

Outcomes of a Problem-based Foreign Language Module at a Japanese Elementary School

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Abstract

This paper explored the range of learning outcomes in a problem-based learning project with beginning students of English at a Japanese elementary school. The fifth grade students were tasked with making a quiz in English for international students, and with finding the language they needed to do so. Qualitative data revealed that students developed explicit metalinguistic awareness in grammar and pronunciation as well as increased pragmatic awareness. Linguistically, students became most engaged, however, in solving self-generated problems about the meanings of words, “lexical puzzles” in this paper. These problems continued to motivate independent student investigations after the unit of study. It was also found that students were able to transfer learning strategies from other subjects with the supportive facilitation of the teacher and a well-defined procedure.

1. Introduction

My specialty is teaching English to young learners. I have therefore been asked, for each of the past two years to act as an adviser to the designated teacher for English Activity classes in preparation for the annual presentation of school research. This advice comes at a late stage, after the unit in which the research lesson is situated has been planned and some of the lessons have already been carried out.

The unit in question, as described later, from its goals to its method, is most unusual, if not unique, in English education in Japan. The lesson involved a very high degree of learner autonomy with learners organizing their own tasks and seeking out the language they need to complete them. While the teacher had many positive impressions of what was happening in class, she expressed confusion about the big picture: In what sense are such lessons valuable, and where do they fit in educational theory? When she first explained the lessons I must admit I was rather skeptical that an approach depending so heavily on cognitive skills and student-directed learning could have any chance of succeeding with students so young and of such limited English ability. My doubts disappeared, however, as she explained her observations and as we pored over group work-in-progress reports and individual post-lesson reflections. In fact, I was wholly taken by surprise. I was able to offer the teacher immediate reassurance that the lessons were indeed useful and that they had ample backing in educational theory.

The remainder of this paper is about the nature of the learning, linguistic, cognitive and social as evidenced in student writings, teacher comments and observations, and my own notes. Since the approach is novel, I would like to detail the range of observed outcomes to give other teachers a sense of the possibilities. The frequency of any particular outcome is not of concern here, since that is subject, in any case, to adjustment through facilitation, setting task requirements and assigning resources.

John Dewey asserted a fundamental difference between traditional, as opposed to progressive education contrasting them thus:

To imposition from above is opposed expression and cultivation of individuality; to external discipline is opposed free activity; to learning from texts and teachers, learning through experience; to acquisition of isolated skills and

techniques by drill, is opposed acquisition of them as means of attaining ends which make direct vital appeal; to preparation for a more or less remote future is opposed making the most of opportunities of present life; to static aims and materials is opposed acquaintance with a changing world. (Dewey, 1938, pp. 19-20)

Educators will at once recognize these “progressive” principles as the foundation for most every approach and technique in modern language education, from task-based learning to promoting meta-cognitive awareness to communicative language teaching. The progressive approach is central to the newly instituted English Activity in Japanese elementary schools with its emphasis on experiential learning, on making connections to students’ interests and daily lives and its goal of developing positive attitudes towards other peoples and cultures, and toward the study of languages; rather than content mastery.

While Japanese elementary school teachers are well versed in such approaches to other subjects, they face some difficulties in implementing them in English Activity. One reason is that much of teaching is based on our experiences as students (Lortie 1975) and Japanese elementary school teachers face a deficit, in that their own English education was most likely based on a transmission model and did not begin until junior high school. Furthermore, transferring skills to the English classroom may be hobbled by the heavy processing load imposed by using a language in which they are not fluent. (Pederson 2004) However, over and above meeting these rather rigorous demands, the teacher in this study had to add another layer of overarching aims to her planning; as part of the latest round of school-based research, it had been determined that all subjects and activities should aim at developing rational thought through language, a daunting prospect for lessons dealing in communication itself, and given the age of the students (10-11 years old), and their very limited experience of English.

