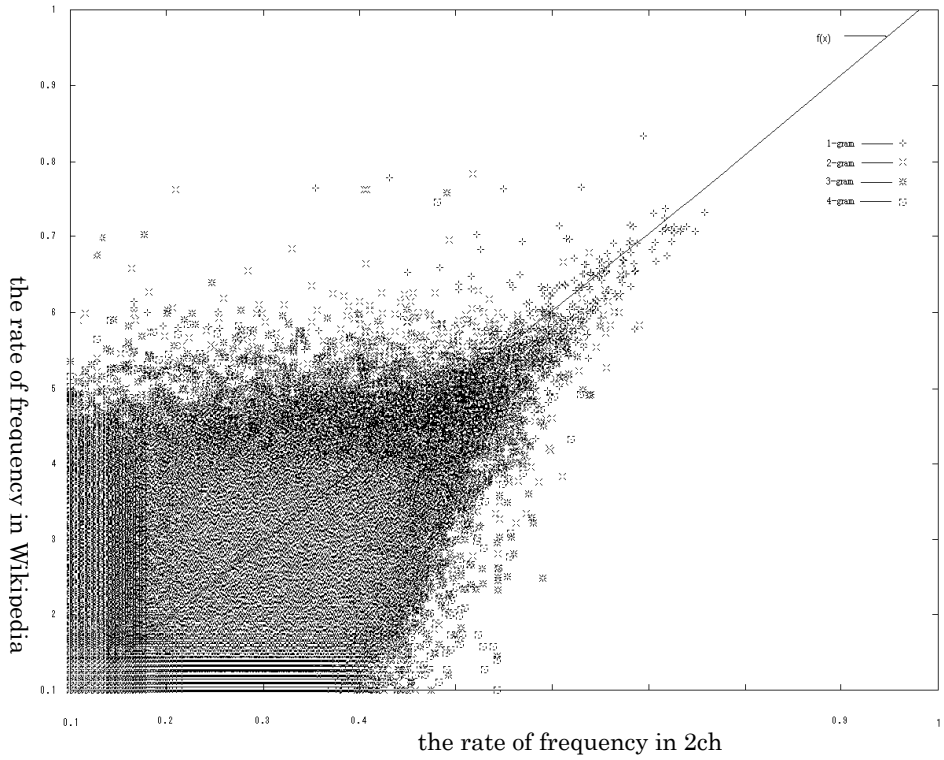


Fig.4.3. Scatter diagram of 1- to 4-gram expressions used in Wikipedia and 2ch sample corpora

With this kind of scatter diagram, each atomic expression, or stylistic feature, can be graded according to its distance from the catercorner (Uchiyama and Chujo 2007). So let us define a signed function *gr* (*e*) representing the preference for a particular subgenre as follows:

> For a given atomic expression e, the grade function *gr* (*e*) of Wikipedia-preference is
> *gr* (e) = *c dis* (*e*)
> where *dis* (*e*) is the distance from the catercorner,
> and *c* = 1 if *e* is plotted below the catercorner
> *c* = 0 if *e* is plotted on the catercorner
> *c* = -1 if *e* is plotted above the catercorner.
> (X-axis: frequencies in Wikipedia, Y-axis: frequencies in 2ch)

With this function *gr* (*e*), We made an expression database *Σ* (*e*) consisting of *gr* (*e*) of all the atomic expressions in the Wikipedia and 2ch corpora we used. Then every atomic expression that appears in a given text *T* is graded using *Σ* (*e*), by which we obtain a ordered sequence of the values of *gr* (*e*) of T as shown below:

> Sample *T*: でも，この問題は解決困難だ.
> (lit. But this problem is difficult to solve)
> 3-gram: [でもこ][もこの][この問][の問題][問題は][題は解][は解決][解決困][決困難][困難だ]
> Stylistic feature value sequence: [-4.2][-3.5][0.4][0.3][0.2][0.5][0.4][2.5][3.2][1.2]

With this type of stylistic feature value sequence representing the resemblance of a given text *T* with the model set of texts of the target genre, we are now able to visualize the textual characteristics on this aspect. A sample visualization of a student' essay is shown in Fig. 4.4.

As shown in Fig. 4.4, the overall tendency of the student's essay used for this analysis resembles more to Wikipedia than to 2ch, but still it contains lots of expressions that are to be avoided in Wikipedia or preferred in 2ch. In other words, if we have a model set of corpora, one of which represents the targeted subgenre, any text can be graded and visualized with the function *gr* (*e*), and this type of visualization, though more improvements are necessary for practical use, can be used to visually point out expressions that may be avoided for the targeted subgenre.

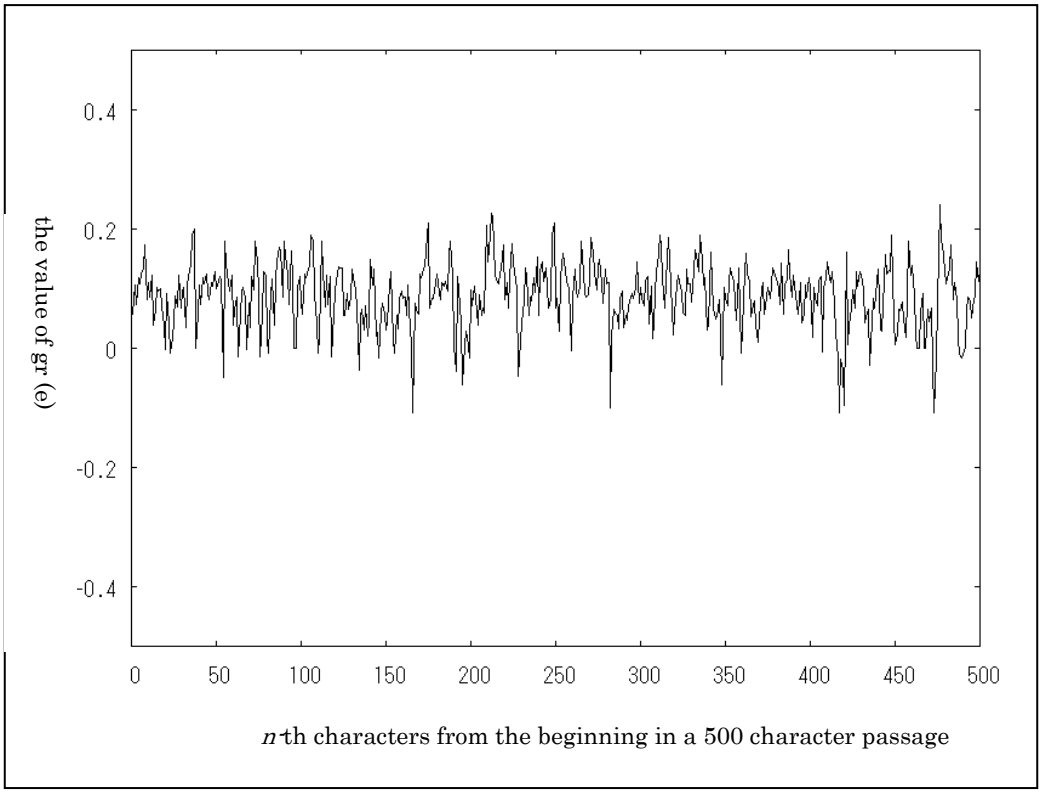


Fig. 4.4 Resemblance visualization of a sample passage

4.4. Visual Improvements

4.4.1. Interface Design to Promote Awareness

So far, we have discussed well-written text must achieve not only the coherent and cohesive logical organization but also the textual consistency of writing style. In the previous section, we have argued what features can specify the characteristics of genre and writer's communicative intention and purposes. In this section, we proposes a new way of visualization method of style inconsistencies in texts using multiple corpora, which promotes awareness of the local and global consistency in the editing text. When one is writing a text, it is necessary for him/her to be aware of the following two viewpoints.

- sentence-level consistency
- passage-level consistency

We propose an interface to realize this idea in Fig. 4.5. In this section, we would like to examine some modules to realize such visual interfaces. Fig. 4.5 shows an editing window (left hand side) which displays errors from the first viewpoint (sentence-level consistency). This kind of visualization, which informs local consistency such as spelling errors and simple syntactic errors, has been implemented in some word processors such as Microsoft Word. The other viewpoint is shown at the right hand side in Fig.4.5. The writer can confirm the global consistency of editing text through the small windows. The information from the windows should correspond to the change in text edit and it is necessary for the revision processing of the author to synchronize in real time.

In Section 4.3, we proposed a rather simple approach to evaluate a text in term of its appropriate style for the targeted subgenre by comparing its expressions with a model set of corpora, and visualized

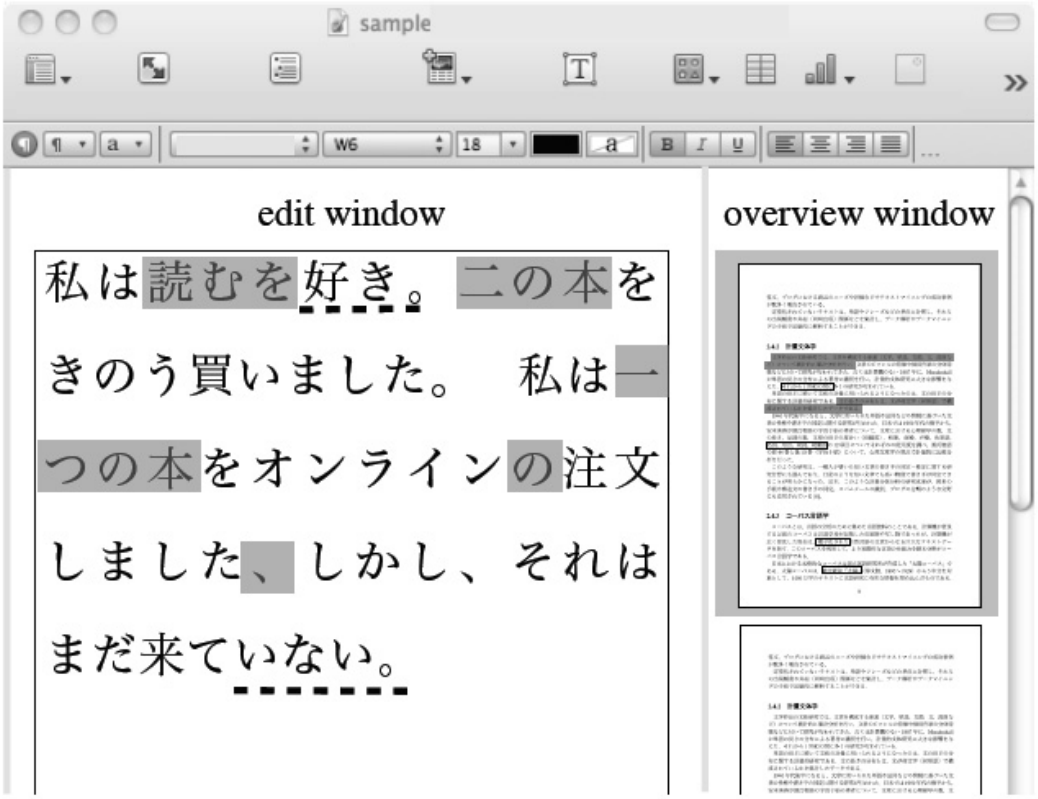


Fig. 4.5. Interface design for text awareness promotion

the result. In order to apply this method to a genre-sensitive style checker to detect the parts to be revised and improved, at least two problems are to be solved.

(P1) First, the method only uses the frequency of expression to judge whether a given expression is preferable or not for the targeted subgenre, but there should be different reasons for each expression being judged unfavorable: some may contain spelling errors, some grammatical errors, and others undesirable choice of words or phrases. This problem closely relates to evaluate the local consistency.

(P2) Second, the visualization like Figure 4.3 is redundant for authors, since what is important is to point out unfavorable expressions for the targeted subgenre, and the grade differences among preferable expressions make little sense because the value of $gr(e)$ near zero means that the expression tends to be used neutrally among corpora. This problem closely relates to evaluate the global consistency.

4.4.2. Visualization of Sentence-Level Consistency

For dealing with the first problem (P1), an additional method detecting serious errors is required. As for the determination of the serious errors, we observed a set of students' essays and picked up the following five frequent serious errors that should be detected:

(a) Spelling errors

(b) Inappropriate choice of case particles

(c) Nouns with inappropriate modifiers

(d) Inappropriate letter choice in nouns
(mischoices among hiragana, katakana, and kanji)

(e) ordering errors of phrases (*bunsetsu* in Japanese)

Then we prepared a set of data in which five types of errors pointed above were mechanically collected. With this data set, we tested two error detection models (shown in Fig.4.6) for Japanese optical character reading (Murata and Isahara 2002, Araki et all 2000), and made experiments for evaluating these two models and tuning parameters.

Model A in Fig. 4.6 focuses on the contextual allegation and detects the maximum inappropriateness (Murata and Isahara 2002). The degree of negativity, $P(x)$ in calculated for each pair x. In this case, we consider each pair $x = (a; b)$ to be a binominal relation this $p(x)$ is expressed by the following equation:

$$p(x) = p(a)p(b);$$

and $P(x)$ is expressed as follows:

$$P(x) = 1 - (1 - p(a)p(b))^n;$$

where n is the number of characters in the corpus, and $p(a)$ and $p(b)$ are

$$p(a) = freq(a) / n$$
$$p(b) = freq(b) / n$$

where $freq(a)$ and $freq(b)$ are the frequency of occurrence of a and b, respectively, in the corpus.

