Teachers' perspectives on second language task difficulty: Insights from think-alouds and eye-tracking[1]

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Abstract

The majority of empirical studies that have so far investigated task features in order to inform task grading and sequencing decisions have been grounded in hypothesis-testing research. Few studies have attempted to adopt a bottom-up approach in order to explore what task factors might contribute to task difficulty. The aim of this study was to help fill this gap by eliciting teachers' perspectives on sources of task difficulty. We asked 16 ESL teachers to judge the linguistic ability required to carry out four pedagogic tasks, and consider how they would manipulate the tasks to suit the abilities of learners at lower and higher proficiency. While contemplating the tasks, the teachers thought aloud, and we also tracked their eye movements. The majority of teachers' think-aloud comments revealed they were primarily concerned with linguistic factors when assessing task difficulty. Conceptual demands were most frequently proposed as a way to increase task difficulty, whereas both linguistic and conceptual factors were suggested by teachers when considering modifications to decrease task difficulty. The eye-movement data, overall, were aligned with the teachers' think-aloud comments. These findings are discussed with respect to existing task taxonomies and future research directions.

Introduction

The last three decades have seen a growing interest in the role of tasks in second language teaching and learning, with pedagogic tasks being increasingly promoted and used as a defining (Long, 1985, 2015, see this issue; Van den Branden, 2006) or key (Ellis, 2003; Bygate, 2000) organizing unit of syllabi. The rationale for the inclusion of tasks in second language (L2) instruction is multifaceted: First, tasks provide an optimal psycholinguistic environment for L2 processes to develop by offering plentiful opportunities for meaningful language use as well as timely focus on linguistic constructions as a specific need arises (Long, 1991). Second, task-based learning is well aligned with the principles of learning-by-doing and student-centred teaching, ideas that have been advocated and widely adopted by scholars in the field of general education (e.g., Dewey, 1913/1975). Finally, pedagogic tasks prepare learners to carry out genuine communicative tasks aligned with their future academic, professional, vocational, and/or personal needs. As a result, L2 instruction utilizing tasks often has high face validity (Long, 2005) and is motivating to students, who in turn engage with the tasks. Given these widely-recognised advantages of integrating tasks into second language syllabi, a considerable amount of research has been directed at exploring ways to optimise task-based language teaching (TBLT) with the aim of informing task-based practise (for review, see Ellis, 2003; Long, 2015; Samuda & Bygate, 2008; Ziegler, this issue).

Although a substantial amount of research has accumulated on TBLT, many issues remain unresolved, including the question of how tasks should be graded and sequenced within the syllabus in order to create ideal conditions for L2 learning. To date no clear, empirically attested findings are available that can guide teachers in grading and sequencing tasks, despite the fact that extensive theoretical (e.g., Skehan, 1998, this issue; Robinson, 2001, 2011) and empirical work (e.g., Baralt, Gilabert, & Robinson, 2014) has been dedicated to addressing this issue. This is likely to be due to various factors, such as methodological

3

shortcomings in existing research that may have confounded the internal validity of empirical studies (Norris, 2010; Révész, 2014) as well as a lack of comparable operationalisations of task- and language-related constructs across studies (Long, 2015; Long & Norris, 2015). An additional reason for the mixed findings might lie in that the two theoretical models, Skehan's (1998) Limited Capacity Model and Robinson's (2001, 2011) Triadic Componential Framework, which have driven the bulk of previous empirical research on factors determining task grading, might not incorporate the full spectrum of the variables that could inform task grading and sequencing decisions. Another possibility is that, some key variables, which are in fact included in the models, might not yet have been the object of ample empirical research.

Besides conducting hypothesis-testing research, there are additional ways to gain insights into what types of factors might be useful to consider when grading tasks, including the collection of learner perception data and/or expert opinions about sources of task difficulty. The aim of this study was to explore the latter - namely, whether introspective data gathered from one group of experts, second language teachers, reflect existing theoretical views or open new understandings about factors contributing to task grading and sequencing criteria. To accomplish this goal, we asked L2 teachers to gauge the linguistic ability needed to perform a set of pedagogic tasks, and consider how they would modify the tasks to make them suitable for learners with lower or higher proficiency levels. The methodological innovation of our research lies in our triangulation of the introspective data we collected with recordings of the participants' eye movements while they simultaneously thought aloud.

In the sections that follow, we first look at the task taxonomies proposed in Skehan's Limited Capacity Model (1998) and Robinson's Triadic Componential Framework (2001, 2011), followed by a review of Ellis's (2003) task framework, a model that also offers criteria for task grading but has received less attention to date. It is important to note that our focus is

restricted to the factors integrated in the taxonomies. A detailed discussion of how these often overlapping factors are proposed to be manipulated to facilitate the effectiveness of task-based syllabuses is beyond the scope of this review.

