Interaction between Form Learning and Content Comprehension as a Function of Manipulation of Learners' Attention in Content-based Instruction

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Abstract

This study experimented learner attention drawing tools, namely, enhanced input, oral prompt and inner speech ways of balancing the distribution of attentional energy between meaning and form in content-based language instruction that seeks to attain content comprehension and language learning at the same time. Seven classes (30 students each) were selected purposively from a population of technical college students. Tests and introspective tools were used to generate data. The study employed independent sample t-test and linear regression to analyze the quantitative data. The data from the introspection was analyzed thematically. The findings show that it is possible to draw the attention of learners to target language structures to the effect of attaining grammatical accuracy without a counter effect on content comprehension. However, this can be constrained by the complexity of input and the adequacy of the attention drawing tool employed in the instructional process.

Keywords: Attention, Accuracy, Comprehension, Content-based instruction, Focus- on- form, Input complexity

Introduction

Over the last four decades, there has been a widely held consensus that input plays a crucial role in driving learners' acquisition of target language accuracy. Over the same period, a considerable scholarly effort has been made to explicate the nature of second language input and its relationship with other learning constructs (Gass, 1997; Krashen, 1985; Robinson, 1995; Schimidt, 1995; VanPatten, 1996). Particularly, it has been found out that not all linguistic data presented to learners can be

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internalized into their interlanguage (Hatch, 1983; Krashen, 1980, 1982; Long, 1983, 1985; Pica, Young & Doughty, 1987).

Thus, researchers today widely agree that provision of plenty of input is necessary but not sufficient for intake to occur (Izumi, 2002; Leow, 2000; Swain, 1995). Studies in meaning-based language practice also revealed that provision of sufficient input is not a guarantee for target language accuracy even though it may promote fluency. A considerable number of investigations in this respect emerged in Canadian immersion language programs where learners were immersed in meaningful input for a considerable period of time. Students in these language programs tended to attain the required levels of receptive skills, and they could speak the language fluently. Yet, their grammatical competence lagged far behind even after years of instruction (Davidson & Snow, 1995; Genesee, 1987; Hammerly, 1987; Harley 1992; Harley & Swain, 1984; Swain 1991). This was mainly attributed to the fact that they do not attend to the language forms contained in the input under processing.

Hence, current research goes beyond general interest in the need for sufficient input for second language acquisition. Particularly, a recent study has examined the role of focus-on-form tools that draw the attention of learners to target language forms amid multitude of language input (Doughty, 1991; Ellis, 1994; Robinson, 1995; Schmidt, 1990, 1995, 2001; Tomlin & Villa, 1994; Truscott, 1998). Central to the use of these tools is the idea that attention is so crucial for learning target language forms and that without it, no new mental representations of these forms can be formed. Furthermore, language learners process target language input in ways that are determined whether or not attention is drawn to them. Accordingly, it has also been argued that attention is what allows speakers to become aware of a mismatch between what they can produce and what they need to produce as well as between what they produce and what proficient target language speakers produce (Ellis, 1994; Gass, 1988, 1997a; Schmidt & Fronta, 1986; Swain, 1993, 1995, 1998). Based on these grounds, a considerable number of studies have been carried out on the role of attention drawing tools such as enhanced input (Jourdenais, 1998; Leow, 2001) and oral prompt (Lapkin, 2000; Swain, 1995). These studies reported different levels of success in improving grammatical accuracy by drawing the attention of learners to target language structures in meaning driven language practice. However, these studies, while they target grammatical accuracy, did not examine the tangential impacts of the pedagogical interventions on comprehension.

Taking this empirical gap as a starting point, this study investigated the interaction between form learning and comprehension in content-based language instruction. Content-based instruction (CBI) is a language instructional model that seeks to bring the teaching of academic content and target language skills together in a way they reinforce each other. This instructional model is largely founded on theoretical bases that come under the umbrella of natural approaches to language instruction (Krashen, 1985; Van Lier, 2000; Widowsson, 1990). At the center of these theories is that language is learned most effectively for communication in meaningful and purposeful social and academic contexts. Learners in schools know and need to know more about their academic subject matter.