Model B in Fig. 4.6 employs m-th order Markov Model(Araki et al 2000). In order to detect the lowest probability of transitions of a given string x_i following the prior m strings using the equation:

$$P(x_i \mid x_{i-m}, x_{i-m+1}, \cdots, x_{i-1}) \equiv \frac{O(x_{i-m}, x_{i-m+1}, \cdots, x_{i-1}, x_i)}{O(x_{i-m}, x_{i-m+1}, \cdots, x_{i-1})}$$

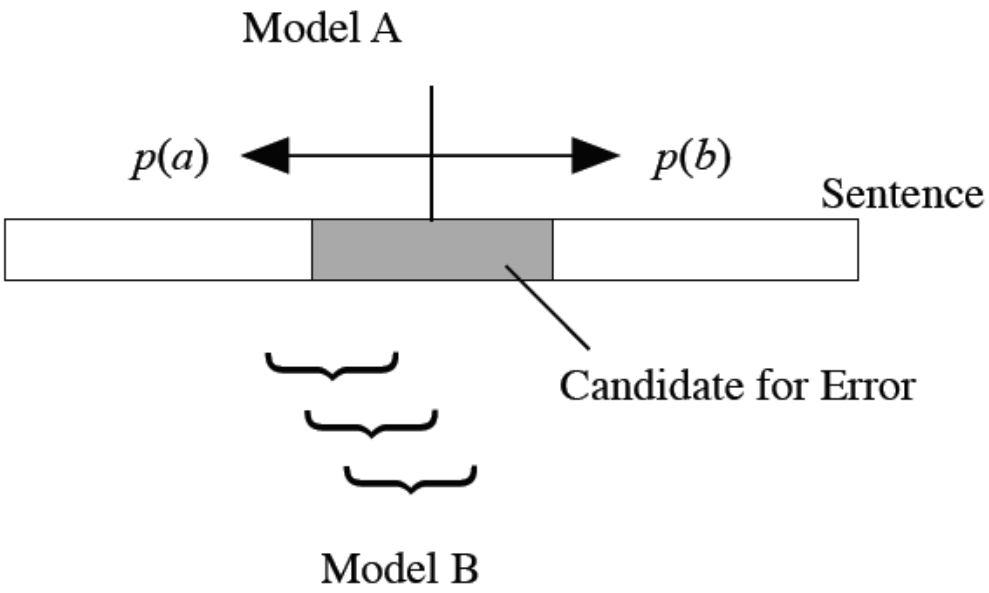


Fig. 4.6. Two error detection models in a sentence

Example
いろいろな事が 出気る ように 部屋に 閉じ込り ゲームで儲けようとする人 より良い人間関係を 気付け たり 計帯 電話はなくてはならないものだ 最近では、パソコンの 複きゅう により 本を 一刷 借りてきた 京都 二句 の開票状況です

Table 4.2 Errors detected with ALG1

Neither models can detect all the errors of (a) to (e) but tuning up the parameters with the artificial set of data improved the detection rate. In the following sections, we refer to the improved modules as ALG1. In Table 4.2, the phrases which are underlined express the error (inconsistencies) detects with ALG1.

4.4.3. Visualization of Passage-Level Consistency

As for the second problem(P2), it is desirable to visualize only the appearances of undesirable expressions effectively, but at the same time, visualizing the sequence of the raw value of *gr* (e) as in Fig. 4.4 should be smoothed, since the raw value of *gr* (e) corresponds to each n-gram atomic expression which naturally contains redundancy. For these purposes, we propose a function *score* (x, w) for smooth visualization of the appearances of undesirable expressions for the targeted subgenre:

$$score(\mathrm{x},\mathrm{w}) = -\sum_{\mathrm{e}\in n-\mathrm{gram}(\mathrm{x},\mathrm{x}+\mathrm{w})} \mathrm{b}(\mathrm{e})$$

$$\text{where } \mathrm{b}(\mathrm{e}) = 0 \text{ when } dis(\mathrm{e}) - \alpha > 0$$

$$= (dis(\mathrm{e}) - \alpha)^2 \text{ when } dis(\mathrm{e}) - \alpha < 0$$

α is a heuristically determined coefficient.

n-gram (x, x+w) is a function that returns the set of *n*-gram expressions included from x-th to w-th strings.

With this simple function, the resultant visualization of the same student's essay used for Figure 4.3 is shown in Fig. 4.7. With this type of visualization, the appearances of wrong expressions for the targeted genre are easy to detect for an author to revise and improve the original text.

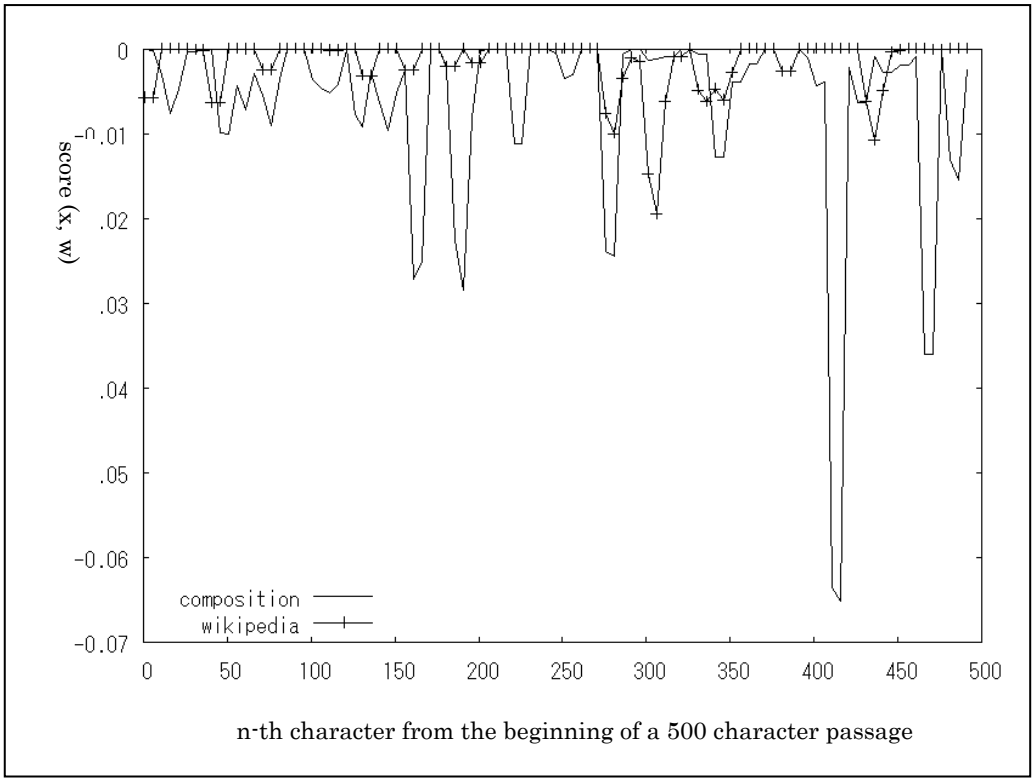


Fig. 4.7. Smoothed visualization

On the other hand, visualization of passage-level consistency should be shown as a different features from the local consistency of a text. The size of consistency spans shown in Fig7 is too small to show the passage-level consistency that a sequences of sentences or clauses forms.

As we have reviewed in Section 4.3, there are words which are successfully used in identifying the genre of a text. Those n-grams are often parts of content words and perhaps they would be better to find frequently occurring words. Content words are defined as the words which are not function words and function words are words that have little lexical meaning or have ambiguous meaning. For example, dictionaries always define the specific meanings of content words, but only describe the general usages of function words. Instead of the complexities to describe the meaning of function words, these words serve to express grammatical structure of a sentence or clause and specify the attitude or mood of the writer. In order to extend a simple consistency analysis based on content words to adopt more various degree of consistency, we adopt a method based on occurrence of function words.

One of the problems when we examine the occurrence of functions words is that the use of them strongly depends on the writers. If we adopt a corpus in which sentences are corrected from a free Internet forum to which anyone can freely post their articles, the use of function words are various beyond identifying certain genre. From this reason, we have to use a smaller corpus in which the use of function words is expected to be consistent

Our idea to override this problem is to rewrite content words which occur not so frequently as function words in a corpus into variables. It means that we consider the occurrence of infrequent content words as special words in certain context. For example, there are some examples:

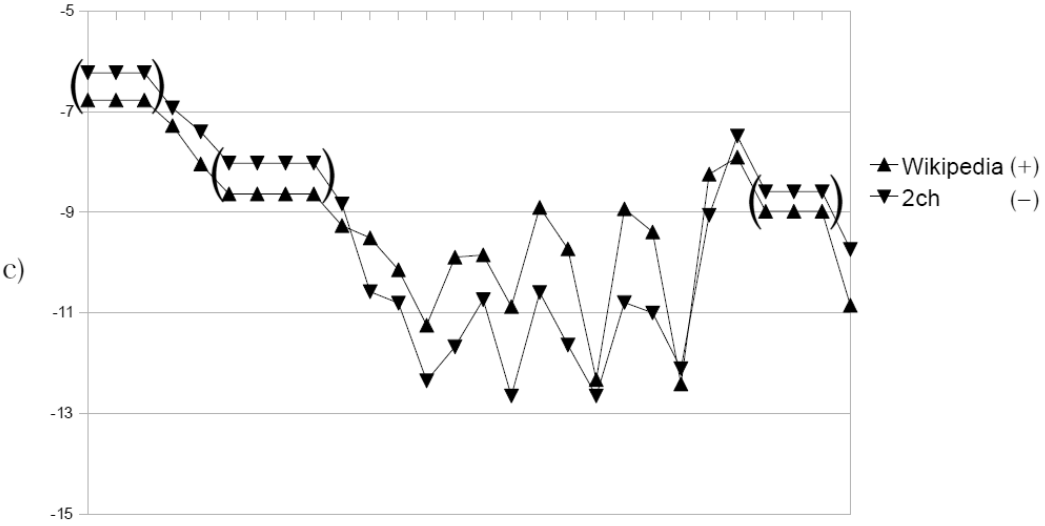
in the following pair a) accepts words which are anything other than the function words in the sentence from Wikipedia are replaced to the special words like ○ and ●, and the example pair b) is from a judicial precedent. The variety of these special words (○ and ●) is small, and which special word should be rewritten to depends on the attributes of the content word to rewrite.

(a) 革製品などの日本に特産物をもたらした。
○などの●に○をもたらした。
(b) 加入金相当額の支払を求めた事案である。
○の●を求めた●である。

In this way, we improve a simple smoothing algorithm to evaluate passage-level consistency. The first sentence (a) shown in Fig.4.8 shows an example extracted from Wikipedia to evaluate the passage-level consistency. The second sentence (b) is rewritten as we explained above, in which each sequence of special character (○ or ●) in (b) is regarded as one character in the algorithm. The graph (c) is a result of the calculation, in which one line shows the passage-level consistency based on Wikipedia corpus, and the other line is based on 2ch. Each character in (d) shows which genre (eg. Wikipedia or 2ch) the corresponding character in (a) belongs to. The stream of characters (d) is an output with the following algorithm, when sentence (a) consists of $\{c_1, c_2, \ldots, c_n\}$ and both functions $gscore(\{Wikipedia, 2ch\}, x)$ are given from the graph (c).

a) フランスの西南西地方で、地震が発生し、同日までの最大規模の

b) ○○○○の●●●●●で、地震が発生し、同日までの●●●●の



c)

d) ＊＊＊＊＊＊＊＊＊＊＊＊＋＋＋＋＋＋＋＋＋＋＋＋＊＊＊＊＊＊

Fig. 4.8 Example of the background process
for passage-level consistency visualization

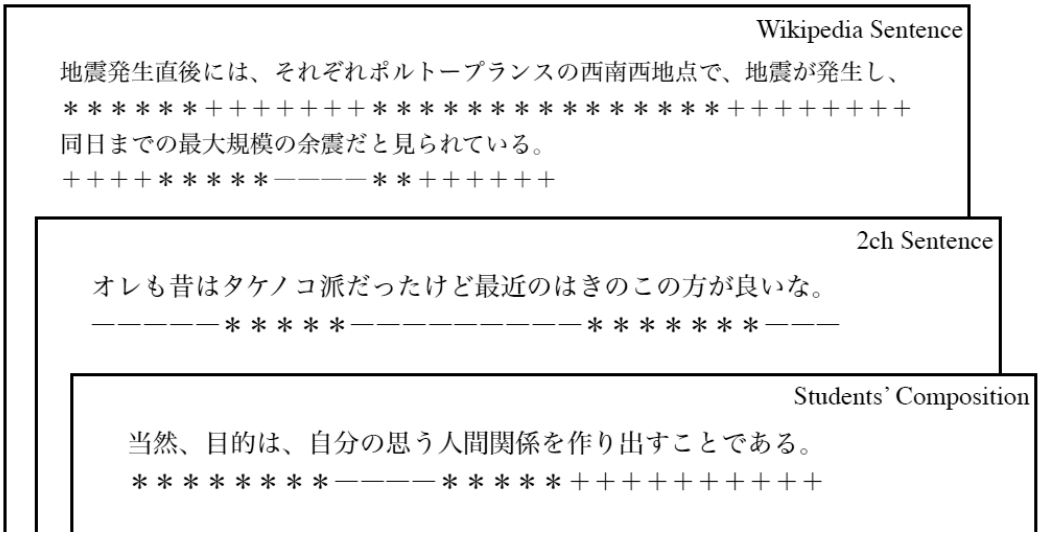


Fig. 4.9. Examples of Passage-Level Consistency Visualization

```
{c1,c2,...,cn}.each do |x|
   y = gscore(Wikipeida, x) - gscore(2ch, x)
   if y-h > 0 then
      print " ＋ "
   else if y+h < 0 then
      print " － "
   else
      print " ＊ "
   endif
end
```

The example sequence (d) shows the passage-level consistency of (a), in which most clauses in (a) judged as neutral(shown as ‘＊’) and the middle part of it belongs to the genre of Wikipedia (shown as ‘＋’). In Fig.4.9, there are some results where we applied this algorithm to the texts in some typical genres. With the consideration above, we can conclude that our improvement of the simple smoothing algorithm will be useful to develop a more suitable visualization of style inconsistency.

