PAPER

Cultivating Listening Skills for Academic English Based on Strategy Object Mashups Approach

Hangyu LI^{†a)}, Nonmember, Hajime KIRA[†], Student Member, and Shinobu HASEGAWA[†], Member

SUMMARY This paper aims to support the cultivation of proper cognitive skills for academic English listening. First of all, this paper identified several listening strategies proved to be effective for cultivating listening skills through past research and builds up the respective strategy models, based on which we designed and developed various functional units as strategy objects, and the mashup environment where these function units can be assembled to serve as a personal learning environment. We also attached listening strategies and tactics to each object, in order to make learners aware of the related strategies and tactics applied during learning. Both short-term and mid-term case studies were carried out, and the data collected showed several positive results and some interesting indications.

key words: academic listening, listening strategies, tactics, strategy object mashups

1. Introduction

Foreign students are faced with many challenges when studying in higher educational institutes abroad. One of the challenges lies in their academic English abilities which are typically far from being enough to meet the academic requirements. Among the other language tasks (reading, writing and speaking), listening tasks are acknowledged to take up most of the time in academic activities. In attendance at lectures, we need to apply the highest level of listening skills, for not only we need to listen to the teacher's expounding abstract and sophisticated concepts, but also taking in useful knowledge point. Such occasions are usually referred as academic listening from the educational linguistic point of view [1]. Academic listening is a complex, multi-faceted process that place enormous skill demands on the listeners [2]. Furthermore, it has been shown in research that effective academic listening comprehension skills are essential for the student in their pursuit of academic success [3]–[5]. In fact, in order to improve the academic listening skills of F/SL (Foreign/Second Language) students, listening strategies which are considered important in cultivating listening skills, are actively studied by many researchers. It has been stated that having a good command of listening strategies can improve the listening skills in a better way [5]. However, ordinarily it is not easy for the learners (especially students studying abroad) to choose appropriate strategies on their own, since they tend to be persistent in their own ways of learning, let alone put them into

effective practice. In order to address this issue, we firstly proposed a strategy object mashups approach [6] which was expected to enable the learners to practice their listening under the more effective supporting functions while making them aware of their strategy application. Therefore, unlike previous learning support systems which provide fixed identical functions to the learners, we entitle the learners with the flexibility of building up their effective learning environment by putting together functional units provided (Strategy Objects). Based on this approach, we designed and developed several functional units, so as the mashups environment where the chosen units can be assembled and operated [7]. In order to clarify whether this new approach and the pilot system developed are useful in improving listening skills in academia, both the short-term and mid-term case studies have been conducted. After analysis of the experiment data, some encouraging conclusions were drawn that the participants' listening skills indeed were effectively improved on some level. The case studies also indicated that it was necessary to offer the learners the flexibility of building up their personal learning environments and, at the same time to inform their actual strategy applications combined with proper guidance for proper strategy choices.

2. Background

2.1 Listening Strategies & Comprehension Tactics

In cognitive psychology, the term 'strategy' is linked to the conceptual framework of human learning and memory and refers to mental steps or operations carried out to accomplish cognitive tasks [8]. Many researchers have tried to define the term language learning strategy in the linguistic world. Wenden and Rubin (1987) defined learning strategies as "any sets of operations, steps, plans routines used by the learner to facilitate the obtaining, storage, retrieval and use of information." Later on, Richards and John (1992) added that language learning strategies were "intentional behavior and thoughts used by learners during learning so as to better help them understand, learn or remember new information" [9], [10]. As learning strategies belong to the realm of language learning strategies, they are mental mechanisms carried out by second language learners to achieve reasonable comprehension when processing information contained in a large input of utterance, for they have to work under the constraints of an overloaded working memory, and a lack of linguistic, sociolinguistic and content

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[†]The authors are with JAIST, Nomi-shi, 923–1292 Japan.