2. Literature review

When the teacher first told me about the lessons and asked about theoretical backing, several methods and theories came immediately to mind. I outlined these in a memo sent on January 16, 2009. In no particular order, I mentioned: task-based learning, learner autonomy, socio-cultural learning theory and learning strategies as theoretical underpinnings. I will discuss these briefly (with learner autonomy subsumed under learning strategies). I will also deal with one other important learning theory, not mentioned in my memo but well known to the teachers at this school as one of the theoretical pillars of this round of school research, problem-based learning.

2.1 Task-based learning

Crookes and Long (1998) distinguish the task-based syllabus from other sorts as being based in learning theory, and second language learning theory in particular, rather than being grounded in linguistic analysis. Instead of linguistic units like structures, notions and functions, tasks form the organizational core. Building on Wilkins (1974, 1976) they divide task-based syllabus types into synthetic and analytic; synthetic being those in which learners take up parts and later combine them into a larger whole, and analytic, those in which a learner encounters language “whole chunks at a time without linguistic interference or control.” (p. 29) Analytic approaches assume that the learner is able to induce rules or regularities or to activate linguistic universals to re-create an ordered language system.

Another useful division is that between Type A versus Type B syllabuses. Type A are classified as those using designated content and pre-determined learning objectives. In contrast, Type B syllabuses:

. . . focus on *how* the language is to be learned. They are noninterventionist. They involve no artificial preselection or arrangement of items and allow objectives to be determined by a process of negotiation between teacher and learners after they meet, as a course evolves. (p. 29)

Among task-based syllabus types, one more important distinction is drawn; that between procedural and task syllabuses on the one hand, and a process syllabus on the other. The first two require that the overarching task be pre-

determined while the tasks leading up to it (pedagogic tasks) may be negotiated. The process syllabus places no such limitations on what the teacher and the students may negotiate.

2.2 Sociocultural learning theory

The sociocultural perspective includes a range of theoretical perspectives including for example, Piaget, Vygotsky and Bruner. While Piaget is famous for his insistence on learning being anchored in the child's interaction with the physical environment, he also acknowledged a supplementary role for peer interaction when developing the ability to understand the world from multiple points of view, decentration:

Even if a second child's answer is as wrong as that of the first, their attempt to resolve their partial and centered solutions would be likely to result in the achievement of a higher level, more decentered representation that could embrace what was correct in both of the initial offerings. So whereas, according to Piaget, the young child cannot treat adults' ideas on their own merit, because of the differences in power and status involved, disagreements with other children serve to highlight the alternatives to the child's own particular point of view. (Mercer & Littleton, 2007, loc. 329-34)

Vygotsky, on the other hand, saw social interaction, not as supplementary to cognitive development, but at its very core. That is:

. . . mind emerges in the course of joint activity. There is a dialectical relationship between the intramental and intermental, so that the child's understanding develops through interaction with others. (loc. 406-412)

Social or "intermental" processes are ultimately internalized as "intramental" thought. Unlike Piaget, for Vygotsky and later constructivists like Bruner, the role of the adult or more knowledgeable other was crucial. The help offered by these experts has been classified as contingent instruction, scaffolding, and more comprehensively as guided participation (Wood 1998). Furthermore, sociocultural learning theory also includes joint information processing, "people do not just interact, they 'interthink', combining their intellects in creative ways." (Johnson 2009, loc. 218-220) Bruner also centers cognitive development on social interaction, but claims that, rather than the learner being in dialogue with the localized knowledge of some more knowledgeable individual, he is, more importantly, in dialogue with the broader culture:

Reality construction is the product of meaning making shaped by traditions and by a culture's toolkit of ways of thought. In this sense, educators must be conceived of as aiding young humans in learning to use the tools of meaning making and reality construction. (Bruner, 1996 p. 19-20)

While reality is constructed largely through cultural ways of seeing and thinking, the individual in cooperation with other individuals makes products (buildings, books, operas) which, in turn, may influence the culture.