Therefore, learning tasks that integrate content and language learning provide real meaning as an inherent feature of naturalistic language learning. In such contexts, meaning provides cognitive hangers for language functions and structures paving the way for better language acquisition (Marsh, 2000; Snow, 2000). Proponents of this educational model also claim that this input processing fosters content mastery (comprehension) while it benefits language learning.

While these claims are widely advanced by this camp of scholars, the other group of scholars (Skehan, 2000; Van patten, 2000) disputes it, arguing that content comprehension and language acquisition (particularly grammatical accuracy) cannot be attained simultaneously through a mere integration of content and language learning. As learners possess limited attentional energy, they cannot attend to meaning and form at the same time spontaneously. According to Van Patten (2000, 2004), under normal circumstances, human attentional energy is channeled to content learning (comprehension) at the expense of form learning. Thus, learners channel their attentional energy to content learning at the expense of language forms. This writer further indicated that in many cases learners do not necessarily utilize syntax in understanding content meanings. They often get the message with a combination of vocabulary or lexical information and extra-linguistic information (Skehan, 2000). Finally, these writers suggest the need for experimenting instructional tools that balance the distribution of learner attentional energy between language forms and content meaning comprehension.

As a way to find ways to balance the distribution of attentional energy between content and form, this study experimented three instructional techniques, namely, enhanced input, pushed output, and inner speech in content-based instructional model.

The use of enhanced input involves a deliberate attempt to make input more perceptible to language learners by employing tools with typographical cues of underlining, boldfacing, italicization, capitalization, or other strategies such as color coding or using different font sizes or types (Sharwood, 2004). The idea behind this pedagogical technique is bringing language forms to the attention of learners, thereby triggering learners' internal learning mechanisms to the effect of interlanguage development.

Pushed output, the second attention drawing tool, refers to an interactional process where a more competent interlocutor (a native speaker or a teacher) pushes a learner in oral interaction to express his/her meanings instead of providing him/her immediate explicit feedback. This interactional move has the purpose of drawing learners to their problems in target language use and notice their gap in the use of target structures, and as a result of this the learners process subsequent input from the interlocutor with more focused attention and modify their output to the effect of enhancing their accuracy (Lapkin, 2000; Schmidt, 2000; Swain, 1995).

The third pedagogical tool that gain due consideration for this purpose is the utilization of learner inner speech. Inner speech is a self-regulated language practice in which the learner makes self-talk (expressing meanings to imaginary interlocutor), silent rehearsal of an output, and monitoring of the appropriateness of this output with due attention to accuracy (Geurrero, 2000; Tomlinson, 2000).

Finally, it is worth noting that all the tree pedagogical techniques (inner speech included) have gained empirical support in terms of their impact in drawing the attention of learners to target language structures to the effect of enhancing target language accuracy (Doughty, 1991; Guerrero, 1999; Jourdenais, 1998; Leow, 2000; Swain & Lapkin, 1989). Yet, many of these studies were carried out in non-CBI setting where the learning of language (mainly accuracy) is sought with no due consideration for comprehension of meaning as a major learning outcome. Therefore, the results of these studies do not show whether and how content comprehension is affected by the manipulation of learner attentional energy through these tools.

Thus, the present study sought to see whether learners can attend to language forms without any counter effect on comprehension and vice versa. Also, it investigated how complexity of input plays out in the interaction between meaning and form processing in this instructional model.

Theoretical Framework

There is a widely held consensus in cognitive psychology and SLA that in meaning-driven language learning more human attentional energy is inherently channeled to meaning over language forms and functions (Skehan, 2000; Van Patten, 1996, 2004). This is also reported to have been the major reason for learners' inability to pick language structures and functions through spontaneous processing of language input in CBI practices.