^{a)}E-mail: lihangyu@jaist.ac.jp

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knowledge [11]–[13]. O’Mally and Charnot categorized listening strategy into three classifications: Metacognitive strategy, Cognitive strategy and Social strategy [14]. Generally speaking, Metacognitive strategies are strategies which require planning for learning, thinking about the learning process, monitoring of one’s comprehension and evaluating learning outcomes after an activity is completed. For example, the learners who take notes to track their level of comprehension during listening practice are adopting one of the metacognitive strategies. On the contrary, cognitive strategies are more limited to specific learning tasks and they involve more direct manipulation of the learning material itself. A learner who successfully inferred the meaning of an unfamiliar word based on the contents understood is actually putting a cognitive strategy into operation. Social strategies are social behaviors that the learners conduct when communicating with others, such as asking skilled ones for advises, comparing notes and etc. Evidences from various experiments revealed that F/SL learners, regardless of skilled or unskilled, were applying a couple of listening strategies, consciously or unconsciously [15]. It has been claimed that the differences in strategy use among the learners lie in what and how they are using [16]. It has been found the effective language learners know how to use appropriate strategies in their learning while ineffective ones are less skilled in their strategy choice and application [15]. Moreover, since what learners know about their learning can directly influence the process and even the outcome of it, it has been proved many times the importance of improving learners’ metacognitive awareness of their strategy choice and application through various experiments of related research [15], [17], [18]. Goh (2008) stressed in her findings that the learners need to be aware of how their listening comprehension is affected by their choice of listening strategies to develop flexibility in the use of listening strategies as well as find suitable ways for systematic practice, ultimately be able to obtain listening skills [17].

The concept of comprehension tactics (which is referred as tactics in this paper) was brought up by Goh [15], [17]. She defined tactics as individual mental techniques through which a general strategy is operationalized. Goh also identified that the tactics used for the same strategies vary from learner to learner, and skilled learners demonstrated better on strategy choices and the combination of appropriate tactics [15], [17]. For example, a learner successfully inferred the meaning of an unfamiliar word out of the content he/she perceived earlier; on the other hand, another learner inferred the meaning of the same word by using his own world knowledge. The fact is that they are adopting the same cognitive strategy called inference but through different tactics. The reasons for this difference, Goh indicated, may exist in the learners’ different in listening ability or whether being aware of the ways of strategy use. Furthermore, unlike listening strategies, tactics are processions of understandable learning behavior, making it possible to identify and organize tactics proved to be effective in academic listening, and then correspond these tac-

tics to the according listening strategies under the classifications of the meta-cognitive, cognitive and social defined by O’Mally [14].

2.2 Research Questions & Challenges

Firstly, it is difficult to consciously put listening strategies into operation. Ordinarily, this problem is usually solved through teaching the learners effective listening strategies and then introducing the ways for operation. Hypothesis can be made from [15], [17] that, without proper guidance, the learners tend to resort to their inefficient accustomed way of practicing without being aware of what strategies they are using and how these strategies affect their learning. Secondly, it is difficult to flexibly adopt effective listening strategies. The possibility has been revealed in some research that even though a number of positive strategies thought as helpful in language learning have been identified, the results were not desirable at all when they were used by some other learners [19]. Factors including personal traits, motivation level and cognitive style can influence the strategy choice [20]. Because of their lacking of strategy knowledge and guidance from experts, it is considered difficult to come up with an effective combination of listening strategies which suits the learners’ characteristics and learning goals. Thirdly, it is difficult to put social strategies into practice. It would be really enlightening if the ways for strategy choice and application of the effective learners can be communicated over groups or communities. As self-directed movement is the mainstream among foreign students, it is considered inconvenient for them to get involved actively in communication or cooperation with like-minded people to ask help, exchange ideas and acquire advices.

With the rapid development of information technology, computers have been used for language learning/teaching since the 1960s. Up to now, numerous CALLs (Computer Assisted Language Learning) whose categories include behavioristic CALL, communicative CALL and integrative CALL have been developed to meet different requirements [21]. However, by considering the difficulties described above, we believe that for all current CALLs, there are still some issues needed to be addressed. First of all, they provided the learners with sets of pre-designed supporting functions without explaining the reasons why those functions were introduced and how would they affect the learning. In addition, the supporting functions provided to the learners were not necessarily suitable to everyone, since all learners were offered with the identical learning environment. Secondly, despite the fact that there are research focusing on adaptations conducted throughout the years, most of them focused on the adaptation from the viewpoint of learning materials, not the learning functions [22], [23]. As a result, learners were not in the position of choosing or adjusting system functions to meet their individual learning needs. Thirdly, they are not providing enough support to take social strategies into account, which causes the lack of communication among the learners themselves. There have

been studies such as the one on enabling limited sharing and peer-reviews on learning outcomes [24], the learning techniques of each learner and the strategy application are not the focuses to be represented in a universally recognizable way.

Having considered these problems, we come up with three research challenges:

- A learning environment should be provided where not only effective supporting functions are provided but also the strategic meaning of each function are provided in order to improve the awareness of strategy application.
- The flexibility of adjusting the supporting functions should be provided to the learners, so they can build up their personal adaptive learning environment according to their own characteristics and learning needs.
- A more effective communicative platform should be provided where not only the sharing of established knowledge can take place, but also the learning techniques and strategy applications of each learner can be perceived and communicated.