2.3 Learning strategies

Learning strategies are mental operations or techniques used to regulate one's own learning. Wenden (1991) classifies these into cognitive strategies and self-management strategies. Cognitive processes may be divided into four steps: selection, comprehension, storage and retrieval. Learner strategies may be applied to any stage. For example, asking for clarification or guessing meaning according to contextual clues are learning strategies aiding comprehension and the strategy of silent rehearsal can aid storage and retrieval. Self-management strategies concern self regulation and regulation of learning. These include: planning, setting goals and choosing strategies to be used; monitoring, checking ongoing performance and; evaluation, assessing the performance with reference to the strategies used to achieve it. (Wenden 1991)

While there are many and varied inventories of specific learning strategies, the differences are less important than the broad agreement that modeling and teaching the metacognitive skills needed for self-regulated learning, is one of

the chief jobs of schooling, especially in the case of younger learners.

2.4 Problem-based learning

Problem-based learning (PBL) has a range of incarnations. But:

they all require the successful student to monitor and direct the process of problem solving, bringing memory of concepts and processes learned earlier to bear upon the current problem. In fact, the general sequence of problem-based learning: the motivational context of learning is set up by a real-life problem; learners are activated through group, peer and facilitator interaction; a knowledge base of relevant materials is constructed and applied to deal with the case; and the case is then reviewed, requires reflection upon declarative, procedural, and conditional knowledge. (Downing et al 2008 p. 3)

It is crucial in this approach that learning be supported by procedures, by facilitation, or regulated by objects. On the procedures side, Schmidt 1983b (cited in Eversen & Hmelo, 2008) listed seven factors that help a group to maximize learning. He dubbed these the Seven Jump:

1. Clarify unknown terms and concepts in the problem description.
2. Define the problem; that is, list the phenomena to be explained.
3. Analyze the problem; "brainstorm"; try to produce as many different explanations for the phenomena as you can. Use prior knowledge and common sense.
4. Criticize the explanations proposed and try to produce a coherent description of the processes that, according to what you think, underlie the phenomena.
5. Formulate learning issues for SDL [self-directed learning].
6. Fill the gaps in your knowledge through self-study.
7. Share your findings with your group and try to integrate the knowledge acquired into a comprehensive explanation for the phenomena. Check whether you know enough now. (loc. 650-659)

Another procedure that enhances PBL is "strategic questioning." King (1989) showed that students who asked the most questions of each other were more successful at solving problems. The mechanism at work may well be the requirement to provide detailed explanations as posited in Webb (1989). King (1991) designed and tested a formal procedure, "strategic questioning," to see if more students could be induced to achieve greater problem solving success. She divided fifth graders into three groups: strategic questioning, unguided questioning, and a control group given no directive to ask and answer questions. The strategic questioners demonstrated more elaborated explanations and greater ability to solve novel problems than either of the other groups. The questions follow the pattern in Wendon (1991) above: planning, monitoring and evaluation. Specifically, the questions are:

Planning

1. What is the problem? What are we trying to do here?
2. What do we know about the problem so far? What information is given to us? How can this help us?
3. What is our plan?
4. Is there another way to do this? What would happen if ___?
5. What should we do next?

Monitoring

1. Are we using our plan or strategy? Do we need a new plan? Do we need a different strategy?
2. Has our goal changed? What is our goal now?
3. Are we on the right track? Are we getting closer to our goal?

Evaluating

1. What worked?

2. What didn't work?
3. What would we do differently next time?(King 1991, p. 309)

Other regulation is achieved through modeling problem solving and monitoring small group activity. According to Everson and Hmelo(2008) the tutor or facilitator plays a crucial role in challenging ideas, helping students clarify their ideas, organizing their knowledge, and learning and helping them to delineate what is not clearly understood.

Object regulation may also be used to structure interactions. Everson and Hmelo(2008) mentions that during discussions easels or whiteboards may be used to record information and ideas. "This written record(which usually remains visible during the entire discussion around the case) helps the students keep track of their problem solving and provides a focus for negotiation and reflection."(loc. 9712)

3. Background

3.1 The teacher

The teacher at the center of this study was unusual. She had been trained specifically in English teaching methodology and, having observed several of her classes, she had, in my opinion, done well to implement modern approaches in her teaching. She had for several years been designated to teach all English classes at the school. At the time of this study, she had returned to duties as a classroom teacher but still maintained responsibility for the English program overall although most of the actual lessons had been re-assigned to regular classroom teachers.