Theoretical models accounting for the interaction between the variables (attentional energy and gains in target language accuracy) are available in second language acquisition and cognitive psychology. The models presuppose the need for pedagogical techniques (for example, the use of enhanced input, pushed output, and inner speech) to draw the attention of learners to target structures as a way to balance the distribution of attentional energy between form and meaning (Skehan, 1998; Robinson, 2000).

While there is consensus over the need for the attention drawing techniques, scholars hold different positions on how to balance the distribution of learner attentional energy between meaning and form. Skehan, (1998) and Foster (2003) argue that cognitively less complex tasks cater for drawing the attention of learners to target language features. This in turn leads to an efficient and balanced utilization of attentional energy for form learning and content comprehension. Skehan (1998) in his model, widely known as the tradeoff hypothesis, justified on the ground that attentional resources are limited, and that learners cannot process complex academic concepts and target language features simultaneously. So, simplified tasks would ease this burden giving room for learners to pay attention to target language features while attaining comprehension.

In contrast, other scholars (Ellis, 2000; Gilabert, 2007, Robinson, 2005; White, 1989) hold that learners can be drawn to target language features not when the text is simplified but when the task demands the use of

more complex target language features to figure out the meaning or to communicate it. Thus, these scholars, notably Robinson (2005), argue that cognitively complex tasks cater for a better room to draw the attention of learners to target language forms through which the distribution of attentional energy is balanced between form and meaning.

The two group of writers produced proofs in support of their respective claims, leaving the controversy alive in the literature. The controversy is also a subject of inquiry in meaning-driven language learning approaches such as the content-based language teaching. Also, it is not clear how the attention drawing techniques such as enhanced input, pushed output, and inner speech are effectively combined with the different types of input for this pedagogical purpose. Thus, this study seeks to explore whether and how these attention drawing techniques can help to distribute learner attention between content comprehension and form learning in content-based language instruction classes.

The following questions were set:

1. Does the use of enhanced input, pushed output, and inner speech enhance target learners' language accuracy?
2. Is there a tradeoff effect between grammatical accuracy and content comprehension in the use of enhanced input, pushed output, and inner speech as instructional techniques?
3. Does the tradeoff effect between grammatical accuracy and content comprehension, if any, vary with the degree of input complexity?

Research Methodology

Research Design

This study employed a pretest – posttest quasi-experimental design. The study was carried out in the Department of Information Technology at Bahir Dar Polytechnic College. Six classes, 30 students each, of experimental group and one control group of 31 students were selected purposively. This was the only department that could accommodate the experimental intervention in the study. All the teachers and students of this department were taken as subjects of the study.

Subject teachers were trained on how to carry out the experimentation on the whole processes of the study. A four weeks training was delivered to the teachers on how to employ the interventions in the CBI classes. Also, conversations and reflections were held between the researcher and the

teachers on the very idea of CBI, its benefits and challenges. The researcher made sure that the teachers could carry out the intervention before intervening in the process. Finally, the teachers' use of the interventions was piloted.

Operationalized through the aforementioned design, the study investigated effects of the three attention drawing tools (enhanced input, pushed output, and inner speech) on learners' grammatical accuracy and content comprehension with two levels of task complexity (simplified and complex). Through the combination of the two variables, the following experimental conditions were established.

Treatment 1- The use of simplified enhanced input
Treatment 2- The use of complex enhanced input
Treatment 3- The use of inner speech with complex input
Treatment 4- The use of inner speech with simplified input
Treatment 5- The use of pushed output with complex input
Treatment 6- The use of pushed output with simplified input
Control condition - Content teaching in English with no use of any of the pedagogical tools

Data Collection Instruments

The data for this study were collected using tests and introspective tools. Tests were administered to assess grammatical accuracy and comprehension whereas the introspection was used to collect students' reflection on their input processing after performing tasks.

All the experimental groups and the control group took the test on grammatical accuracy both before and after the treatments. To assess the participants' gain in grammatical accuracy, three different written testing measures were used: filling in blank spaces, combining sentences, and completing picture-cued sentences.