3. Approach

3.1 Strategy Object Mashups Approach

Figure 1 describes the main concept of the proposed approach. Firstly, strategy models are constructed by putting together listening strategies which have been proven as positive for cultivating academic listening skills [14], and the related tactics most commonly adopted by effective F/SL learners. They are, in another word, learning techniques and methods supposed to be taught to the learners to strengthen their listening ability. Secondly, based on the established strategy models, we design and develop functional units—referred as strategy objects in this paper. The learners are expected to choose their interested strategy objects to compose their personal distinctive learning environment that we refer as strategy object mashups in this paper. Finally, the strategy object mashups used by each individual learner, together with the ideas or opinions of making such combinations, can be communicated on the social strategy platform, we hope that the good ways of learning would be passed on to the less effective learners. In the meantime, a feedback agent is to be implemented to recommend the learners with more appropriate strategy objects will advance their learning skills, in order to help the learners construct a more appropriate learning environment, and on the other hand, make them aware more advanced learning skills.

3.2 The Ontological Relationship among Strategies, Tactics and Objects (STO)

In order to connect the strategy objects with the according tactics and strategies, we introduced our simple ontological manner to do the job. The ontological relationships between

Fig. 1 The concept of strategy object mashups approach.

Fig. 2 The ontological manner among strategies, tactics and objects.

the listening strategies and the tactics are referred as the strategy & tactic models as shown in Fig. 2. And then the strategy objects will be developed based on various established strategy & tactic models. In order to visualize each tactic into minimum-sized functional units yet capable of being operated either alone or cooperatively, we take into account the actions learners usually take (common learning actions: See, Write and Listen) while doing listening practice, and then combine them into the strategy & tactic models. Because we intend to attach tactics and strategy to the object mashups composited by the learners, we relate the items of strategy, tactic, and strategy object and object mashups in an ontological manner as shown in Fig. 4. The strategy models are expected not only to be able to represent the learning processes of different learners who uses diverse tactics for the execution of the same listening strategies, but also to be presented as the model of the intellectual activities with the applicable description for designing purpose.

3.3 System Overview

Recently, we have developed a pilot system using Microsoft .NET MVC. The system can be operated in common browsers such as Microsoft Internet Explorer and Google Chrome consisting of 16 strategy objects and a mashups environment where the chosen strategy objects are assembled and operated as a whole. Firstly, we grouped the strategy objects according to the learning actions (what to see, what to write and how/what to listen) thought to be taken by the learners as shown in Fig. 3. By this arrangement, the learners are assumed to be able to quickly decide on their choices on strategy objects as long as they have determined on what to see, what/how to listen and what to write. In

Fig. 3 The GUI for selecting objects for each listening phase.

Fig. 4 The GUI for the phase of on-listening.

the meantime, we divided the listening activity into three phases—Pre-listening, On-listening and Post-listening, by considering that the academic listening in colleges usually takes the form of taking lectures, which is necessary for the learners to develop a sense of phases. Below the strategy objects, there are three boxes representing each listening phase where the learners drag and drop the chosen objects into. The next step would be the start of practicing starting from Pre-listening phase. Of course the learners can always come back to change the combination of objects to meet their needs and learning goals until satisfied with the assembled learning environment.

Figure 4 shows the learning environment of the On-listening Phase. This page is divided into two blocks. The right one is where the learners conduct their actual listening practice, which is consisted of movable tiles that respectively are the visualizations of the selected strategy objects. The sizes of each tile can be changed by being dragged and dropped into places of various sizes. On the left side, it depicts the information about tactics and strategies being adopted by the current learners and the relationships with the objects they have chosen. We call this graph STO which is automatically generated based on the objects chosen to construct the learning environment. The lowest layer of the graph represents the chosen objects (dark red circles),

and the objects suggested to be chosen (light red circles) to effectively use certain tactics. The upper layer of squares is the tactics in connection with the objects, informing the learners what they should consciously be aware of while using the chosen objects, and in the meantime, what are other options of object they should consider for a possible better learning experience. The layer of triangles is the listening strategies in connection with the tactics right below. It informs the learners of what listening strategies they are actually adopting, and also, on the contrary, what other options of tactics are under the same listening strategies. By clicking the shapes of circles, squares and triangles, the descriptive information will appear on the left-down corner. The STO is believed to play an important role in cultivating the learners' listening skills during their listening practice by informing the learners of the according tactics and strategies as well as the advises for object selections. For instance, as shown in Fig. 7, the object O3: See Related Words is chosen by the current learner, showing related vocabularies in a tile on the right side. As shown in the graph, this object directly relates to Tactic T3 (Get familiar with the pronunciations and sounds of the related words of the current listening material) and T4 (Pay attention to the keywords appeared when listening and try to figure out the whole meaning of the current listening material) which directly relates to S3