She has a high level of English ability and is comfortable with spontaneous interaction with students including unexpected questions. She is able to discuss procedures with an Assistant Language Teacher(ALT) in detail, and beyond this to communicate effectively her goals, methods and educational philosophy, albeit sometimes in non-technical language. Beyond this, she is able to understand the specialized vocabulary of educational theory as evidenced in my own extensive discussions with her.

3.2 The students

The students are in the fifth grade at the elementary school affiliated with Kumamoto University. They hail from a wide geographical area within 30 minutes transportation from the school. They tend to be bright, attentive and highly cooperative. More specific to English classes, the teacher wrote in the lesson prospectus that: while there were several children who said they didn't really understand the content of English classes, they wanted, nevertheless, to know more English expressions and wanted to be able to use them and to find out more about them. This would indicate that even those who were dissatisfied with their own knowledge or progress were not dispirited. They were still interested, motivated, and willing to take initiative in learning.

4. The project

An exchange activity had been conducted earlier in the year with international students from the university. At the time it was noticed that students' natural curiosity had been engaged in a number of areas. For example, students had struggled with questions such as how to say *hajimemashte*(How do you do?) a question about the language of social discourse They had questions that were more linguistic such as: In English they say homeroom teacher, but home means household so Given this foundation of children's curiosity, the teacher wanted to expand their opportunities to discover new questions and to struggle with trying to answer them. That was the positive side. On the negative side, the teacher listed these learning deficits in the draft prospectus:

- Regarding the meaning and usage of foreign language, many students possess no real concerns or questions about the words they are using.

- While many children enjoyed the first exchange event, others felt anxiety about the English they were using.
- More than a few children have shown reluctance to consult a dictionary or phrase book or to ask the ALT how to say something in English.

(Author's paraphrase)

The teacher decided to follow up on the first exchange and negotiated a new project with the students, which was to design a quiz for international students. The quiz would be a platform for children to talk about Japan, as seen in their daily lives and for the foreign students, informally, to relate information about their home cultures.

She formalized the plan into a seven lesson unit titled "One Step to the World: Talking About Japan." Students were arranged in small groups, each in charge of designing one part of the quiz, from greetings, to posing the question, to elaborating on the answer. When they encountered difficulties, they were to discuss them with their group, refer to resources such as dictionaries, phrase books and the Internet, or consult experts like the classroom teacher or the ALT. No language was pre-taught. Groups had to identify their own needs, linguistic and otherwise, then find ways to fill them.

Groups would announce what they were working on at the beginning of a session and report their state of progress at the end. As an aid to discussions, groups kept a sketchbook to assist them in exchanging ideas in both words and pictures. The end of lesson report included relating how they overcame difficulties and what they planned to do next. The teacher operated primarily as a facilitator, posing questions and modeling problem solving.

According to the final lesson prospectus the goals of the activity were:

1. By means of the quiz format to promote interest in the exchange with foreign students and motivation to communicate in English.
2. Regarding aspects of Japanese life unknown to foreign students, to create quiz questions and hints.
3. In the process of conducting the quiz and communicating about Japanese daily life, to compare the meanings and usage of Japanese and English and come to understand some of the differences.

The lessons were planned in a general way leaving considerable room for the process to be shaped around the children's needs and progress. The general outline appears in Table 1.