4.5. Concluding Remarks

Any text, be it written by humans or generated by computers, must choose a specific style and hold consistency. Textual style is based on the genre to which the text should belong. Each genre has its unique characteristics based on the way of narration, the topics, the targeted audience, and the author ’s intention. Thus, in order to write or produce better passages, a finer-grained style checker sensitive to differences among genres is to be developed. In this chapter, we discussed a foundational idea for this purpose: 1) the flexible data accumulation of the style features of atomic expressions based on any kind of

contrastive sets of texts representing the good and bad examples for the targeted genre, 2) an analysis of a given text using the style features, 3) and a visualization to effectively detect the local and global consistency. As a foundational data accumulation and analyses for them for the purpose of developing a fine-grained consistency checker with visualization for users to aware the consistency in his/her writings, we proposed a method using multi-corpora comparison to correctly extract expressions not suited to a particular subgenre intended, and developed an experimental visualization. Much has to be done towards a practically effective tool, but any advanced tool to help to detect undesirable expression should be conscious of stylistic differences among subgenres and our proposed methods are fundamentally effective.

Chapter 5 Rhetorical Structure Ontology

5.1. Introduction

In Chapter 6, as an instantiation of learner support system for text organization, we will propose a comprehensive online learning/support system for presentation with slides, and, as part of it, we are constructing a multimedia learner corpus of learners' presentations. The former contains Presentation Organizer with which to construct oral manuscripts and corresponding slides simultaneously, and the latter contains orally spoken texts and slides to be annotated. Both require a fine-grained way to describe and represent the text organization, or rhetorical structure of presentation.

Rhetorical structure has long been investigated in literature and linguistics, and computational linguists have pursued the possibility of applying it to natural language generation and automatic summarization in particular (Forsbom 2005). A number of theories and frameworks have been proposed (Groza 2009), of which Rhetorical Structure Theory, originally proposed by Mann and Thompson, is the most popular, together with its numerous variants. However, all of the frameworks deal with written texts, and though it is obvious that

presentations have similar, if not truly the same, rhetorical structures, none of them have been applied to presentations.

Various types of domain ontology have been investigated in order to make structured knowledge machine-readable for further computational treatments (Nicholas 1994, Haris ad DiMarco 2009, Pinto), and instances of rhetorical structure ontology have also been proposed (Staaab, and Tempich 2004, Rahhal et al 2007). In particular, Rahhal *et al.* (2007) share a similar perspective with us in that their system is intended for supporting collaborative writing, and is based on OWL which is widely used for Semantic Web. For implementing a well-designed ontology for annotating writings or presentations with some potential textual inconsistencies or imperfections, at least three conditions must be met:

(1) to reveal the rhetorical structure properly

(2) to reveal and represent textual inconsistencies or imperfections,

(3) to minimize annotators' biases.

Furthermore, presentations with slides naturally have dual structures: orally spoken texts and corresponding slides, and it should be necessary for our ontology framework to deal with both in a unified way.

In this chapter, we propose a prototypical ontology, PRESONTO, for representing rhetorical structures of presentations, based on our intensive analyses of hundreds of learners' presentations with slides. PRESONTO, with a revised variant of rhetorical structure, can be used to annotate both writings or presentations with some potential textual inconsistencies or imperfections, and in particular, the relationship between the orally spoken text and the corresponding slides can be satisfactorily handled.

The rest of the chapter is as follows: In Section 2, we reconsider Rhetorical Structure Theory for the purpose of representing presentations with potential textual inconsistencies and imperfections.

In Section 3, we propose our prototypical ontology, PRESONTO, and section 4 is the conclusion.

5.2. Rhetorical Structure Theory

5.2.1. Basics of RST

Rhetorical Structure Theory (henceforth, RST) was proposed and developed by Mann and Thompson and other researchers as a descriptive framework of texts (Mann and Thompson 1987, Mann and Thompson 1988, Tohmpson and Mann 1992, Taboada and Mann 2006a 2006b), and has been widely used for various linguistic and computational purposes like natural language text generation and automatic text summarization (Forsbom 2005). In the RST framework, the discourse structure of a text is considered to be coherent and thus capable of being basically represented as a single-rooted tree defined in terms of the following four aspects:

- The leaves of the tree correspond to text fragments that represent the minimal units of the discourse, called elementary discourse units (EDU)
- Each internal node of the tree corresponds to a contiguous text span
- Each node, whether it corresponds to an EDU or a span, is characterized by its nuclearity—a nucleus indicates a more essential unit of information than its leave(s), while a satellite indicates a supporting or background unit of information for its immediately dominating node
- Each node, whether it corresponds to an EDU or a span, is characterized by a rhetorical relation that holds between two or more non-overlapping, adjacent text spans. Relations can be of

intentional, semantic, or textual nature. As a span is assigned a rhetorical relation, rhetorical relationship is recursive in nature.

So the rhetorical structure of a given text is a tree structure with a single root and a set of directed graphs. Each directed graph is labeled for its rhetorical relation. Originally 23 relations were proposed by Mann and Thompson (1988), but the exact number proposed varies among researchers, and de Silva (2007) proposes only nine relations based on her analysis of technical writings.

5.2.2. Reconsideration of RST

5.2.2.1. EDU

As shown in the previous section, RST is basically clause-based: its EDU is assumed to be clausal. A number of researchers have repeatedly reinvestigated this validity of this approach both from theoretical and practical perspectives, but nearly all of them still assume clause as EDU (Forsbom 2005, Groza et al 2009, Nicholas 1994) However, Kibble (1999) pointed out, in investigating a small corpus of pharmaceutical leaflets, that at least a nominalized noun phrase, particularly a gerundive one, plays the same role as a clause, and a given relation between two conceptual units can be embodied as two independent sentences, two coordinated clauses, one main clause and one subordinate clause, one clause with an independent prepositional phrases, two noun phrases combined by a relational verb as a subject and an object, and so on. The choice among these possibilities directly relates to the style chosen, the simplicity, and the media chosen (whether it is orally described or on a slide). For example, it is often the case that an EDU is represented as a noun phrase on a slide while the same content is represented as a sentence in speech. So we define EDU

as “semantically” clausal segment. Note that this definition does not regard all noun phrases as EDU’s. “Semantically” clausal segment means a segment in which a subject-predicate relation is contained, whether explicitly or implicitly. Thus, most nominalized noun phrases are counted as EDU’s while noun phrases denoting objects are not.

5.2.2.2. Surface or Deep?: Potential Textual Inconsistencies and Imperfections

Rhetorical structure deals with the detailed organization of the content to be written or told. In that sense, a given rhetorical structure is assumed to represent the deep structure of the content, on the naive assumption that the deep structure of the content is properly mapped onto the surface structure, the text. This cannot be assumed, however, in the case of learner’s presentations. According to our analysis on learners’ presentations recorded in our multimedia learner corpus of learners’ basic presentations, a typical textual inconsistency comes from the misuse of logical cues, typically connectives and conjunctions, specifying the relation between two EDU’s, and a typical textual imperfection comes from the inappropriate connection of two EDU’s, mainly due to the omission of intermediate EDU’s or to the logical flaw. Thus, in order to reveal textual inconsistencies and imperfections, it is important to annotate a rhetorical structure mainly based on surface logical cues, which is expected to be largely automated, and then to evaluate it.

5.2.2.3. Supra-textual Cues

One of the biggest differences between written texts and oral presentations is the existence of interactions between text itself and the outer world. A presenter frequently gives instructions to the audience to draw their attention to some part of the slide, such as “Look at the

graph." This type of instruction is to be considered supra-textual in that it points out some element outside the orally spoken content, but it still has its nucleus adjacent to it, since such instructions are naturally done for elaborating an EDU. So supra-textual cues are to be incorporated into rhetorical relations.

5.2.2.4. Revised RST for representing the rhetorical structure of presentation

Based on the discussions in the previous sections, we defined our revised RST as shown in Table 1.

Table 5.1 Our Revised RST

EDU: Semantically clausal segments
A rhetorical relation is basically based on the surface structure and is assigned 0 or 1 according to the logical validity.
The Set of Rhetorical Relations for our purpose

Name	Description	Order of N&S
Background	Satellite provides background information to the nucleus	S before N
Contrast	Applies to two nuclei that contrast each other	
Elaboration	Satellite elaborates the information in the nucleus	N before S
*Elaborative Example	Satellite exemplifies the information in the nucleus	N before S
Enablement	Information in the satellite enables the audience to perform action in nucleus	N before S N before S
Evidence	Satellite provides evidence to the statement in the nucleus	
Justify	Satellite justifies the nucleus	
Motivation	Satellites motivates the reader to perform the action in the nucleus	
List		S before N
Sequence	Listed nuclei	
Solutionhood	Multiple nuclei that follow each other in sequence	N before S
Summary	Satellite is the problem; Nucleus provides the solution.	
*Supra-textual	Short summary or paraphrase of the previous span	
Cue	Cue for an action on the part of the audience.	
*Orphaned	Any other orphaned nucleus, to be connected to the nearest dominating nucleus	
	(* indicates that the item is newly introduced here)	

5.3. PRESONTO: a prototypical rhetorical ontology for presentations

Our revised RST discussed above has to be formalized for machine-readability, and one of the plausible implementations is to make a rhetorical ontology. We are now implementing a prototypical rhetorical ontology for presentations, PRESONTO, using OWL 2.0. A key feature is to annotate rhetorical structures of the oral part and the slide part of a presentation in the same way. The underlying assumption is that a span, maximally of a slide, necessarily corresponds to a span of oral speech, and this correspondence guarantees the correspondence between oral speech and slides. Furthermore, it is possible, with this correspondence, that even a non-verbal element like graphs and pictures are properly annotated in the same way. PRESONTO is still prototypical, but its overview is shown in Fig. 5.1.

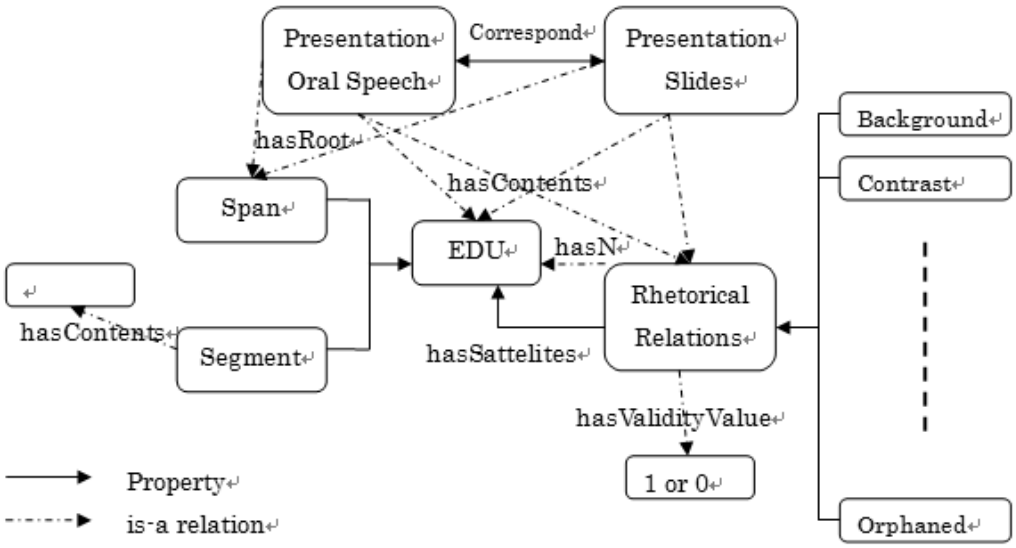


Fig.5.1. Overview of PRESONTO, a Rhetorical Ontology for Presentations

5.4. Concluding Remarks

In this chapter, we have reconsidered RST and proposed a set of rhetorical relations for representing rhetorical structures of presentations, and a prototypical ontology for representing rhetorical structures of presentations, PRESONTO, based on our intensive analyses of hundreds of learners' presentations with slides. We are now annotating learners' presentations to reveal typical inconsistencies and imperfections, and are implementing a module helping a learner to construct an orally spoken text and corresponding slides simultaneously with PRESONTO being a key component to grasp detailed rhetorical structures, and this will in turn open a door to penetrate into the linguistic style properties of logical organization.

Chapter 6

Awareness Promoting Learning Support System of Presentation

6.1. Introduction

In the last chapter, we discussed and designed a rhetorical structure ontology to describe the logical organization of texts and utterances, which is part of linguistic style. Logical organization is a linguistic style element in that the preferred organization vary according to different linguistic styles. In this chapter, we will discuss a comprehensive support of preparing an English presentation.

It is more and more important for any one of us to make a good presentation, particularly that in English, in various situations. Oral presentation is one of the most sophisticated communicative activities; deliberately designed to be presented to a specific audience with slides to deliver information and attempt to make a persuasion. Not only the linguistic aspects but also the paralinguistic effects like body language and eye contact are utilized, and the presenter should have a deep understanding not only of what he or she delivers but of how the audience will react. Indeed a good presentation is not at all easy, but

presentation is not exclusive for talented celebrities like Steve Jobs of Apple or U.S. President Barack Obama. On the contrary, a great many number of people, from college students to university professors, from retailing sales people to senior managers of global enterprises, have to hold some kind of oral presentation almost every day. Thus, acquiring good presentation skills is indispensable for anyone, and thus a great many books on presentation have been published (Reynolds 2007, 2008, Koegel 2007, Monarth and Kase 2007, Weissman 2008, Atkinson 2007, Alley 1996, 2002, Gallo 2009, Powell 1996, Duarte 2008, Reinhart 2002 to name a few), and many colleges and universities have curricula for teaching presentation.