(Functional planning: Planning for and rehearsing linguistic components necessary to carry out an upcoming language task) and S4 (Self-evaluation: Checking the outcomes of one's own language learning against a standard after it has been completed). By checking these connections, the first step the learner probably takes is to add object O15 (Listen Video Tag) and O7 (See Transcript) to effectively adopt T3 and T4. And secondly, through the checking of the listening strategies, the learner notices that there is another tactic T5 for operationalizing S4 which, totally up to the learner himself/herself though, might lead to another attempt of configuring the current object arrangement for the possibility of constructing a better learning environment. (For more information of the STO, please refer to the appendix.) The reasons for this GUI representation are, first of all, to make the learners aware of their strategy and tactic application, making them aware of what the meanings are for choosing such combinations of objects, and secondly, to help the learners build up more efficient mashups learning environment which suits their needs the most.

4. Preliminary Case Studies

As the first two of our research challenges are about informing learners with the listening strategies and tactics and, at the same time, enable them to construct their own personal learning environment, we felt it was necessary to evaluate the mashups environment in the current pilot system for two reasons: one is to see the effectiveness of the STO in the role of building up suitable learning environments; the other one is to see whether the pilot system has potential in cultivating listening skills after a longer period of application. As a result, we conducted both short-term and mid-term case studies.

4.1 Short-Term Case Study

One of the unique features of the pilot system is making the learners aware of their applications of the listening strategies and tactics, as well as the suggestions of other strategies, tactics and objects which might lead to a better learning experience. The STO, as an important part of the system, plays just the role of these aspects. Therefore, we find it necessary to evaluate the effectiveness the STO has in the pilot system, especially in the process of building up the effective personal learning environment. Moreover, we decided to address this issue objectively by conducting a short-term case study to see whether the STO promotes the number of objects used and the times of making changes to the mashups in the system, both of which are considered important in the process of shaping up the personal learning environment. 20 Japanese graduate and undergraduate students from the department of Information Science and Engineering, whose first language is not English, attended this case study and the procedures are as the following. Firstly, the participants were instructed how the system works. After that, we divided them into four groups and then asked them to finish

Table 1 The experiment arrangement (for short-term).

Phase 1	Interval	Phase 2
Task 1 with STO	3 days	Task 2 without STO
Task 2 with STO	3 days	Task 1 without STO
Task 1 without STO	3 days	Task 2 with STO
Task 2 without STO	3 days	Task 1 with STO

Table 2 The experiment data with T-test.

	Without STO	With STO	T Stat	T Critical two-tail	P (T<=t) Two tail
Number of Objects	12.25	14.35	3.34468	2.09302	**0.0034
Times for Changing Mashups	2.15	4.75	6.72498	2.09302	**0.0000

(**P-value<0.01)

tasks using the system with or without the STO. The arrangement is shown in Table 1. This arrangement was made by taking into account the counterbalancing and the tasks are the videos from Ted talks which were carefully selected due to the necessity of giving the participants the most authentic lecture-taking experience. In order to diminish the influence from the first task in phase one, we took an interval of 3 days instead of having both phases conducted back to back. Finally, we collected qualitative data through questionnaires with questions related to the experiences they had with the pilot system, the comparative thoughts between with and without the STO, and their suggestions and expectations.

We established two evaluation factors: 1. from the changes of number of strategy objects chosen by each participant between phase one and phase two, we wanted to see if the STO affected the number of objects chosen by the participants; 2. from the times for making changes to the mashups between the two phases, we wanted to see the effects the STO had on the participants when feeling necessary to make changes to their object collections.

We can see from Table 2 that t Critical two-tail < $|T \text{ stat.}|$ and $p < 0.01$ from every group of data indicated that differences within each group were statistically significant. Based on the results of the quantitative data analysis, we can see that the STO does have a positive effect on the promotion of the number of the object used and the times for making changes to the mashups. Furthermore, we designed questions in the questionnaire to subjectively seek the evidences for such results, as shown in Table 3. In Table 3, From Q1 to Q4, the questions were particularly designed to investigate the participants' thought on the STO. 7 or 6 Likert scales were prepared for them to choose, as well as their reasons for making such choices. We received positive responses in general. Specifically speaking, Q1 and Q3 were asked to evaluate to what extent the STO influenced the participants when making changes to the mashups. 15 participants thought their mashup environments more helpful with the STO, meaning that they had followed the suggestions the STO provided when changes to be made. In

Table 3 Questionnaire for short-term case study (item/number of participants).