4.1 Teacher as Facilitator

With such a process heavy approach, the lesson plan is incomplete without an account of the facilitating behaviors of the teacher. These include modeling and scaffolding problem solving strategies, setting problems and asking timely questions. Many of these behaviors were in evidence in the research lesson on February 5th. At the beginning of the lesson, she modeled communicating through multiple modes in what appeared to be spontaneous interaction with the ALT. This can be identified as modeling because the teacher then stated explicitly that they had communicated using

Table 1: One Step to the World lesson outline

<u>Lesson hours</u>	<u>Activities</u>
1 hr	Set event and goals. Introduce quiz format and start students thinking about the exchange, what they want to communicate and what questions they would like to pose.
3-4 hrs.	Watch a video about what surprised foreign students when they first came to Japan. Have students think up quiz questions in groups of four. In groups, think about how quiz questions will be presented. Guide them to find the English expressions they need by looking them up in a dictionary or consulting with the ALT. Groups present questions and concerns arising out of the expressions they came up with in English. Help students to explore the differences in meaning and usage between Japanese and English expressions. After resolving concerns and deciding on expressions, practice for the quiz.
1 hr.	Conduct the exchange and quiz.
1 hr.	Look back on the process of making the quiz through creating a group newspaper.

various means including gestures and incomplete sentences. Planned modeling took place immediately following with the teacher presenting a problem (identify the problem). She then asked for ideas and gave students a chance to consult each other (consulting others, sharing ideas). After that she asked for ideas and wrote them all on the board without any judgment of value (group brainstorming). She then took them into the evaluation phase and some groups talked about what they found in the dictionary (generating multiple solutions). She left the example at this point without continuing to critiquing solutions and making a final selection.

She then changed to a more elaborate example using a group's work-in-progress as a basis. She projected handwritten student work on a screen and asked students to explain their own submissions. Through questions and paraphrasing, she made their approaches to the problem explicit then proceeded to critiquing solutions, although, once more, a final selection was not made.

5. Sources of data

We met first in mid-December to talk about the research lesson set for February 5th. We met twice more before the lesson and once more after the unit had been completed to go over the group newspapers. Our meetings were recorded in my notes and supplemented with documents and classroom observations. In summary the sources of data include:

- Individual student responses "Study Reaction Sheets" written at the end of lessons
- Progress reports by groups written while planning their quiz
- Draft and final versions of the lesson prospectus
- The teacher's report on lesson outcomes (*kyoukanken repoto: naiyo men hansei*)
- My notes from 3 meetings with the teacher
- My observation notes from the research lesson
- Student newspapers

6. Learning outcomes

As learning outcomes were analyzed, three broad divisions emerged from the data: use of learning strategies, pragmatic awareness, and metalinguistic awareness.

6.1 Learning Strategies

The following strategies were noted during my first consultation with the teacher as she recounted her observations. They are distilled from my notes and quoted directly from my letter to the teacher the following day.

Using your own knowledge to solve the problem. This may seem trivial but how often do we see both children and adults begin with the position: I can't speak English—a position which puts an end to the problem solving process.

Pooling your knowledge with others. This is information gathering.

Discussion. This is problem-solving with others, not just pooling information.

Consulting an authority. This means asking for help from someone in a position of superior knowledge.

Generating multiple solutions. The danger for children is that they will stop after getting the first idea, which can prevent them from ever finding the best idea.

Thinking a solution through. A solution may seem promising at first but loses its appeal as the implications are drawn out. Again, persistence in following a solution through to a conclusion is something children will not naturally do.

Taking notes. The example is given of noting an English expression using one's existing knowledge of English letters or *katakana*. Less important than the script used to record the expression is the noting of the expression itself. Younger children will assume they will remember things. Taking notes is a learning strategy they must learn in school.

Using a dictionary. This simple strategy allows learners to access information independent of the classroom situation.

Although such strategies are used in elementary school, they are most uncommon in English classes. They can therefore be regarded as existing skills transferred to a new context of use.