These tests were given in the order shown above. In all the tests, to standardize the testing procedure, the entire test session was directed by a recorded guide. The exact time allocated for the test, including the time interval between test items, was determined on the basis of the results and lessons obtained from the pilot study.

Content comprehension tests

Content comprehension was assessed across treatment types in the study. Participants under the pushed output and inner speech conditions were

provided with open ended question comprehensively covering the conceptual content covered in the text. However, subjects in the enhanced input conditions were presented with multiple-choice comprehension questions on the enhanced content text. These question forms were preferred over open-ended forms because the latter involves production (output) which would confound the effect of the input-based treatment (enhanced input).

Introspection

Students made meta-reflection on their input processing immediately after their performance of the task. As such, they forwarded what they recalled of their cognitive processes in each of the three treatments and explained their contents and when and why they attended to form or meaning in the processes.

Methods of Data Analysis

This study dominantly employed quantitative data analysis with a few qualitative supplements. The quantitative data on accuracy gains were analyzed using independent samples t-test that compares the pretest-posttest differences between the experimental groups and the control group. This has been made across treatment types in the study.

The interaction between target language accuracy gains and content comprehension has been computed using linear regression analysis. Also, the assessment of the effect size (partial eta squared) is used to determine the degree of association between comprehension and gains in grammatical accuracy.

Results

The results in this study fall under three major categories: (1) accuracy gain, (2) interactional effect between accuracy and comprehension, and (3) the interplay among task complexity, grammatical accuracy and comprehension. Accordingly, the presentation of the data follows these categories as threads of organization.

Accuracy Gain

Table 1: Target language accuracy gains across treatment conditions

Treatment	Groups	Mean scores	Mean difference	t	df	Sig.
Enhanced input with simplified input	pretest-posttest difference of accuracy scores under enhanced input with simplified task	.68	.06	1.074	57	.208
	Pretest-posttest difference of accuracy scores under control group	.62				
Enhanced input with complex input	Pretest-posttest differences of accuracy scores under enhanced input with complex task	.71	.11	.786	57	.368
	Pretest-posttest difference of accuracy scores under control group	.62				
Pushed output with simplified input	pretest-posttest difference of accuracy scores under pushed output with simplified task	15.13	14.57	20.85	58	.002
	Pretest-posttest difference of accuracy scores under control group	.62				
Pushed output with complex input	Pretest-posttest difference of accuracy scores under control group	.432	.39	1.85	58	. 073
	Pretest-posttest difference of accuracy scores under control group	.62				
Inner speech with simplified input	pretest-posttest difference of accuracy scores under inner speech with complex task	24.66	23.13	33.18 .	57	.000
	Pretest-posttest difference of accuracy scores under control group	.62				
Inner speech with complex input	pretest-posttest difference of accuracy scores under inner speech with simplified task	20.53	19.04	43.7 .	57	.012
	Pretest-posttest difference of accuracy scores under control group	.62				

Table 1 above shows that not all treatment conditions in this study positively impacted the interlanguage accuracy of learners. To this end, treatments under the enhanced input did not affect the accuracy gains of learners both in the simplified (p = .208) and complex (p = .368) input conditions. The pushed output treatment enhanced target language accuracy under the simplified input condition (p = .002), but not under the complex input condition (p = .073). Comprehensive positive impact is observed under inner speech treatments. Both the simplified (p = .000)

and complex (p = .012) task conditions of the inner speech treatment paid off in target language accuracy gains of the learners. Taken overall, the results in this table support the first research question only partially.

Interaction between Content comprehension and Grammatical Accuracy

Table 2 below depicts the degree and type of relationship between the achievements in content comprehension and target language accuracy computed through linear regression analysis. The table bears the correlation coefficient (which signifies the type and degree of association) and the adjusted R (which indicates the degree of causal relationship) between the two learning outcomes.