	1 Strongly With STO	2 With STO	3 Mildly with STO	4 Similar	5 Mildly Without STO	6 Without STO	7 Strongly Without STO
Q1	0	5	10	3	1	0	1
Q2	1	6	9	4	0	0	0
Q3	0	8	7	2	3	0	0
	1 Strongly yes	2 Yes	3 Mildly Yes	4 Mildly No	5 No	6 Strongly No	
Q4	0	10	6	3	1	0	
Q5	0	13	6	1	0	0	
Q6	2	7	8	2	1	0	

Q1: Which Mashup environment you built into the system are more helpful?

Q2: From which system you think you have learned more in the ways of practicing listening?

Q3: When you wanted to make changes to the mashup environment, which one encouraged you more?

Q4: By using the one with STO, have you learnt new and effective tactics and strategies that you did not know before?

Q5: Do you find the objects you applied useful for the listening practice?

Q6: Are you willing to try more objects in the pilot in the future?

addition, 15 participants answered that the STO encouraged them more when making the changes, which explains the outnumbered situation in changing times using the STO revealed from the quantitative data. Q2 and Q4 were designed to investigate the effects the STO had on the participants' learning skills. 16 participants thought that they had learned more ways of practicing listening with the help of the STO, and also 16 believed that they had learnt new effective tactics and strategies. Because the more objects the learners use in the system, the more tactics and strategy knowledge they will be exposed to, we suppose that these answers indirectly explains why more objects were being used with the STO as shown in Table 2. At the same time, the participants provided us with the reasons why they made such choices, although most of them were encouraging, there were several minus yet constructive remarks. Most participants expressed that the STO was helpful in the process of building the mashups, they felt that the information/suggestions received from the STO "taught me the purposes of using some objects or the combination of objects", "gave me advices on choosing some useful objects", "helped me understand more of the video", "improved the learning efficiency", "informed me other effective ways of learning, making me try more objects", "supplemented what was lacking in my learning environment" and etc. On the contrary, there were participants thinking: "it costs time when reading the STO", "It may be useful once become familiar, it was quite troublesome in the beginning", "It interrupted me when trying to concentrate on listening", "it was difficult to understand" and etc. From these comments, we concluded that the STO was undoubtedly necessary but further thoughts and considerations should be given to the design, contents and presentation in the future. Q5 and Q6 were mainly for their attitudes to-

wards the objects. Nearly all of the participants were contented more or less with the objects they had applied and willing to try more in the future. Meanwhile, we received many suggestions on the designs and functions of certain objects, as well as the expectations for some new objects in days to come.

4.2 Mid-Term Case Study

The results from the short-term case study indicated that the STO would promote both the numbers of objects used and the times of making changes to the mashups. Meanwhile, the qualitative results suggested that the STO was helpful in the construction of a more effective learning environment and introducing more effective ways of learning. However, since the time for the participants to use the pilot system was rather limited, there are still two questions need to be answered: is the pilot system assistant in cultivating listening skills; and can the learners listening ability be improved by using the pilot. Given the fact that it is almost impossible to cultivate learning skills or abilities overnight, the chances that learners' listening skills/abilities can be improved after one-time use of the system are even more remote. For this reason, we conducted a mid-term case study allowing the participants to use the system for at least one hour a day for eight consecutive days. We invited 6 international students studying at our graduate school whose native languages are not English but using English to conduct their research. Although their English abilities were diverse, they had all experienced difficulties in understanding the lectures effectively and were keen to find ways to improve their academic listening skills. In order to make the experience closer to the real-time academic lecture, we carefully chose 8 Ted Talks videos as listening tasks covering different topics of various fields. The participants were asked to use the system to finish one task per day for at least one hour until all the eight tasks were completed.

There were several steps in the mid-term case study. Firstly, we operated a pre-test for listening ability for every participant. This procedure was to test their actual listening abilities as an indicator of possible changes after using the system. Since we targeted academic listening in our study, we partially selected some listening tests from a book of simulation test collection for IELTS academic test-takers. Secondly, we spent around 10 minutes explaining to the participants how to operate the system, what listening strategies and tactics were, how to comprehend the graph generated on the left side of the page—all they should know in order to finish each listening task smoothly. Thirdly, the participants used the system to carry out the eight listening tasks one by one. As language learning required an enduring process of accumulation which required daily attendance, they were asked to finish only one task for at least one hour per day. The fourth step was to test the listening ability again using the similar level of listening tests from IELTS simulation test book. It again in order to check whether the participants listening abilities changes after using the system. The

final step was to ask all the participants to take a questionnaire for qualitative data collection and, a short interview afterwards mainly about their opinions or reasons of making such choices.