Evidence that these and other learning strategies were effectively transferred is seen in the independent and unsolicited investigations undertaken after the project work had finished. These were written up in the student newspapers. One child looked at *kendama* (cup and ball) in other countries and how it came to Japan. Another searched for more lexical puzzles and wrote about *senko hanabi*, literally incense fireworks, but called "sparkler" in English. Another child worked alone on their newspaper and wrote about breakfast in Honduras, an interest stimulated by contact with the international student from Honduras. One group devoted their whole newspaper to a new area of investigation, food in other countries. Transfer of independent learning skills can also be seen in another child who attempted to find the English word for *hansei* (looking back on an experience with a critical eye) for the purpose of using it in the newspaper.

6.2 Pragmatic awareness

Because the task was real, children (and the teachers who advised them) were also concerned about whether the words they used suited the situation and the relationship between children and adults who were guests. Examples from post-lesson reaction sheets include:

- In English they say "No. Sorry." But in a Japanese quiz program we would just say *chigaimasu* (Wrong) so I thought it was alright just to say "No."
- When someone gets the right answer, you can't just say "Yes". I want to know the correct way to respond in English.
- I want to know how to say *Wakarimashita ka?* (Did you get it?) and *Hinto wa irimasu ka?* (Do you need a hint?) politely.

The children showed an awareness of pragmatics and had a natural desire to apply this to the real situation of meeting foreign guests.

6.3 Metalinguistic awareness

Although one of the goals of the project was to develop awareness of differences between English and Japanese, it is important to note that the students were not tasked to make a comparison of the two languages as part of the project. Rather the differences were noticed as a bi-product of investigating language for the quiz.

The data provides many examples of an emerging metalinguistic awareness. Three categories emerged. These were: syntax, pronunciation and what I call lexical puzzles.

Many students were able clearly to identify word order, the most important feature of English syntax; and particles, the most important feature in Japanese syntax as fundamental differences between the languages:

- When I tried to change Japanese into English directly, I had problems. This is because the order of the words matters.
- I found it odd that English does'nt have anything like [the Japanese particles] *no* or *wa*.

One student wondered whether English had an equivalent to *desu*, (a copulative roughly equivalent to the English

“be”) and word endings like —*masu* (both a tense and politeness marker). And some students were able to frame questions about the “be” verbs and verb morphology as differences between Japanese and English.

Pronunciation also came into the picture as part of task requirements. Students consulted the ALT regularly as they practiced their new expressions. In the process of transcribing an expression for the quiz, one child became acutely aware of the difference between “and” and “end” and that she was hearing them as the same word when they were, she realized, distinct for English speakers. This realization came about as part of discussing problems with the class. The ALT demonstrated the difference.

6.4 Lexical puzzles

Students made a lot of progress in the area of semantic awareness. For example, some students talked about finding multiple uses for words like “take” when they investigated language they needed for the quiz, in this case “take one.” They concluded that because words may have many meanings, we must be careful to select the right one. This was directly related to the search for the right language to conduct their quiz.

Lexical puzzles, while being part of a more general semantic awareness, differed in two important respects: solving them was not necessary to the task at hand, and children showed intense engagement with each lexical puzzle as a problem in its own right. Although several examples can be cited, two puzzles: *kanji* (Chinese character) and *kendama* (cup and ball) became class-wide concerns.

One group wanted to talk about the Japanese writing system, *kanji*, and found the English equivalent, Chinese character. “Chinese” presented little problem but the word “character” is confounded by a more restricted cognate in Japanese, meaning a player in a drama, including fictional personalities such as Mickey Mouse. This produced some questions because it is clearly used in a different way in Chinese character. One child looked it up in an electronic dictionary, read out the definitions then summarized them in his own words to classmates. While this failed to result in a solution, (character as a written symbol was not among the definitions) the process invoked two learning strategies-- looking up a word, and summarizing the meaning--and resulted in understanding a wider range of meaning in the English word. At a metalinguistic level, we can infer that the child has come to understand, in a concrete and direct way, that words have multiple meanings and that cognates do not have a one-to-one correspondence.

A more elaborate example is found in the search for an English equivalent to *kendama*, a traditional Japanese toy. After discovering that it is rendered as cup and ball in English, the question arose as to why. One child showed that he had falsified a hypothesis, saying: since it’s a traditional Japanese toy I thought we could just call it *kendama*. Another child offered:

Maybe they just looked at it and talked about how it looked. There’s a red ball and there is a dish. And the dish is sort of like a cup so that’s how it came to be cup and ball.