However, non-native speakers of English, particularly those in non-Western countries like Japan, often suffer from added difficulties in making presentations in English, partly because English is not their native language but more because the way to organize and elaborate a presentation, which is basically based on English essay writing, is not well familiar. The organization of an English essay focuses on coherent logical organization. Of course, many institutions of higher education in Asian countries have long been aware of the problem. Not a few colleges and universities there have developed an original curriculum for presentation skills; other universities do not have a dedicated curriculum but still train students a lot individually at seminar classes, particularly on academic research presentations. However, even in those institutions, to say nothing of those with little or no dedicated education on presentation, training methods of presentation skills are too often based on private experiences and personal subjective judgments of each instructor. It is thus necessary to investigate non-English-native learners' difficulties and to devise and elaborate teaching methods based on such investigations. Some researchers have made some investigations (Takahashi, Kato, and

Kashiwagi 2007, Kayatsu 2009, Tateno, Kato, and Kato 2008, Ishikawa 2009), but none of them have yet pursued the development of learner support system for presentation, and there is little consideration on the relationship between presentation and essay writing on which the organization of presentation is basically based. So, whether it is a pure e-learning or a blended learning, developments of comprehensive learner support systems for presentation are in need.

Based on the recognition above, we devised a prototype of a comprehensive learning support system of basic presentation with an emphasis on learners' self-awareness promotion on various linguistic style elements as well as paralinguistic effects. It consists of several modules including digital contents of preliminary tutorials, an interactive aide for organizing a presentation and its corresponding slides, semi-automatic evaluation estimation, and a online review of recorded presentations, with a multimedia learner corpus of presentation. The overview of our system is shown in Fig.6.1.

The organization of this chapter is as follows: Section 2 discusses self-awareness promotion in e-learning; Section 3 discusses what the basic presentation is, and what and how students should be supported by a learning support system from the viewpoint of self-awareness promotion on linguistic style elements; Section 4 describes our multimedia learner corpus of presentation, MLCP, and discusses our findings based on the existing data; Section 5 investigates the relationship between the holistic evaluation and the element-based evaluation of presentation and pursues the implementability of semi-automatic estimation of the element-based evaluation from the holistic evaluation with some queues on evaluator's preference; Section 6 proposes an online tutorials consisting of instructions and exercises on English sentential grammar reviews, paragraph and essay constructions, and the basic concepts of informative presentation;

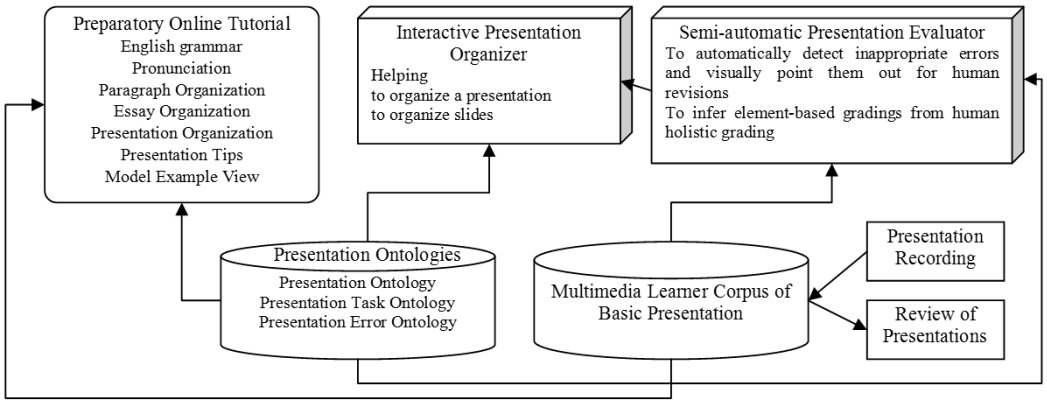


Fig.6.1　Overview of our prototypical learning support system of Basic Presentation

Section 7 proposes an online interactive presentation organizer, or an interactive aide for organizing a presentation and its corresponding slides; and Section 8 is the concluding remarks.

6.2. Self-awareness Promotion

As we discussed in Chapter 2, when people have acquired an advanced skill like presentation, they are supposed to have acquired not only the knowledge about what it is and how it is done but also (the knowledge about) how the process is monitored and controlled. In other words, those who have acquired presentation skills are to be self-aware of what they should do, what and how they are doing, and what they should improve, both when preparing and doing a presentation. This self-awareness has been called metacognition, are to be revised when preparing a presentation. Metacognition has been widely investigated in the studies of learning (Nelson and Narens 1990, Hacker, Dulonsky, and Grasser 1998, Nelson 1999, Perfect and Schwartz 2002, Dulonsky and Metcalfe 2009, Hacker and Dunlosky,, Waters and Schneider 2010). Its basic idea is that when people do something, they are aware not only of what they are doing (Object-level or Cognitive Level) but also of how they are doing (Meta-level), though their awareness is not always explicit. Meta-level awareness controls Object-level, and Object-level awareness monitors Meta-level, as shown in Fig. 6.2. Learners are assumed to have some difficulty of this flow of information due to insufficient metacognition. In other words, learning is the process of acquiring sufficient cognitive and metacognitive awareness, and teaching or learning support is the attempt to let learners do so with efficacy and efficiency.

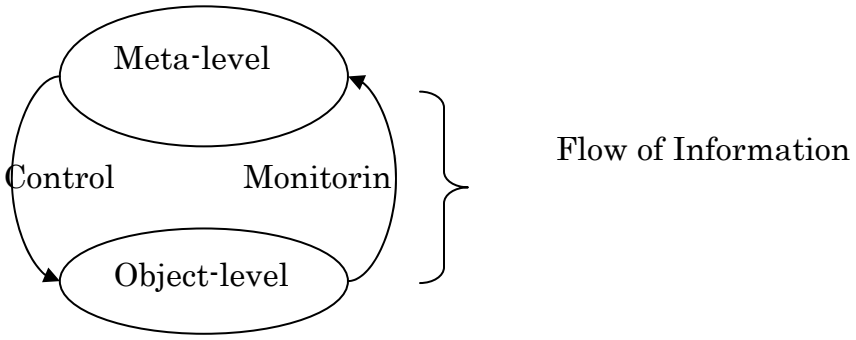


Fig. 6.2 Theoretical Model of the Mechanism of Metacognitive Process (Nelson and Narens 1990)

When we investigate the cognitive and metacognitive processes in presentation, as no study for it has ever been done, those of reading and writing are good to be referred, as presentation preparation contains a lot of writing, and writing in turn contains a lot of reading not only external materials but also what one is writing. As for reading, Hacker (1998) proposed the reading model shown in Fig. 6.3. Reading is usually considered to be a receptive process, but is actually an interactive process between metacognitive-level and cognitive-level.

As for writing, the popular model of composing was originally proposed by Flower and Hayes (1981), the model being shown in Fig. 6.4. Based on their research into the writing of experts and novices, they distinguished three major processes: planning, translating, and reviewing. In the processes, interactivity is emphasized and subprocesses are clarified: for planning, generating, operating, and goal setting; and for reviewing, evaluating and revising.

One of the seemingly important differences between the reading and writing models above is the status of strategy and the knowledge of world, which are implicit or non-existent in the Flower and Hayes model. But for an obvious reason, they are to be merged into their model.

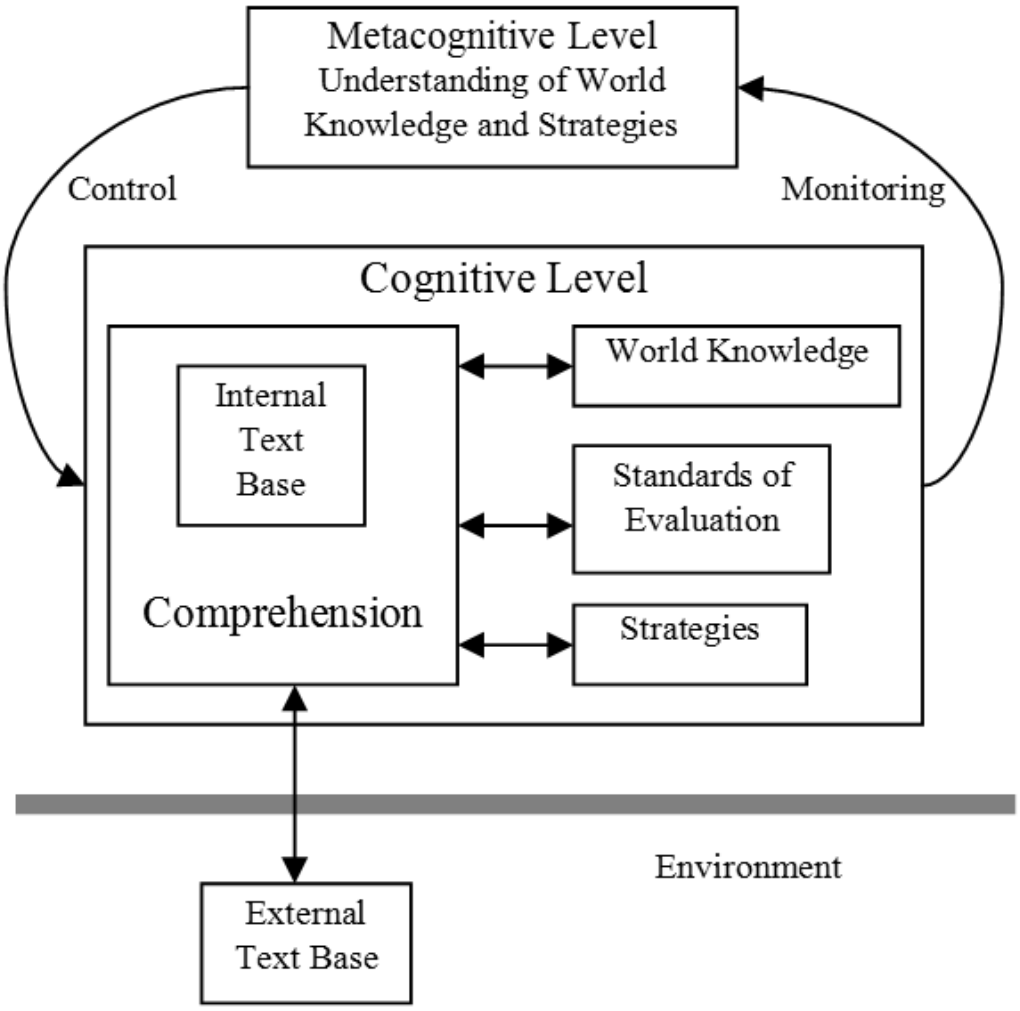


Fig. 6.3. Theoretical mechanism of comprehensive monitoring of reading (Hacker 1998)

Based on these models, we propose a tentative model of the presentation preparation process, as shown in Fig.6.5. It is based on the Hayes and Flower model, but we added a performance section and clarified the status of strategies in the long-term memory. With this model, what any learner support system for presentation should promote is clear. In order for learners to acquire presentation strategies in their long-term memory, the skill choosing the proper writing style, speaking style, visual aids, and performance style, together with the feature of the chosen topic and the tendency of the audience, should be fostered in the way to stimulate their self-awareness. When preparing the presentation itself, three processes are to be effectively supported again by letting them be aware of what they are doing and what are to be improved.

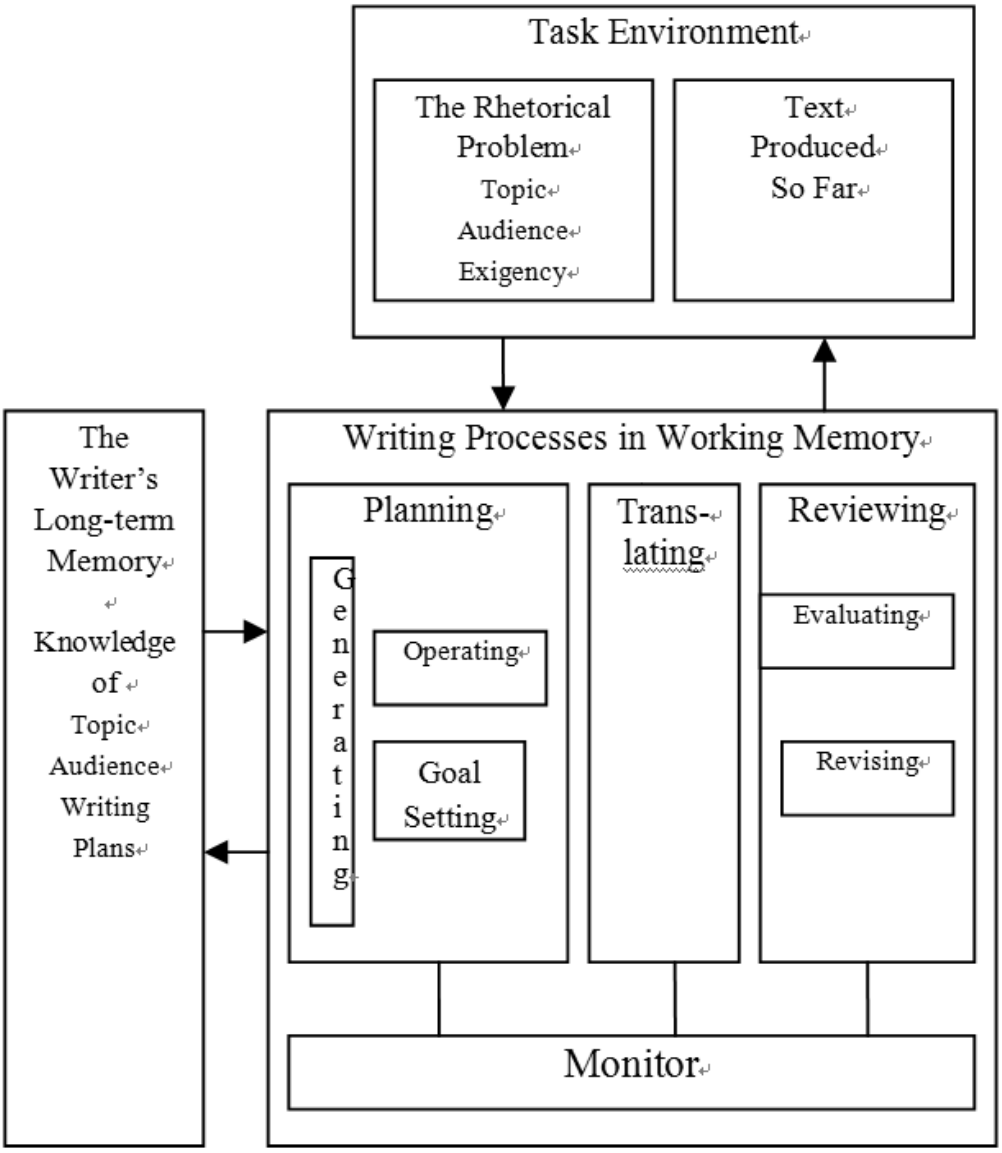


Fig. 6.4 The Hayes and Flower model of the writing process (Hayes and Flower 1980)