In order to evaluate the effectiveness of the pilot system with a longer period of application—whether the participants' awareness of listening strategies had strengthened, as well as their listening skills and abilities got improved. We established several evaluation factors, trying to find the indications which could address the first two challenges we had proposed from the quantitative data collected from the case study. 1. From the changes of number of strategy objects chosen by each participant for every listening task, we hoped to find patterns or trend indicating the effects, resulted from the operation of the system, on listening skills of each individual. 2. From the times for the changes of object selection made by each participant for every listening task, we believed that how many times the participant changed their mashups and the pattern/trends of doing it must have some meaningful indications. 3. From the times of usages for every strategy objects for each participant, we hoped to see diverse preferences over a certain object for certain listening phase. 4. From the comparison between the percentage of correct answers revealed from the pre and post listening tests, we hoped the trace of improved listening ability (if there is any) resulted from the cultivation of listening skills could be found, which might justify our study from a result-oriented view.

From Fig. 5, we can see how the number of objects used by each participant for each task changes during the case study. At least four participants showed an increasing trend in the number of objects they chose over tasks. As every object was connected with the according tactics which were related to certain strategies, the more objects the participants used during the task, the wider range of tactics and strategies they had access to. We deduced that this could possibly enable the participants to learn more effective tactics and put them into operation consciously, as a result, making the participants with more strategy objects at their disposal stand a better chance of improving the learning skills. Four participants showing an increasing trend could indicate that their learning skills had got improved in the process of finishing the tasks one by one. By comparison, the interviews with the other two participants revealed that they had been willing to improve the object numbers, but they simply thought they were just temporarily overwhelmed and lost confidence in dealing with more objects at the same time. The two participants were sure that they would increase their objects number if there had been more tasks to come.

Figure 6 showed the results for the times of changes made to every individual mashups for each task. The participants were encouraged to change the mashup environment they have created whenever they felt necessary, by deleting or adding the strategy objects they thought appropriate. The results showed a decreasing trend for every participant. We assumed that in the beginning, the participants were not fa-

Fig. 5 The change of the number of objects for each task.

Fig. 6 The changes of the number of mashups for each task.

miliar with the functions of every object and changed the configurations of the objects frequently. Later on, as they were gradually becoming accustomed with each object and, with the reference to the STO, the participants started to grow confidence in their first choices knowing what objects were suitable for conducting a more successful practice. Therefore, in the later stages, their needs for adding/deleting objects of the first choice diminished. These results at least conveyed two pieces of information: one is that the participants would take the initiatives to construct the effective learning environment, if granted with the privilege; and the other one is that at first they might appear unskilled due to the unfamiliarity, but later on they would catch up by providing proper support/guidance. After the case study, we asked the participants what prompted them to make the changes. All the participants answered that it was mainly because they were inspired mainly by the STO on the left, combined with their personal experiences over previously used objects and their willingness of trying out new objects. The same results also were revealed in the short-term case study.

We also recorded the times being used for every strategy objects in the pre-listening, on-listening and post-listening phases respectively, in the hope of discovering some patterns out of it for each participant. Figure 7 showed the examples of participant 1 and participant 4. The X axis is for all the objects and the Y axis is for the times being used for each object. From this graph, we can see that some strategy objects were frequently used for certain listening phases while some were either less than 3 times or none. There was a pattern of preferences for the object usage for

Fig. 7 The times of object use of each learning phases (For P1 & P4).

Fig. 8 Correctness of before/after listening tests.

everyone, and the pattern varies from participant to participant. For example, as shown in Fig. 7, for participant 1, object 1, 2, 3, 4 and 15 were apparently his favorite for pre-listening phase. By comparison, participant 4 only showed preference on object 1, 2 and 3 for his pre-listening phase. We believe these results indicate that the participants had their preferences over object choices to suit their learning needs, which would justify the necessity for giving learners the right to build their own personal learning support system. In addition, providing the participants with the freedom to build their personal learning environment might increase individuality, but at the same time, probably shut them from accessing to more effective objects. Hence, in our future study, we will implement the recommendation feature to the system, helping the learners in the process of building up the adaptive learning environment.

From the results of pre and post listening tests, we can see that all the participants showed different levels of improvements in the percentage of correct answers. Although we expected that this positive change was the result of sharpened listening skills after using the system, there were no direct connections to explain this difference. It might be caused by the less difficult questions in the latter test, or simply because anyone who practices that much could also progress, which had nothing to do with the system. In order to find much clearer clues leading to this outcome, we interviewed all the participants about any changes between the two tests in their own experiences. Two participants could not explain why the scores were higher than previously, but the other four claimed that they actually put the learnt strategies and tactics into practice for the latter test. One said: “at the Post-test, I check all the questions listed before starting to listen, while trying to picture the images possible to appear in the upcoming context. Because I knew that would

Table 4 Questionnaire for mid-term case study (item/number of participants).