Table 2: The Interactional Effect between Content comprehension and Grammatical Accuracy across Treatment Conditions

Treatment Condition	Difference in Pretest-posttest		Interactional effect	
	Accuracy scores	Comprehension scores	**r**	**Adjusted R^2**
Simple enhanced input	.68	.63	-.76*	.51
Complex enhanced input	.71	11.5	-. 81*	.64
Simple pushed output	15.12	13..02	.79*	.63
Complex pushed output	.432	14.5	-.82*	.65
Simple inner speech	24.66	23.08	.97*	.81
Complex inner speech	20.53	21.07	.86*	.66

The figures in Table 2 above indicate two patterns of relationship between content comprehension and target language accuracy gains. Some of the treatment conditions result in strong positive relationships between the two learning outcomes. Particularly, treatments such as (1) pushed output with simple task condition (r= .79; p = .03), (2) inner speech with simplified task (r=.97; p = .02), and (3) inner speech with complex input (r= .86; p = .023) yielded strong association between the two learning outcomes. This suggests that there was no tradeoff between the processes of content comprehension and the learning of target language forms. Furthermore, the adjusted R^2 from the three treatment

conditions (.63, .81, and .66, respectively) demonstrates that the cognitive processes of content comprehension and target language accuracy changes reinforce each other under these treatment conditions.

This signifies that the accuracy gains significantly benefited from the comprehension processes under the treatment conditions. For example, the adjusted coefficient of determination under the simplified task condition of the pushed output (R^2=.63) indicates that 63% of the target language accuracy gains under this treatment condition benefited from the content comprehensions attained in the simultaneous learning of content and language. Similarly, 81% and 66% of the accuracy scores under simple task condition of inner speech and complex task condition of inner speech treatment in their respective order resulted from the comprehension attained in the respective treatment conditions.

Turning to another treatment condition in this study, an opposite pattern of relationship was observed. This is particularly true under the complex task condition of the pushed output treatment and both task conditions of the enhanced input treatment. The figures in the same table (Table 2) above show that there is a significant negative relationship between the target language accuracy gains and the content comprehension under these treatment conditions (-.78, -.76 and -.81, respectively). This result suggests that there was a significant tradeoff effect between the content comprehension and the target language accuracy gains. It is recalled that these treatment conditions are experimental situations where participants failed to attain the required level of target language accuracy in the immediate posttest. Thus, the correlational results between the accuracy and content comprehension suggest that the deficit in target language accuracy is largely caused by the utilization of the attentional energy for content comprehension at the expense of learning target language forms. The results also suggest that the tradeoff resulted from the mix of the complexity of the input and the nature of the attention drawing tool employed.

In sum, the results on the interaction (between content comprehension and form learning accuracy) demonstrate varying patterns which need explanations based on the theoretical bases of the learning constructs under consideration.

Discussion

This section presents the theoretical explanations behind the results found across the three treatment conditions. As such, a two-step analysis of data was conducted. First, the degree of participants' performance in target language accuracy and content comprehension was set out. This was followed by a close look into the interaction between content comprehension on the one hand and target language accuracy on the other. This framework of analysis has been carried out across treatment types in the study and the discussion takes each of the treatments in turn beginning with enhanced input treatments followed by pushed output and inner speech conditions.

Interaction under enhanced input treatment

Looking into the findings under the enhanced input treatment, we see that learners comprehended the academic content meanings of the reading texts both in simple and complex task conditions. Yet this same group of learners failed to change the interlanguage accuracy despite their noticing of the target structures typographically enhanced in the text.

A combined look into the sets of results begs two questions. First, how do learners manage to understand the reading text without making changes in their interlanguage accuracy? Secondly, do the results suggest tradeoff effect between comprehension and target language accuracy under the enhancement treatment conditions?

In order to answer these two questions, qualitative date were generated, in addition to the quantitative ones, through probing into the cognitive processes involved in the learners' struggle to learn content and language simultaneously. Among others, the participants were asked (1) what they were focusing on during the reading of the typographically enhanced input, (2) whether they use the typographically enhanced structures to figure out the meanings in the reading, (3) whether they experienced difficulties in trying to figure out the meanings in the reading and learning the rules of the enhanced target structure simultaneously, and (4) what exactly it was responsible for their comprehension of content in the CBI instruction.