A third child backed up this idea saying: what we learned before *me-dama-yaki*, is “sunny side up” and *miso-shiru* is “miso soup” and *onigiri* is “rice ball” which shows that people look at the distinctive features of something and describe what it looks like. This shows hypothesis making. Note that it is exemplar based but extends into a sort of tentative rule or hypothesis.

Another child brought up “bowl” as another possible rendering of “ball” which is transposed into the same word when converted into the Japanese sound system. In addition, as the children investigated this, some came to understand that the same sounds can be expressed in two different, but exactly equivalent, ways in Japanese *bo—ru* and *bouru*. Furthermore, the teacher asked the ALT to pronounce the words so the children could understand they were distinct in English. Here children learned (but were not explicitly taught) that two distinct sounds in one language can be collapsed into one when converted into another language. Some children confirmed the difference in meaning (and spelling) with their dictionaries.

Lexical puzzles persisted as the most impressive feature of the project for most children. As the final stage of the project, groups were to produce newspapers as a forum to reflect on their learning, including how they interacted and solved problems. To aid the process, the teacher returned the reflection sheets they had written during the project.

However, students did not write about process and problem solving strategies. Instead they related their own thoughts about specific problems, mostly lexical puzzles. In addition to their own group puzzles, nearly every group talked about one or both of the puzzles featured in the main research lesson: cup and ball and Chinese character. This may have been because they were showcased at that time, but it may also be that unsolved problems continued to stimulate student thinking.

Lexical puzzles can also be creative in nature as students try to cobble together an explanation from what they know. One child, who was not particularly interested in English, wrote about his own thought process and the deliberations in his group as they worked out a way give an English name to a placard used to display a quiz question. The process can be seen in action in this short conversation recorded by the teacher:

A: "Card" sounds strange because it isn't really a card.

B: It's more of a stick, isn't it?

A: Stick? This is a stick. (waving it in the air) Not a card, a stick. A card is made of paper.

B: Teacher, what do you call this? Is it a stick? Is it a card?

C: Is it a board? Is it a stick? Is it a card? Teacher, it's not "answer," we decided on "question." "Answer" is *kotae* (answer) so it's "question" for *mondai kado* (question card). (Author's translation)

As mentioned earlier these puzzles continued to generate interest and activity outside and beyond task requirements which shows not only that learning strategies had been transferred but also that autonomous learning was generated as a major outcome.

7. Discussion

The program generated a variety of outcomes, which can broadly be classed under learning strategies, pragmatic awareness, and metalinguistic awareness. While metacognitive awareness was explicit in some instances, the rules by which students were operating were most often to be inferred from their statements. This is in keeping with their level of development. According to the developmental stages of Piaget these 10 and 11 year olds would be starting the transition from concrete operational to formal operational stages. While children in the concrete operational stage use operations, internal cognitive structures, to solve problems, these are based on internalized exemplars. Their thought has not yet been formalized into abstract, generalizable rules which may be stated explicitly.

Motivation was high among students as seen in the continuing engagement with problems even after the project. Some students went on to investigate unrelated problems (breakfast in Honduras, sparklers) even though such activity was not requested. In fact, the teacher regarded such activity as off-task (she had instructed students to reflect on the project and how they had learned and solved problems) meaning these students were motivated only by their own interest and curiosity.

While students were given a daunting task, including teaching themselves language, giving structure to the process—setting goals together; pursuing the goals through discussion and following up with individual tasks; reporting progress and reiterating the cycle with a new set of goals—they were able to engage in an elaborate and extended effort at problem solving. In line with problem-based learning and sociocultural learning theory, the support of the procedure and teacher facilitation (including modeling and probing questions, and the timely provision of direct assistance) must be considered key to the success of this project and should be at the center of any plans to initiate a similar project in another school.

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