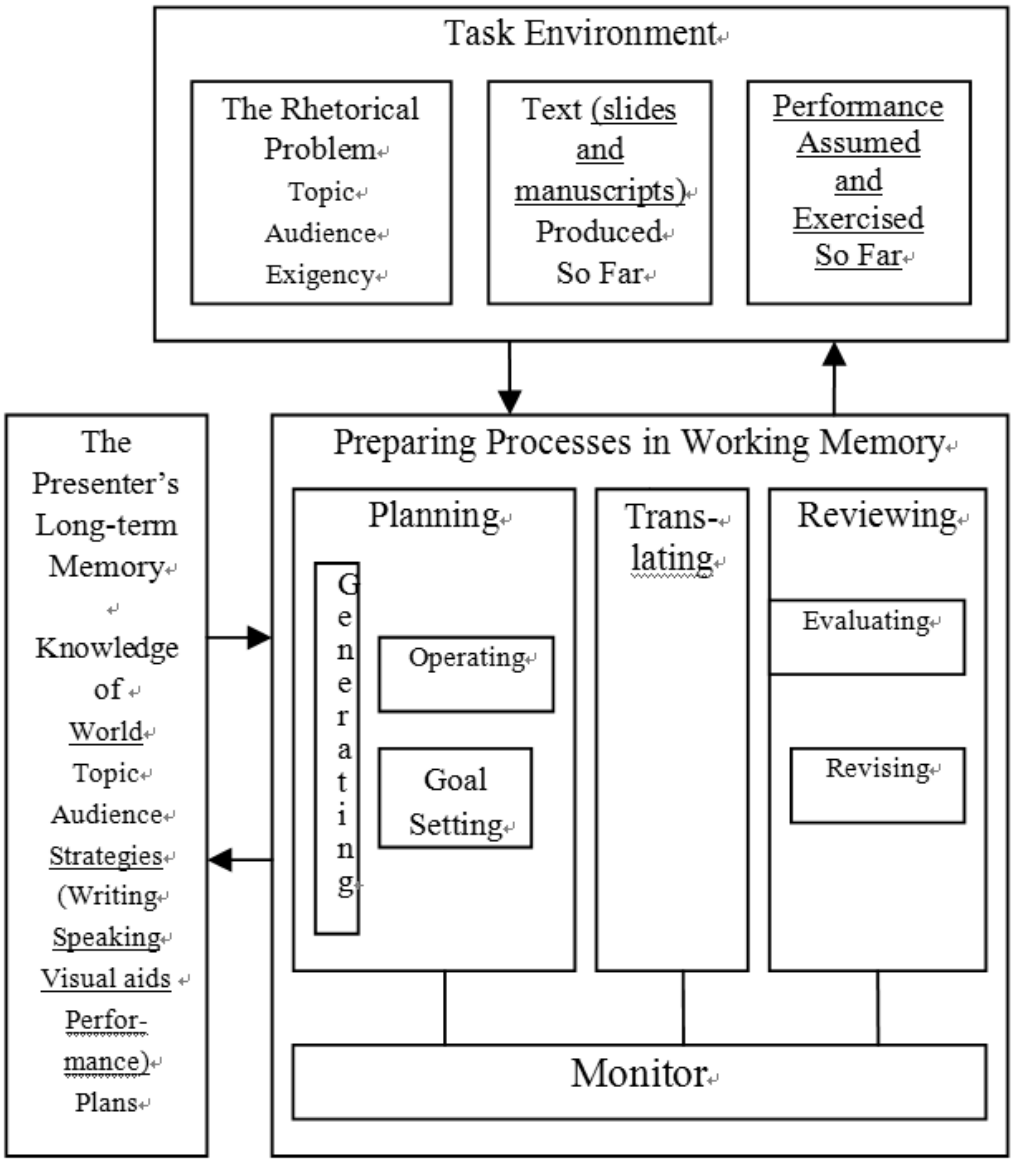


Fig. 6.5 Our tentative model of the presentation preparation process (Difference from Fig.6.4 is shown by underlines)

6.3. Basic Presentation as a Restrictive Type for Effectively Mastering Essay Strategies

The organization of presentation varies according to its purpose and the time to be given. However, according to our extensive observations of academic research presentations and students' class presentations, the lack of understanding of the core structure of the basic essay in English more often than not leads to the poor support of their main idea and too much concentration on the description of each slide they prepare. So, for an educational purpose, we restrict the structure of presentation to be dealt with our system to the minimum basic structure of essay in English: the five paragraph structure comprising the introduction, three supporting paragraphs, and the concluding paragraph, which aims to logically convince the audience. In other words, restricting the basic structure of presentation sheds more light on logical organization, an important linguistic style element. Note that the restriction does not require a single type of logical organization; different sets of linguistic style factors—particularly the targeted audience, purpose, and intention—require different logical organization.

Presentation is conducted for a variety of purposes, but it is roughly divided into two contrastive ones: informative presentation and emotive presentation. Informative presentation is the one whose goal is to give audience enough information to be convinced; informative presentation may well contain some aspect appealing to the emotion of the audience, but too much emotive appeal is judged as biased and un-objective. On the other hand, emotive presentation is the one whose goal is to persuade, or tempt, the audience; it may contain much information, but the ultimate goal is to have the audience feel like

reacting as the speaker intends. Essays in English, unlike what is often believed to correspond to them in Japan, are considered to be more informative than emotive, and it is also the case with the type of presentation to be taught in colleges and universities. A longer essay can have a complex structure, but the most basic one is assumed to consist of just five paragraphs: the introduction, three supporting paragraphs, and the concluding paragraph. This is a natural extension of a paragraph, which in turn consist of the introductory part containing the topic sentence, supporting sentences, and the conclusion. An essay can be longer by containing multiple recursions of this basic essay structure. So we define the basic presentation as follows:

Definition of Basic Presentation
Basic Presentation has the rigid structure containing
(1) Title and its corresponding slide
(2) Introduction and its corresponding slide
(3) Three supports and their corresponding slide
(4) Conclusion and its corresponding slide

Fig. 6.6 visualizes the correspondence between the basic presentation and the basic essay organization.

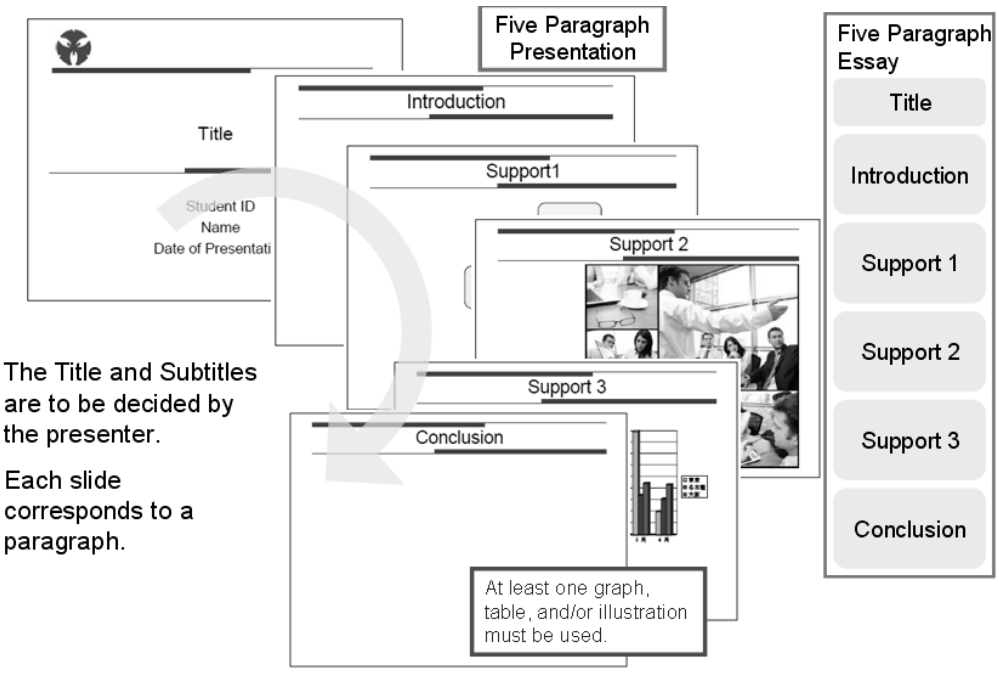


Fig. 6.6. Correspondence between presentation slides and basic five paragraph essay

6.4. Prototypical Multimedia Learner Corpus of Basic Presentation

Based on the discussion in the previous sections, we have constructed a prototypical multimedia learner corpus of basic presentation (MLCP) before constructing a computational support system. The ultimate purpose of this corpus is multifold: to observe learners' presentations to improve the supportive contents, to let learners be aware of what is to be revised and improved by watching their own and others' presentation recordings, and to enable (semi-)automatic evaluation of basic presentations. Other studies constructing databases of learners' presentations (Takahashi, Kato and Kashiwagi 2007), and the distinct features of MLCP compared to other learner corpora are: (1) the registered presentation has the same organization as five-paragraph essays, though topics vary; (2) each registered presentation consists of three parts: the video-recorded speaker, the presented slides synchronized to the video as well as their initial manuscripts (if available), the prepared oral script as well as its initial manuscript (if available); (3) the three parts can be watched simultaneously using Internet Explorer; and (4) holistic and element-based evaluations by teachers and students are added. Currently MLCP contains approximately 100 five-minutes presentations with slides, and another 100 are planned to be added by the end of this academic year. Presentation stored in the database can be watched, whose video, slides, manuscripts in a window, as seen in Fig. 6.7.

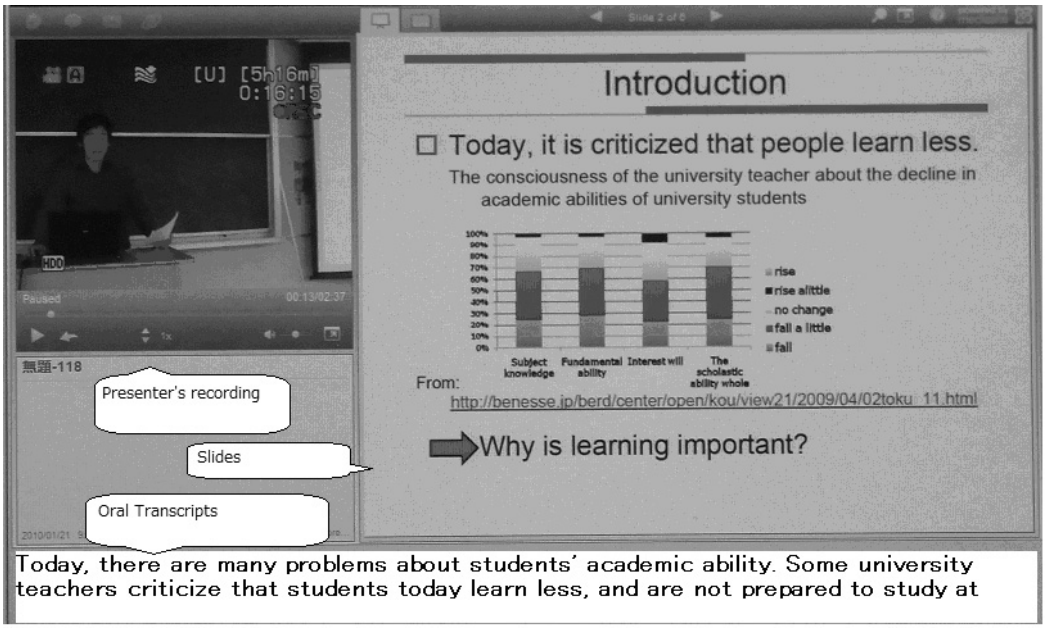


Fig. 6.7. Sample view of presentation recordings in MLCP

A. Database

The data of our multimedia learner corpus of presentation, MLCP, are currently gathered as follows. First, students are supposed to prepare their presentation with slides and oral manuscript at least a week before, and the instructor makes some advice and suggestions for improvements. Slides and oral manuscript at this stage are stored. Then, students' presentations are recorded using Mediasite ML Recorder (http://www.mediasite.co.jp/product/mlrecorder.html), which records two sources simultaneously, a standard quality of speaker's video recorded as MPEG with queues for slide changes embedded and six slides recorded as JPG of VGA size. The conceptual image of our presentation recording is shown in Fig. 6.8. Both video and slides, together with the final oral manuscript are stored in the database. In addition, the original slides and prepared speech manuscript are submitted by presenters and are stored in the database. The stored content data is shown in Table 6.1.