The participants both in simplified and complex enhanced input treatments remarked that their focus was on understanding meaning. This

action of prioritizing meaning comprehension over form learning is an inherent human cognitive tendency. This natural tendency is one of the manifestations of the tradeoff effect between comprehension and form learning in a given task (Van Patten, 2000; 2004). To further understand the cognitive processes, we need to see the reflection of learners passing under simplified enhanced input and complex enhanced input separately.

Responding to the probing questions, learners under simplified task condition of treatment reflected that they benefited from the pedagogical actions taken to simplify the task. Particularly, they indicated that they are assisted by: (1) visual support of the task (pictures) and (2) familiarity of the text. Also, they largely relied on the lexical rather than syntactic processing to figure out meaning in the text.

Thus, it can be inferred that the learners managed to comprehend the content not because their attentional energy was channeled to comprehension at the expense of target language accuracy but because the input was made comprehensible through these pedagogical actions. Their remarks suggest that they spare attentional energy beyond their comprehension of the academic content. This in turn suggests two important points: (1) it substantiates the postulation that human attentional energy is inherently predisposed to meaning, and (2) the attentional drawing tool (typographical input enhancement) could not take the extra attentional energy to form learning. Thus, the tradeoff between content comprehension and form learning under this simplified enhanced input condition can be attributed to the weakness of the pedagogical tool to distribute the attentional energy between the two learning processes.

With regard to the results under the complex input condition of the enhanced input, the participants under this input condition, like their counterparts in the simplified input conditions, managed to comprehend the text and failed to attain grammatical accuracy, suggesting a tradeoff effect between content comprehension and form learning.

These evidences of the learning outcome still suggest that typographical input enhancement cannot draw learners' attentional energy to language forms regardless of the input complexity. This evidence is in conflict with Robinson's (2000; 2005) tenets of cognition that this hypothesis holds that complex input conditions (unlike simplified ones) better balance the distribution of attentional energy in form focused instruction

like the one at hand. This, according to Robinson (2000; 2005), is because under such input conditions, learners tend to draw their attention to language form as a means to meet demands of complex input processing. Nevertheless, this could not be true under this treatment condition.

In sum, the use of typographically enhanced input could not redress the inherent tradeoff between the learning of target language forms and comprehension. This is true regardless of the complexity of input presented to learners.

Interaction under Pushed Output Treatments

Moving to the results under the pushed output treatments, a slightly different picture on the interplay between the two components of the instruction was found. There was no tradeoff effect (r= .81; R^2= .65) between content comprehension and target accuracy under the simplified task conditions while the results in the complex task conditions demonstrated a tradeoff effect between the two learning outcomes (r= -.76; R^2= .51). The positive relationship between content comprehension and target language accuracy (absence of tradeoff effect) under the simplified task conditions of the pushed output treatment suggested that the competing process of the two learning processes turned into complementary cognitive processes.

In particular, the comprehensibility of the input under this task condition has been the basis for the acquisition of the target structures. As the content was comprehended through the interactional moves of prompts (pushes) and the simplifying tools, the learners moved a step forward to accomplish the target language acquisition process which involves other steps. This is consistent with the widely acclaimed models of oral input processing formulated by Levelt (1992, 1994) and Gass (1997). According to these models, the first stage of oral input processing involves the process of understanding of content meaning. This segment of input, which Gass (1997) calls comprehended input, enables learners to see their gap in their ability to express the desired meaning on their own. This in turn gives them the chance to formulate hypothesis of expressing this meaning which they test either immediately in their interaction with an interlocutor or through a delayed stage of interlanguage change.

In this study, the learners under the simplified task conditions (unlike those under complex input conditions) seemed to have tested the hypothesis in the immediate interaction with their teachers as they have shown marked changes in their target language accuracy in the immediate accuracy posttest scores. Also, they benefited from the simplification of the input which facilitated the comprehension and the other stages of the input processing leading to the accuracy gains.