	1 Strongly yes	2 Yes	3 Mildly Yes	4 Mildly No	5 No	6 Strongly No
Q1	0	3	3	0	0	0
Q2	0	5	1	0	0	0
Q3	1	1	2	2	0	0
Q4	0	3	3	0	0	0
Q5	0	4	2	0	0	0
Q6	2	3	1	0	0	0

Q1: Is the mashups you build in the system helpful for you?

Q2: Is the STO graph on the left helpful for you when building the mashup?

Q3: Has the System taught you better ways of practicing listening?

Q4: Have you learnt new and effective tactics and strategies that you did not know before?

Q5: Do you find the objects you used during listening practice helpful?

Q6: Are you willing to try more objects in the system in the future?

help my understanding”. Therefore, the system might have some positive effects on the sharpening of the participants listening skills.

In the end, all the participants were asked to fill in a questionnaire for the investigation of their subjective satisfactory. The questions and results are shown in Table 4. Generally speaking, almost all the responses were positive. Q1 and Q2 were to investigate the participants’ attitudes towards the mashups they built for each task and the STO graph which was supposed to help them build it. The answers were positive. As one of them put it: “the mashups I created were helping me understand more during the task, and the STO was surely helpful”. But there were also comments such as: “most of the objects were useful, but the functional improvements should be taken care of in the future”, “the STO was not quite informative” and “the tactics information was quite limited, soon I found myself running out of tactics for latter tasks”. According to these comments, we concluded that not only more considerations should be given to the functional aspects, but also more tactics should be included in STO in our future study, so as other options to present the STO for better understanding. Q3 was to make sure whether the participants had benefited by using the system—have their learning skills got improved (mastering new useful ways of learning). 4 participants were positive on different levels. They commented that more or less they felt that they had learnt new effective learning techniques for listening practice and were willing to stick to these techniques in the future. On the contrary, the other two participants did not think the same way, they claimed that they were still exploring and might be able to find good ways of learning if there had been more tasks. From these comments, we again felt the necessity of implementing a recommendation feature in the system, helping the learners find the good learning techniques at an early stage. Q4 was set to find out that, to every participant, whether the listening strategies and tactics encountered useful while using the system for the improvement of listening ability. The responses were positive, but three participants wished that if the explanations for some listening strategies could be more understandable. We realized that it was true that compared with tactics, listening strategies were indeed obscure.

In the future, more explanatory information about listening strategies should be included. Q5 and Q6 were designed to investigate the satisfaction over the objects. Despite the fact that the responses were relatively promising, we also received a lot of suggestions for the improvement of certain objects, ranging from interface design to functional refinements. Even several new objects were suggested to be added in the future. However, all of them expressed a more or less desire to try more objects in their learning, which encouraged us to put more efforts to develop new and more useful objects in our future study.

5. Conclusion

In this paper, we proposed a concept of approach–strategy object mashups, which is a brand-new methodology in this field. This new approach is intended to provide self-directed language learners with the freedom of constructing an effective learning environment by putting together wanted strategy objects, but also to be aware of the corresponding tactics and strategies they are adopting and how they are affecting their learning. Furthermore, we proposed an ontological manner, based on which, we develop a pilot system, consisting 16 strategy objects and the mashup environment where the chosen objects can be operated together. Along with the mashup environment, we introduced the STO—a graph consisting of links and notes of different shapes to inform the learners of the according listening strategies and tactics. We expect the learners to improve their listening skills in the process of building up their personal learning environment. In order to evaluate the effectiveness of the pilot system in this aspect, we conducted both short-term and mid-term case studies. The short-term case study mainly evaluated the effectiveness of the STO, while the mid-term case study, on the other hand, was set to evaluate the effectiveness of the system in cultivating listening skills. Based on the results of both mid-term and short-term case studies, we can tentatively state that this pilot system has a positive effect on cultivating listening skills, and might possibly be effective in improving listening abilities. In the meantime, the results of the case studies also indicated that it is necessary to not only provide the learners with the flexibility for constructing their personal learning environment, but also the STO (or other similar forms) to make them aware of the strategy and tactic related and guide them in the early stage of learning.

In the future, based on the comments we received from the participants, we will firstly re-design/develop some objects and the STO to provide the learners with a better user-friendly interface, and secondly we will introduce a feedback agent and a social strategy platform. The feedback agent is supposed to give the learners recommendations of objects or mashups based on their personal preferences and learning situations. The social strategy platform is where the learners can compare the mashups of each other, as well as the corresponding tactics and strategies. We expect that by adding these two new features to the system, we can not

only provide the learners with the more adaptive learning environment, but also improve their learning skills more effectively.