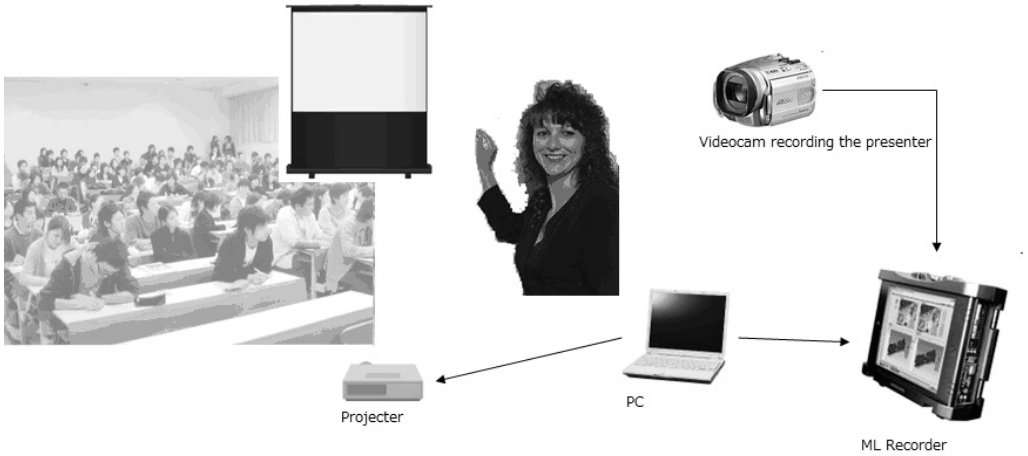


Fig. 6.8. Presentation recording

MPEG Video	Records the presenter with cues embedded corresponding to each JPEG picture of slide 320 x 240 MPEG2
JPEG pictures of slides	640 x 480 JPEG
Oral Transcript	Text transcribed afterwards
Prepared manuscript	Text
Original slides	File for PowerPoint or OpenOffice.org Impress

Table 6.1. Content Data of MLCP

B. Metadata

Metadata characterizing each presentation are also tagged and stored in MLCP. Together with the usual metadata like the date of the presentation, the title and the keyword representing the topic of the presentation are also stored as metadata, for the Basic Presentations stored in MLCP are common in the basic organization of five paragraphs but are different in the topic they discuss. The current list of the metadata of MLCP is shown in Table 6.2.

RecDate	The date of the presentation
Age	Presenter's age
Grade	Presenter's grade U1 for freshmen, U2 for sophomore, G1 for freshmen of graduate school, etc.
Sex	Presenter's sex (M or F)
Time	Time of presentation
NumWords	Number of total words spoken
Title	Title of the presentation
Topic	Keyword representing the topic of the presentation
Toeic	TOEIC grade within three months from the date of the presentation (optional)

Table 6.2. Metadata of MLCP

C. Evaluation Data

With this data, we added evaluative values for each presentation. Evaluation of student's presentation has been conducted in one of two ways: the holistic evaluation in which the whole presentation is scored as a value, and the element-based evaluation in which each aspect of presentation (grammar, sound, content, eye-contact, etc.) is individually evaluated. As we discuss in the next section, one of our research interests is to correlate them and to automatically infer element-based evaluations from the holistic evaluation, we gathered these two types of evaluations made by teachers and peer-learners. Teachers watch the recorded videos to evaluate them. On the other hand, students evaluate each presentation as one of the audience: in other words, peer-learners make peer-reviews at class. In this way, as many as 40 different evaluations by different teachers and peer-learners are accumulated for each presentation, and all this data is also put in the database. The detailed information of evaluation data is described in the next section and the list of evaluation element is shown in Table 6.3.

Physical	1 Posture, gesture, and eye contact
	2 Volume, clearness, effectiveness of his/her voice
Whole	3 Validity of the title
	4 Presentation organization (including slide organization)
	5 Persuasiveness of the presentation
Slides	6 Organization and Structure of each slide
	7 Understandability and Effectiveness of Slides
	8 Proper use of graphs, images, or illustration
Pronun-ciation	9 Phonetic correctness
	10 Phonetic fluency
Grammar	11 Grammatical correctness
	12 Grammatical variation

Table 6.3. Elements for evaluation

6.5. Holistic and Element-based Evaluations

As explained in the previous section, our multimedia learner corpus of basic presentation, MLCP, contains human evaluation value sets. Before turning to linguistic style aspects, let us discuss the nature human evaluations and analyze the collected data.

Usually, the evaluation of student's presentation has been conducted in one of two ways: the holistic evaluation in which the whole presentation is scored as a value, and the element-based evaluation in which each aspect of presentation (grammar, sound, content, eye-contact, etc.) is individually evaluated. The holistic evaluation is easier to make, but tends to be heavily influenced by a conspicuously good or bad point and is often based on impression. At the same time it naturally contains less information for students to be aware of their defects. The element-based evaluation, on the other hand, requires more time and efforts on the part of evaluators, but tends to be more objective, and it contain a far richer information with which students are readily aware of their weak points.

However, it is often the case that these two types of evaluations make very much different gradings on a single presentation, and although the element-based evaluation seems to be more objective, the simple sum of the values for each aspect of the presentation does not always correspond to the holistic evaluation, which is often a good reflection of the whole impression of presentations. So, considering the balance between the cost and the effectiveness, it is desirable if we can automatically infer the element-based evaluation from the holistic evaluation (not the opposite. The opposite inference is by far the easier).

To pursue this, we planned, at our first stage, to gather the data of

human evaluations of students' presentations both by teachers and by students. For each presentation, they evaluate it as follows: first, they grade it holistically and mark between 0 and 30, second, they grade it on 12 elements, each between 0 and 6. The 12 elements are shown in Table 6.3. Evaluation elements are decided based on the discussion and analysis of learner presentation and its evaluation (Takahashi, Kato, and Kashiwagi 2007, Kayatsu 2009, Tateno, Kato, and Kato 2008, Ishikawa 2009). Currently, as a result, for each presentation, more than four teachers' gradings and more than thirty peer-learners' gradings have been accumulated.

To take a grasp of the characteristic of grading data, a sample of gradings whose holistic grading is 20, as in Table 6.4.

Hol.G.	1	2	3	4	5	6	7	8	9	10	11	12
20	4	4	5	4	4	4	4	4	4	4	***5***	***5***
20	4	4	5	5	5	4	4	4	5	5	***5***	***5***
20	3	4	***3***	4	4	4	4	5	4	4	4	4
20	4	3	5	4	4	5	5	5	4	5	4	3
20	3	4	4	3	3	3	3	3	4	3	***2***	***2***

Table 6.4. Sample evaluations of the same holistic grading by the same evaluator

This result clearly shows that the elements 1 to 10 vary little while elements 11 and 12, grammatical aspects, diverse. Interestingly, the values of the element 1 to 10 are in fact biased by evaluators: some put a high holistic mark presumably because of presenter's vocal features such as the element 9 and 10, and others presumably because of presenter's attitudes, and still others presumably because of visual supremacy. More interestingly, the elements of 11 and 12 do not vary among evaluators. If, then, we have an automatic evaluation for the

element 11 and 12, we may well infer the element-based value of the elements 1 to 10 from the holistic value with automatic grading of the element 11 and 12. The tentative simple hypothesis of correlation between the holistic and element-based gradings would be described as follows:

Tentative Hypothesis

The holistic evaluation of an evaluator is basically converge to the biaed sum of element-based evaluations and automatic grammatical evaluations:

$HE_{\alpha}(P^{\beta}) = \Sigma(a^{\alpha}_{i} \quad x^{\beta} \quad) + y^{\beta} \quad (1 \leq i \leq 10)$

where

$HE_{\alpha}(P^{\beta})$ ... Holistic evaluation of the presentation by ß made by an evaluator α

a^{α}_{i} ... Bias coefficient of element i of an evaluator α

x^{β}_{i} ... Element evaluation of i of the presentation by ß made by an evaluator α

y^{β} ...Automatic grammatical evaluations of the presentation by ß

Automatic grammatical evaluations of the presentation by ß are being individually developed. However, given the value of y^{β}, the hypothesis above produces significantly similar inferred element-based values, though we at this stage ignore the correlations among element values, which is an interesting result to be more pursued.

6.6. Preparatory Online Tutorial

As our targeted users of our system are non-native speakers of English, though they have several years of learning experiences of

English, we prepared a preparatory online tutorial consisting of several modules. It is currently designed for blended learning (Hays and Flower 1980, Garrison and Vaughan 2007), and has no exercise or workout modules yet. Each module consists of one or more types of materials: PDF's, recorded lectures, multimedia slides. All these contains the contrastive examples of appropriate and inappropriate instances, which are designated to let learners be self-aware of what is to be followed and what is not. In other words, linguistic style elements that will be positively monitored are to be learnt here. The contents are basically the revised version of those of several classes at a couple of Japanese universities through the years.

The overview of our blended learning of basic knowledge on presentation is shown in Fig. 6.9. As shown, the lack of online exercises are complemented by class assignments, and additional instructions are given at class. However, the core body of the necessary knowledge and strategies are contained in the online tutorials, and we are currently elaborating them for independent use without class instructions, and are further planning to make them compatible with SCORM 2.1.

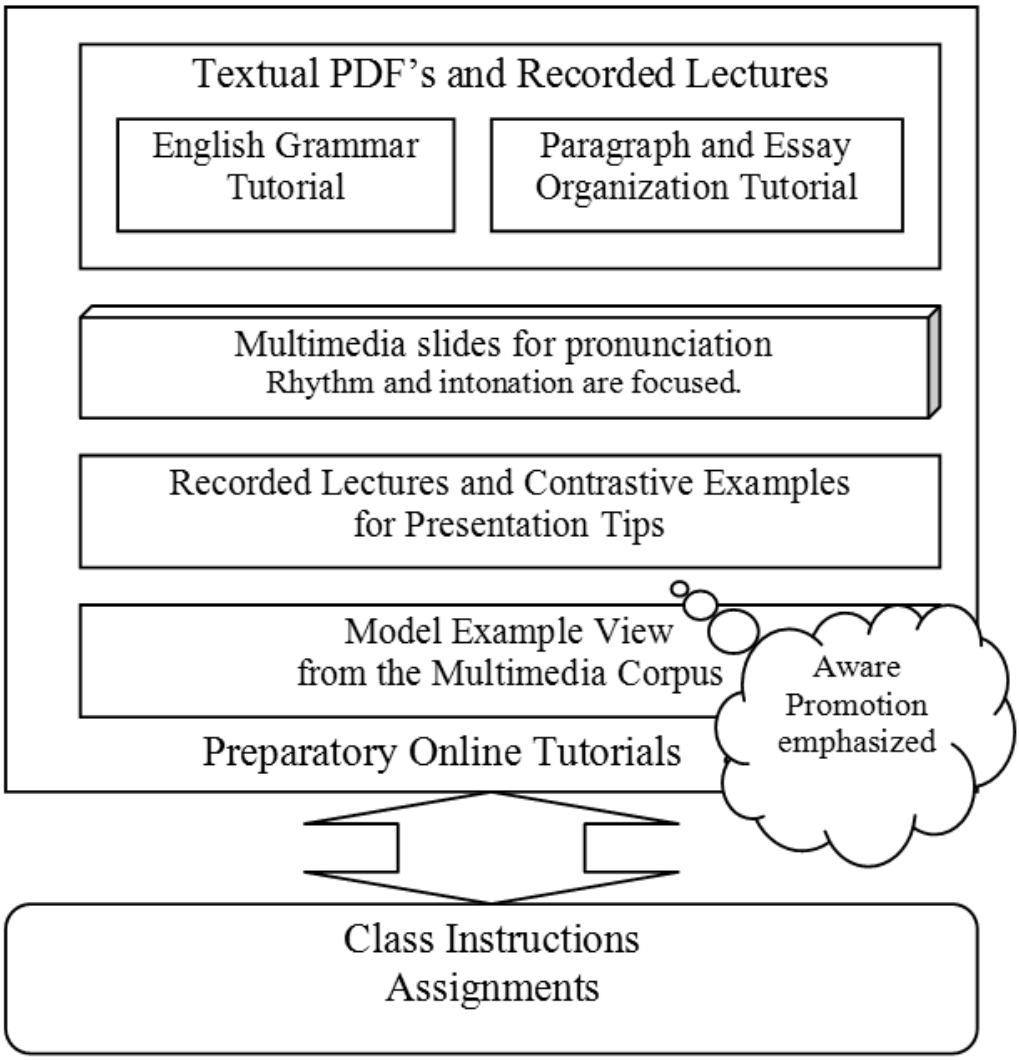


Fig. 6.9. Blended learning processes of basic knowledge of presentation

6.7. Interactive Presentation Organizer

For helping organize a presentation, we provide an interactive presentation organizer module. This module is dedicated to promote the learner's awareness on logical organization. It consists of several submodules: Strategy Maker, Idea Penetrator, Logical Editor, and Slide Organizer. The relations among submodules are shown in Fig. 6.10. The common feature of these submodules is their interactiveness to promote human awareness on what they are doing: all ask the user pre-designed questions that forces him/her to consider various aspects of presentation preparation. All of them are still in their infancies, and its user-interface is quite simple, but more than 80% of trial users (n=35) had an affirmative reactions in our questionnaire survey.

Each submodules are related in that the information input in the Strategy Maker and Idea Penetrator affects the recommended organization in Logical Editor and Slide Organizer. In addition, a set of advice for improvement is prepared for each submodules to let the user consider them by himself.