In sum, the results both under the pushed output treatment showed that oral prompt (push) is a viable pedagogical tool to take learners above the constrains identified in Van Patten's (1996; 2000) model of input processing and thus can remedy the major deficiencies of CBI practices. However, it requires simplification of input for oral interaction.

Interaction under Inner Speech Treatments

The inner speech treatment conditions offered the most significant level of content comprehension and accuracy gain with the least degree of tradeoff effect between two learning processes (r= .97; R^2= .81 and r= .86; R^2= .66, respectively). These results lend strong support to the theoretical claims on the potentialities of this mental tool.

Specifically, these results prove that, where other things are kept constant, learning situations allowing the utilization of inner speech enable learners to make examination of multi-dimensional cognitive processing at a greater depth of processing with better control of figuring out meanings, encoding them into linguistic representations, and monitoring the overall cognitive processes (Lantolf, 1992; Guererro, 2000).

Moreover, it proves the theoretical claim that inner speech caters for what Lantolf (1997) and Geurrero (2000) call sufficient planning time and rehearsal opportunity. For example, as opposed to the case in pushed out treatments, learners in inner speech practices had the chance to plan what they intended to express with no pressure to do so. Thus, this may have given them the chance to figure out meanings required by the task, plan how to express these meanings, and monitor their accuracy in expressing these meanings.

These advantages of inner speech practice over pushed output have been justified by a considerable number of educators in ESL and cognitive psychology (Ellis, 2005; Foster, 2000; Skehan, 1998). According to these

educators, meaning driven language learning processes such as CBI involve a number of cognitive processes that require proper planning and management of cognitive processes on the part of the learner.

In sum, the use of inner speech proves to be the most promising pedagogical tool to attain the two major learning goals of Content and Language Integrated Learning (CLIL), content comprehension and target language accuracy, without a tradeoff effect between the two. There is also a possibility to create a space for the optimal utilization of this mental tool in this pedagogical practice in a way that independent learning capacity could be fostered.

Conclusion and Instructional Implications

The results in this study showed that the construct of attentional energy is central to the cognitive processes in the integrated learning of content and language. It was shown that under normal circumstances, human attentional energy is inherently predisposed to meaning (content comprehension) at the expense of form learning. It followed that teaching target language structures through the incidental way is impossible in this instructional approach. Thus, the instructional process in CBI requires pedagogical tools that proportionally allocate attentional energy to content comprehension and form learning. While there are such techniques experimented to this end in this study, not all are equally efficient to attain this desired end.

Hence, the use of inner speech is the most efficient pedagogical technique that enables learners to attain target language accuracy and content comprehension with no tradeoff between the two learning outcomes, whereas the use of enhanced input failed to achieve this showing that the attentional energy of learners remains disproportionally destined to meaning following the natural route. Yet, the use of oral prompt (push) can proportionally distribute this cognitive energy between comprehension and form learning with some limits. Particularly, it could do this only under simplified input conditions.

From the results of the interventions, two points can be drawn. First, there is evidence that learners can successfully process content meaning and target language forms at the same time. This in turn suggests that learners are not limited capacity processors. Secondly, the failure to

achieve both content comprehension and target language accuracy under enhanced input treatment and pushed output with complex input does not suggest that learners are limited processors. The failure in the case of the pushed output treatment is due to provision of demanding input with insufficient processing space. Also, those under the enhanced input treatment failed to process syntax not because they are limited processors but the pedagogical tool is inadequate to utilize the cognitive tools for learning of forms and comprehension at the same time.

Finally, to refine the impact of these pedagogical tools more investigation is needed. Particularly, the role of pushed output needs to be investigated with the addition of more planning time for learners for oral output. In addition, enhanced input should be combined with brief explicit teaching of language forms prior to the use of such input as an attention drawing tool. With these efforts of refinement of these tools, content-based instruction should be made a viable educational model that shapes the future educational practice in foreign language education.

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