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Appendix: Detailed Information of the STO (Listening Strategies, Tactics and Strategy Objects Used in the Pilot System and Their Relationships)

Table A-1 All the objects used in the pilot system.

O1	See Abstract: check the abstract of the current learning material
O2	See Pictures: Check the pictures related with the current learning material
O3	See Related Words: see the related vocabularies which will appear in the learning material.
O4	See Questions: check the questions has been asked by other people who have listened the current learning material.
O5	See Notes Taken: see the notes the users have taken
O6	See Others' Summary: See the summaries taken by other learners who listened to the current martials
O7	See Transcript: Add Tags to places where you want to focus on later during your listening.
O8	Write Video Tags: Add Tags to places where you want to focus on later during your listening.
O9	Write Summary: Summarize the content of the current listening material
O10	Ask Questions: Write down the questions you have for the current learning material.
O11	Answer Questions: Answer questions posted by other learners who have listened to the current learning material.
O12	Take Notes: Write down the words you think important, for example: words you do not know, words related and etc.
O13	AB Repeat: Repeat the A, B selected part while listening.
O14	Speed Control: Control the play speed of the current learning material.
O15	Listen Video Tag: Jump to the parts you have marked before.
O16	Rehearsal: Play the pronunciation of the word you input.

Table A-2 All the tactics used in the pilot system.

T0	See the Transcript of the current learning material and write down the words needed to pay attention to
T1	See the abstract of the current learning material and deduce the contents and keywords which might appear during listening.
T2	Use the image provided to visualize the information appearing during listening.
T3	Get familiar with the pronunciations and sounds of the related words of the current listening material
T4	Pay attention to the keywords appeared when listening and try to figure out the whole meaning of the current listening material
T5	Check the questions having been raised by other learners and deduce content related with the listening material
T6	Summarize the contents and learnt knowledge of the listening material, while referring to the notes taken before
T7	See the summaries taken by others and try to deduce contents related with the listening material
T8	Mark the parts you want to listen again for a clearer understanding or for note down something important
T9	Ask questions or answer questions being raised by other learners
T10	Repeat/slow the parts you think difficult to understand during your listening
T11	Check the transcript while listening for a better understanding, and make the places you might want to listen again.
T12	See the transcript after listening to check how much you have understood

Table A-3 All the listening strategies used in the pilot system.

S1	Advance Organizers: Previewing the main ideas and concepts of the material to be learned.
S2	Using mental or actual pictures or visuals to represent information.
S3	Functional planning: Planning for and rehearsing linguistic components necessary to carry out an upcoming language task.
S4	Self-evaluation: Checking the outcomes of one's own language learning against a standard after it has been completed.
S5	Cooperation: Working together with one or more peers to solve a problem, pool information, check a learning tasks, model a language activity, or get feedback on oral or written performance.
S6	Summarizing: Making a mental, oral, or written summary of new information gained through listening or reading.
S7	Note Taking: Writing down keywords and concepts during listening activity.
S8	Self-monitoring: Checking one's comprehension during listening.
S9	Question for clarification: Asking peers or teachers questions for additional explanations, rephrasing, examples.
S10	Repetition: Repeating a chunk of language (a word or phrase) in the course of performing a language task.

Table A-4 Relationship between objects and tactics.

T0	O7, O12
T1	O1, O12
T2	O2
T3	O3, O16
T4	O3, O8
T5	O4, O12
T6	O5, O9
T7	O6, O12
T8	O8, O15
T9	O10, O11
T10	O13, O14
T11	O7, O8, O15
T12	O7

Table A-5 Relationship between strategies and tactics.

S1	T0, T1, T5, T7
S2	T2
S3	T0, T3
S4	T4
S5	T5, T7
S6	T6
S7	T0, T1, T5, T7
S8	T8
S9	T9
S10	T8

Hangyu Li received His M.E. from Japan Advanced Institute of Science and Technology in 2013. He is currently a Ph.D. candidate in the School of Information Science, Japan Advanced Institute of Science and Technology. His research interests include Topic Maps, CALL and Learning Engineering. He is currently a member of APSCE.

Hajime Kira received his M.E. from Japan Advanced Institute of Science and Technology in 2014. He is currently a Ph.D. candidate in the school of Information Science, Japan Advanced Institute of Science and Technology. His research interests include support for ICT Classroom (Future School).

Shinobu Hasegawa received his B.S., M.S., and Ph.D. degrees in Systems Science from Osaka University in 1990, 2000, and 2002. He is now an associate professor at Research Center for Advanced Computing Infrastructure, Japan Advanced Institute of Science and Technology. His research areas include support for cognitive skill learning, game-based learning, language learning, and community based learning.