6.7.1. Strategy Maker

Strategy Maker is the submodule that is assumed to be used first. Its purpose is to let the user be more aware of the purpose of the presentation and the assumed audience. At the beginning, the user is prompted to choose the purpose of the presentation like information description, persuasion, or opinion assertion. Then, s/he is prompted to choose the type of the supposed audience: from novices to professionals to various people, from peers to strangers. These two inputs are evaluated by (currently) the prepared strategy templates, and the recommended type of performance, points to be cared about, and other

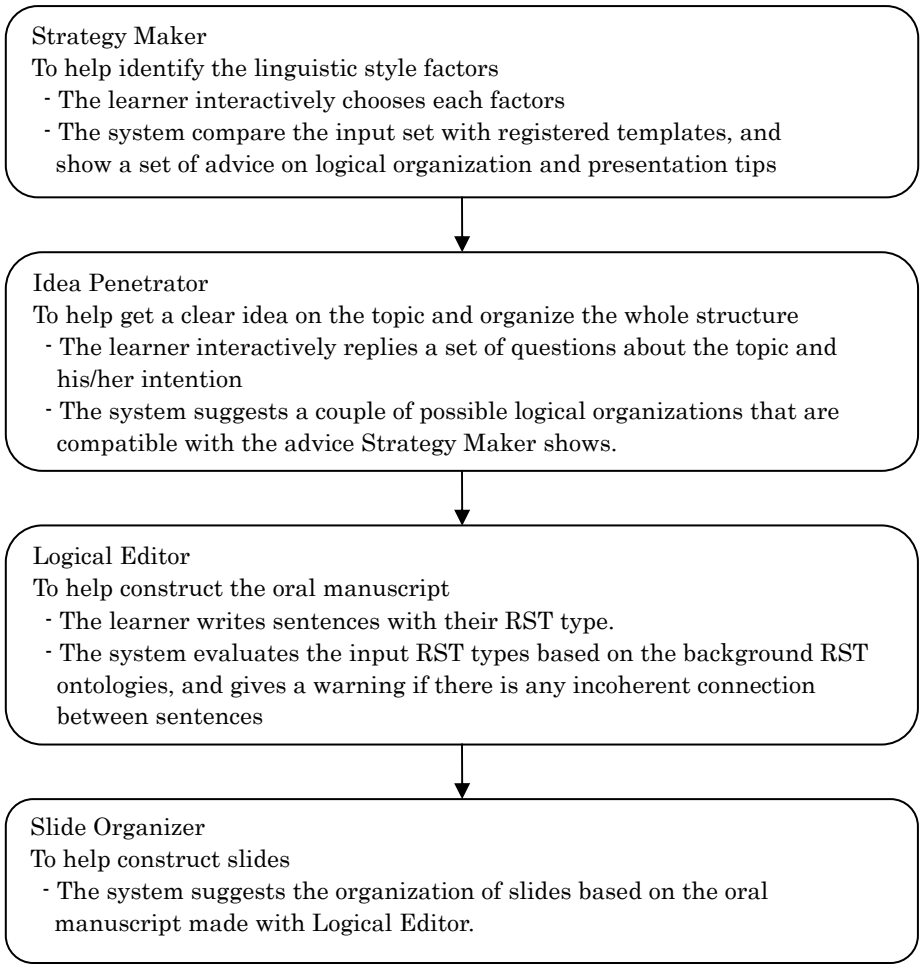


Fig. 6.10. Overview of submodules in Presentation Organizer

advice are displayed to the user.

6.7.2. Idea Penetrator

Idea Penetrator is the submodule whose purpose is to penetrate one's own idea, i.e., to let the user know more about his idea. At the beginning, the user is prompted to write the main idea, or conclusion, of the presentation. Then, Idea Penetrator asks the user a dozen of questions like "Why do you want/need to present the idea?," "Why do you think the audience should spare the time for your presentation?," "Isn't the idea popular? If so, why do you present it now?," "Do you know the details of the issue? If not, how are you going to investigate it?," and so on. The choice of the set of the questions to be asked is affected by the result of the evaluation outputs of Strategy Maker. For example, if the supposed audience is novices, then a question will be "why do you think your presentation is worth for anyone?," instead of "what is the new information for the professionals?" The output of Idea Penetrator is a set of advice to follow before writing the manuscript and slides, like the recommendation for further research.

Both Strategy Maker and Idea Penetrator are designed for learners to be aware of the necessity to know much in advance about the external aspects of the presentation and to identify the linguistic style factors..

6.7.3. Logical Editor

Logical Editor is currently a rather simple editor with the role of each paragraph and each relations between succeeding sentences clarified by the user. A particular set of roles of paragraphs is recommended according to the outputs of Strategy Maker, though the user can change it. Relations between succeeding sentences are chosen

from the revised RST relations proposed in Chapter 5. Rhetorical Structure Theory (RST) is proposed and developed by Mann and Thompson and other researchers as a descriptive framework of texts, and has been widely used for various linguistic and computational purposes like natural language text generation and automatic text summarization. In the RST framework, the discourse structure of a text is considered to be coherent and thus to be able to be basically represented as a single-rooted tree. The set of rhetorical relations used here is shown in Table 5.1 in page 78. When writing a succeeding sentence, the user adds a rhetorical relation to it before or after writing the sentence. Currently no automatic intelligent evaluation of each relation is not implemented, but the user, by making sure each relation between sentences, may well write a logically coherent manuscript.

6.7.4. Slide Organizer

The input texts in Logical Editor is roughly interpreted by the paragraph-type and RST evaluating engine, and Slide Organizer displays two types of candidates for slides: possible textual structured itemizing and recommendations of the uses of illustrations, graphs, and tables. Possible textual structured itemizing is decided according to the rhetorical relations specified by the user in Logical Editor. Particularly, the use of “Elaborative examples” proposes the possibility of using some illustration or picture to visually present the example. The use of numbers in Logical Editor recommends the user to use a graph or table in slides. Note that Slide Organizer just proposes the structure and types of component parts, and the proposal is output as an HTML text. For actual productions of slides, the user uses Microsoft PowerPoint or any other favorable presentation tools.

Currently all these submodules are implemented with a set of

simple deterministic rules for outputs, but we are now elaborating our presentation ontologies that should be a basis for outputs.

6.8. Concluding Remarks

In this chapter, we proposed a prototype of comprehensive online learner support system for basic presentation whose structure strictly corresponds to basic five paragraph essays. The core design idea is to maximize learners' awareness on linguistic style factors and elements, and the system is based on our tentative model of presentation preparation process. The system is composed of several modules, each of which further comprising several submodules. The practical development is a way ahead, but our prototype, still in its infancy, is being tested by a couple of English presentation classes, and have enjoyed favorable replies from learners.

Chapter 7

Conclusion

It is indispensable in today's world to cultivate advanced communicative ability both in one's own native language and in foreign languages, and for that purpose, not only what is communicated but also how it is communicated should be properly mastered. More specifically, whether it is written or spoken, it is important to use appropriate words and phrases, and to employ the proper and coherent linguistic style in order to suit themselves to the targeted genre, the purpose, and the situation. However, linguistic styles vary according to many related factors, and it is difficult to teach all of them only in ordinary classes, which is why computational supports are in need for facilitating and improving the heuristic learning of linguistic styles with reference to individual learner's needs. Based on this assumption, supports for heuristic learning of linguistic styles are investigated from the educational technological viewpoint through designing and developing learner support systems for lexical choices, stylistic consistency, and logical organization.

Let us review what is investigated. Chapter 2 discusses linguistic style and learning models as a foundational premise of this study, and presents an educational technological meta-model for style-sensitive

language learning, repeated here as Fig. 7.1. This meta-model is to be

Chapter 3 presents, as a learner support for lexical choices sensitive to the targeted genre, purpose, situation, a prototypical learner support system for Japanese mimetic expressions with a particular reference to their paraphrases.

Chapter 4 discusses and presents a heuristic learning support system to notify learns of style inconsistencies and anomalies using multiple corpora.

Chapter 5 discusses style consistency from the viewpoint of logical organizations of text. Rhetorical Structure Theory is critically investigated and a couple of improvements are presented. In so doing, ontologies related to Rhetorical Structure are constructed and their educational utilization is discussed.

Chapter 6 presents a prototype of a comprehensive learner support system for informative presentation. Learning presentation is more and more focused on in contemporary higher education, and computational supports are indispensable due to multiple reasons. Here, we have constructed an educational technological model of presentation preparation, and implemented a prototype based on existing successful teaching examples.

With these investigations, this study demonstrates the support methods for each aspect of linguistic style, and shows the plausible direction of computational learner support through designing and realizing three learner support systems on the appropriate choice of linguistic style according to genre.

There need a number of further researches and investigations for every aspect of style-sensitive language learning, but this study would contribute as a foundation of future research.

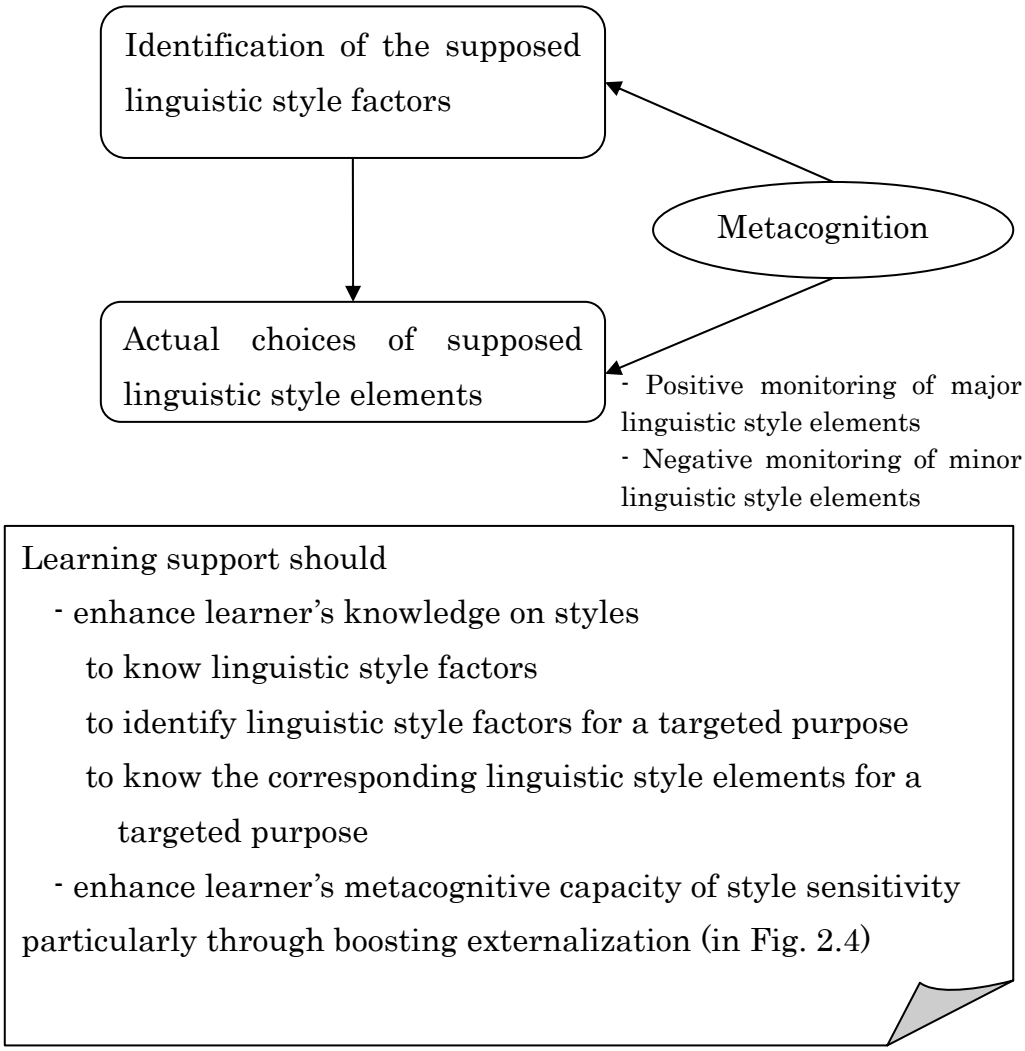


Fig. 7.1 (=Fig. 2.7) A meta-model of style-sensitive language learning

References

Akutsu, T. (1994) Picture Dictionary of Echoic and Mimetic Word, Tokyo: Alc

Alley, M. (1996) *The Craft of Scientific Writing*, 3rd ed., New York: Springer.

Alley, M. (2002) The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid, New York: Springer.

Amanuma, N. (ed.) (1974) *Dictionary of Echoic and Mimetic Words*, Tokyo: Tokyodo, (1974) (in Japanese)

Bryceson, K. (2007) The online learning environment—A new model using social constructivism and the concept of 'Ba' as a theoretical framework, Learning Environments Research 10, 189-206.

Chatti, M. A., R. Klamma, M. Jarke, and A. Naeve (2007) The Web 2.0 Driven SECI Model Based Learning Process, *Proceedings of Seventh IEEE International Conference on Advanced Learning Technologies*, 780-782

Araki, T. et al, (2000) A Method for Detecting and Correcting of Characters Wrongly Substituted, Deleted, or Inserted in Japanese Strings Using *m*th-Order Markov Model, *The Transactions of the Institute of Electronics, Information and Communication Engineers*, D-II J83-D-II(6) 1516-1528.

Atkinson, C. (2007) *Beyond Bullet Points*, Seattle: Microsoft Press.

Biber, D. and S. Conrad (2009) *Register, Genre, and Style*, Cambridge:

Cambridge University Press.

de Silva, N. (2007) A Narrative-based Collaborative Writing Tool for Constructing Coherent Technical Documents, Ph.D thesis, University of Southampton.

Duarte, N. (2008) *Slide:Ology: The Art and Science of Creating Great Presentations*, New York: O'Reilly.

Dunlosky, J. and J. Metcalfe (2009) *Metacognition*, Los Angeles: Sage.

Flavell, J. H. (1979) Metacognition and cognitive monitoring: a new area of cognitive-developmental inquiry, *American Psychologist* 34, 906-911.

Forsbom, E. (2005) Rhetorical Structure Theory in Natural Language Generation (available from http://stp.lingfil.uu.se/~evafo/gslt/nlg/assignment.pdf)

Fox, E. and M. Riconscente (2008) Metacognition and self-regulation in James, Piaget, and Vygotsky, *Educational Psychological Review* 20, 373-389.

Gallo, C. (2009) *The Presentattion Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience*, New York: McGraw-Hill

Garrison, D. R. and Vaughan, N. D. (2007), Blended Learning in Higher Education: Framework, Principles, and Guidelines, New York: Jossey-Bess.

Gomi, T.(1989) *Dictionary of Japanese Mimetic Words*, Tokyo: The Japan Times

Groza, T., S. Handschuh, T. Clark, S. Buckingham Shum, and A. de Waard (2009) A short survey of discourse representation models. In: *Proceedings 8th International Semantic Web Conference, Workshop on Semantic Web Applications in Scientific Discourse. Lecture Notes in Computer Science*, Springer Verlag: Berlin, 26 Oct 2009,

Gourlay, S. and K. Hill (2004) The SECI model of knowledge creation: some empirical shortcomings. (available from http://eprints.kingston.ac.uk/2291/1/Gourlay%202004SECI.pdf)

Hacker, D.J. (1998) Self-Regulated comprehension during normal reading, in Hacker, Dunlosky, and Grasser (1998), 165-193.

Hacker, D.J. and J. Dunlosky (eds.) (2009) *Handbook of Metacognition in Education*, New York: Routledge.

Hacker, D.J., J. Dunlosky, and A.C. Grasser (eds.) (1998) *Metacognition in Educational Theory and Practice*, New Jersey: Lawrence Elbaum Associates.

Harris, R. and C. DiMarco (2009) Constructing a Rhetorical Figuration Ontology, Proceedings of Symposium on Persuasive Technology and Digital Behaviour Intervention, Convention of the Society for the Study of Artificial Intelligence and Simulation of Behaviour (AISB), April 2009, Edinburgh, Scotland.

Hayes, J.R. and L. Flower (1980) Identifying the organization of writing processes, in L.W. Gregg and E.R. Steinberg (eds.) *Cognitive Processes in Writing*, New Jersey: Lawrence Erlbaum Associates.

Ishikawa, S. (2009) Elements of English Presentation Skills, *Proc. of Japan and British Language and Culture*, 1, 1-18.

Japanese Wikipedia dumped file (http://download.wikimedia.org/jawiki/20071013/jawiki-20071013-pages-articles.xml.bz2)

Kakehi, H.(1983) "Onomatopoeic Expressions in Japanese and English," *Proc. of the XIIIth International Congress of Linguists* I, 913-918

Kakehi, H., Tamori, I., and Schourup, L.(1996) *Dictionary of Iconic*

Expressions in Japanese, Berlin: Mouton de Gruyter.

Kayatsu, R. (2009) A Trial of Peer Review in an Information Presentations Class and its Evaluation, *Journal of Nagano Junior College*, 64, 71-79.

Koegel, T.J. (2007) *The Exceptional Presenter: A Proven Formula to Open Up and Own the Room*, New York: Greenleaf Book Group.

Lo, C. and Sugiura, M. (1998) 'A Hypermedia Program for Learning Onomatopoeia,' *Forum of International Development Studies* 17, 29-37

Mann, W.C. and S.A. Thompson (1987) Rhetorical Structure Theory: A Theory of Text Organization, ISI/RS-87-190.

Mann, W.C. and S.A. Thompson (1988) Rhetorical Structure Theory: Toward a Functional Theory of Text Organization, *Text* 8(3), 241-281.

McCawley, J.D.(1968) *The Phonological Component of a Grammar of Japanese*, The Hague: Mouton

Monarth, H. and L. Kase (2007) *The Confident Speaker: Beat Your Nerves and Communicate at your Best in any Situation*, New York: McGraw-Hill.

Mukarramah, Y. Asaga, C., and Watanabe, C. (2008) 'Onomatopeta!: Developing a Japanese Onomatopoeia Learning-Support System Utilizing Native Speakers Cooperation,' *Web Intelligence/IAT Workshops* 2008, pp.173-177

Murata, M. and H. Isahara (2002) Automatic Detection of Mis-Spelled Japanese Expressions Using a New Method for Automatic Extraction of Negative Examples Based on Positive Examples, *IEICE Transactions on Information and Systems*, E85-D(9), 1416-1424.

Nakabe, F. Asaga, C. and Watanabe, C. (2007) 'Onomatopoeia Learning

System With Aesthtic Information,' DEIM2009, E5-1

Nelson, T.O. (1999) Cognition versus metacognition, *The Nature of Cognition*, R.J. Sternberg(ed.), 625-641, Cambridge, MA: MIT Pr.

Nelson, T.O. and L. Narens (1990) Metamemory: A theoretical framework and new findings, *The Psychology of Learning and Motivation*, 26: 125-173.

Nicholas, N. (1994) Problems in the Application of Rhetorical Structure Theory to Text Generation, Unpublished M.Eng. Sc. Thesis, University of Melbourne.

Nonaka, I. and N. Konno (1998) The concept of 'Ba': Building a foundation for knowledge creation', *California Management Review*, 40 (3), 40-54.

Nonaka, I. and H. Takeuchi (1995) *The knowledge creating company. How Japanese companies create the dynamics of innovation*, New York: Oxford University Press.

Nonaka, I. (1994) A dynamic theory of organizational knowledge creation, *Organization Science*, 5 (1), 14-37.

Ono, M. (2007) Echoic and Mimetic Words 4500: Dictionary of Japanese Onomatopoeia, Tokyo: Shogakkan, (in Japanese)

Perfect, T.J. and B.L. Schwartz (eds.) (2002) *Applied Metacognition*, Cambridge: Cambride Univ. Pr.

Pinto, H.S., S. Staab, and C. Tempich (2004) DILIGENT: Towards a fine-grained methodology for DIstributed, Loosely-controlled and evolvInG Enginnering of oNTologies, *Proc. of ECAI* 2004, 393-398.

Powell, M. (1996) *Presenting in English: How to Give Successful Presentations*, New York: Language Teaching Publications.

Rahhal, C., et al. (2007) OntoReST: A RST-based Ontology for

Maintaining Semantic Consistency in Collaborative Writing, Rapport de recherche n 6384.

Reinhart, S. M. (2002) *Giving Academic Presentations*, Ann Arbor: U. Michigan Press.

Reynolds, G. (2007) *Presentation Zen: Simple Ideas on Presentation Design and Delivery*, New York: New Riders Press.

Reynolds, G. (2009) *Presentation Zen Design: Simple Design Principles and Techniques to Enhance Your Presentation,* New York: New Riders Press.

Rodger Kibble (1999) Nominalisation and rhetorical structure, *Proceedings of ESSLLI Formal Grammar* 1999, pp.49-60.

Sasano, C. (ed.) (1978) *Dictionary of Echoic and Mimetic Words*, Tokyo: Kadokawa, (in Japanese)

Schiffrin, D., D. Tannen, and H.E. Hamilton (2001) *The Handbook of Discourse Analysis*, Blackwell.

Schunk, D. H., and B.J. Zimmerman (1997) Social origins of self-regulatory competence, *Educational Psychologist*, 32, 195-208.

Sebeok, T.A. (ed.) (1960) *Style in Language*, Cambrdige, MA: The MIT Press.

Shiraishi, D.(ed.) (1982) *Dictionary of Echoic and Mimetic Words in Everyday Use*, Tokyo: Tokyodo (in Japanese)

Strunk Jr., W. and E.B. White (2004) *The Elements of Style*, Longman.

Strunk, Jr. W. (1959) *The Elements of Style*, 3rd edition, Boston: Allyn and Bacon.

Taboada, M. and W.C. Mann (2006a) Rhetorical Structure Theory: Looking Back and Moving Ahead, *Discourse Studies* 8(3), 423-459

Taboada, M. and W.C. Mann (2006b) Applications of Rhetorical Structure Theory, *Discourse Studies* 8(4), 567-588.

Takahashi, Y., M. Kato, and H. Kashiwagi, (2007) Development of a Web-based Presentation Database for English Language Learning, *J. of the School of Languages and Communication*, 4, 93-103.

Tamori, I. and L. Schourup (1999) *Onotmatopoeia—Their Form and Meaning*, Tokyo: Kuroshio

Tateno, T., Y. Kato, and S. Kato (2008) Comparative analysis between Student Attitude and Competency of Presentation in PowerPoint among Overseas Students and Home Students, *Research Report of JET Conf.*, 08-1, 61-64.

Thompson, S.A. and W.C. Mann (1992) Rhetorical Structure Theory: A Framework for the Analysis of Texts, Papers in Pragmatics 1-1, 79-105.

Three-A Network (1998) *Japanese for Everyone*, Beginner 1, Tokyo: Three-A Network

Three-A Network (1998) *Japanese for Everyone*, Beginner 2, Tokyo: Three-A Network

Uchiyama, M and K. Chujo (2007) Linking Word Distribution to Technical Vocabulary, Technical Report B, College of Industrial Technology, Nihon Univ. Vol.40, 13-21.

Umemoto, K., A. Endo, and M. Machado (2004) From to: the evolution of concurrent engineering at Fuji Xerox, *Journal of Knowledge Management*, Vol. 8-4, 89-99.

Vygotsky, L.S. (1978) *Mind in society: The development of higher psychological processes*, Cambridge, MA: Harvard University Press.

Waters, H.S. and W. Schneider (eds.) (2010) *Metacognition*, Strategy Use, and Instruction, New York: Guilford Pr.

Weissman, J. (2008) *Presenting to Win: The Art of Telling Your Story*, New York: FT Press.

Williams, J.M. (1990) *Style*, Chicago: The University of Chicago Press

Williams, J.M. (2008) Style—The Basics of Clarity and Grace, Longman.

Yamaguchi, N. (ed.) (2003) *Dictionary of Echoic and Mimetic Words: Expressions in Everyday Use*, Tokyo: Kodansha, (in Japanese)

Zimmerman, B. J. and Martinez-Pons, M. (1990) Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use, *Journal of Educational Psychology*, 82, 51-59.

Zimmerman, B. J., & Risemberg, R. (1997). Self-regulatory dimensions of academic learning and motivation. In G. D. Phye (Ed.), *Handbook of academic learning: Construction of knowledge*, 105-125, New York: Academic Press.

List of Selected Publications

Publications directly related to this thesis

Journal Papers

- Kiyota Hashimoto, Hideaki Ando, and Kazuhiro Takeuchi, A Corpora-based Detection of Stylistic Inconsistencies of Text in the Targeted Genre, *Artificial Life and Robotics*, 15, 5 pages, to appear.
- Kiyota Hashimoto and Kazuhiro Takeuchi, Rhetorical Structure Ontology for Representing Learner's Presentations with Potential Textual Inconsistencies and Imperfections, *ICIC Express Letters* Vol.3 6 pages, to appear.
- Kiyota Hashimoto, and Kazuhiro Takeuchi, Prototypical Implementation of E-Learning System for Foreign Learners to Master Japanese Onomatopoeia, *Japan Journal of Educational Technology*, 34(Suppl) 4 pages, 2010.

International Conferences and Symposiums (Refereed)

- Kiyota Hashimoto and Kazuhiro Takeuchi, Toward the Development of an E-Learning System for Japanese Mimetic Expressions, *Proceedings of the 3rd Japan-China Joint Symposium on Information Systems*, 41-44, 2010.
- Kiyota Hashimoto and Kazuhiro Takeuchi, Multimedia Learner Corpus of Foreigner's Basic Presentation in English with Evaluations, *Proceedings of International Conference of Educational and Information Technology 2010*, Vol.3, 469-473, 2010.
- Kiyota Hashimoto and Kazuhiro Takeuchi, Prototypical Development of Awareness Promoting Learning Support System of Basic Presentation, *Proceedings of the 2nd International Symposium on Aware Computing*, 304-311, 2010.

Publications indirectly related to this thesis

Journal Papers

- Kiyota Hashimoto, Toward a Successful Higher Education Reform on English, *Kwansai Review*, 20, 1-16, 2003. (in Japanese)
- Kiyota Hashimoto, On the Paragraph Construction, *Joshidai Bungaku: Journal of English Studies* 3, 41-71, 2002. (in Japanese)
- Kiyota Hashimoto, A note on linguistic meaning: an analysis of English progressives, *Kwansai Review* 17, 133-142, 1998. (in Japanese)
- Kiyota Hashimoto, What is missed in word order instructions in English education, *Kwansai Review*15, 93-103, 1996. (in Japanese)
- Kiyota Hashimoto, Sentence Initial Position and Information Structure in English, *Hyogen Kenkyu* 64, 4-11, 1996. (in Japanese)

International Conferences

- Yuji Matsumoto, Masayuki Asahara, Kiyota Hashimoto, Yukio Tono, Akira Ohtani, and Toshio Morita, An Annotated Corpus Management Tool: ChaKi, *Proceedings of the 5th International Conference on Language Resources and Evaluation*, 2006.
- Kiyota Hashimoto, Some Notes on the Use of Cohesive Devices in Scientific Papers, The Second International Conference on Speech, Writing, and Context, 2003.
- Kiyota Hashimoto, A finer-grained way of making word frequency lists, ASIALEX, 2003.
- Kiyota Hashimoto, Potential Pitfalls of CALL and Distance Learning Materials, The 20th Annual Meeting of International Council for Innovations in Higher Education, 2002.
- Kiyota Hashimoto, On English Writing Courses for Non-Native Speakers of English, The 16th Annual Meeting of International Council for Innovation in Higher Education, 1998.

- Kiyota Hashimoto, Education for World-Wide Network Society, The 15th Annual Meeting of International Council for Innovation in Higher Education, 1997.

Books

- Kiyota Hashimoto, Mari Yamauchi, Kevin Keane, *Building Up the TOEIC Vocabulary*, Tokyo: Shohaku-sha, 2002.
- Kiyota Hashimoto, Koichiro Nakamura, P. Dale Rorex, *Writing Essentials*, Tokyo: Eicho-sha, 1998.