The Limited Capacity Model

Skehan (1998) proposes utilizing three categories when assessing L2 task difficulty: code complexity, cognitive complexity, and communicative stress. *Code complexity* refers to the linguistic demands imposed by a task. Tasks that elicit the use of more advanced and a greater variety of constructions are likely to pose more difficulty. Also, learners are expected to experience more difficulty when they need to deploy more sophisticated, diverse and dense lexis. *Cognitive complexity* captures the cognitive processes induced by the task. Within this category, Skehan makes a further distinction between cognitive familiarity and cognitive processing, with cognitive familiarity encapsulating the ability to handle familiar information with greater ease and cognitive processing referring to the extra demands posed on processing when new solutions are needed. Cognitive familiarity may stem from familiarity with the topic, discourse genre, and task. Cognitive processing demands, on the other hand, may increase if the information relevant to task completion is less structured, explicit, and clear. Cognitive demands are also anticipated to rise when the task requires greater amount of computation, that is, manipulating and transforming information. *Communicative stress*, the third category in Skehan's model, is concerned with the performance conditions under which the task is completed (see also Skehan, this issue). Task difficulty is likely to increase if the task is performed under greater time pressure, more participants are involved, real-time processing is required, there is more at stake, and there is no opportunity to alter the way the task is implemented.

The Triadic Componental Framework

Robinson (2001, 2011), in what he referred to as the Triadic Componential Framework, also outlines a taxonomy of task characteristics in order to provide syllabus designers with operational criteria that can be used to classify and sequence tasks. Robinson's framework includes three main characteristic types: factors contributing to task complexity, task conditions, and task difficulty.

Task complexity factors determine the inherent cognitive demands of tasks, that is, task complexity appears similar to what is meant by cognitive complexity in Skehan's model. According to Robinson, level of task complexity should serve as the only basis underlying sequencing decisions in the syllabus. Task complexity can be enhanced by manipulating tasks along two types of task dimensions: resource-directing and resource-dispersing. Resource-directing features, by definition, relate to conceptual task demands. For example, the tasks that are expected to place enhanced conceptual demands on learners are those that that require learners to engage in causal, intentional, or spatial reasoning; description of events that are displaced in time and space; and/or reference to many elements instead a few. Robinson further argued that resource-directing features have the capacity to direct learners' attention to specific, task-relevant linguistic features. By way of illustration, tasks that require causal reasoning are likely to elicit more widespread use of logical connectors (e.g., *therefore*). Resource-dispersing dimensions, on the other hand, concern the procedural conditions of task performance. Task demands are anticipated to increase when learners need to carry out several rather than a single task concurrently; little or no planning time is made available; the task structure is unclear; and/or more steps are needed to complete the task.

Task conditions include variables that influence interactional task demands, and subsume factors related to the interactional partners and the level and nature of participation

6

required. Participant-related characteristics, for example, are concerned with whether participants have the same or different gender, proficiency level, and/or status and role. Task demands may also differ depending on the extent to which the partners are familiar with each other, or share content and cultural background. Variables associated with the nature of participation include whether the task allows for multiple or one predetermined solution; the participants need to converge or can diverge on the task outcome; the task instructions call for one-way or two-way interaction; the participants need to contribute more or less during task performance; and/or the task-based interaction involves two or more participants.

Finally, the notion of *task difficulty* captures the fact that individual differences in ability (e.g., aptitude) and affect (e.g., anxiety) may also influence task-based performance and development. It is important to point out that, in Skehan's (1998) work, task difficulty is conceptualized in a more general sense to denote differences in overall task demands. Skehan regarded tasks as more difficult if they pose increased demands in terms of any of the three types of task factors proposed in the Limited Capacity Model - code complexity, cognitive complexity, or communicative stress. In this article, we follow Skehan in using the term task difficulty in this more general sense.

Ellis's criteria for task grading

Ellis's (2003) task classification framework delineates four types of task dimensions that can be used by syllabus designers in the task grading process: features related to the *task input*, *task conditions*, *task processes*, and *task outcomes*. Most factors subsumed under task conditions and processes are also included in the Limited Capacity Model and/or the Triadic Componential Framework, although they are labelled differently in some cases. According to Ellis, task conditions comprise variables describing the relationship between the interactants (one-way vs. two-way), the task demands (single vs. dual), and the discourse mode elicited

by the task (dialogic vs. monologic). Task processes capture differences in the type (information vs. opinion exchange) and amount (few vs. many steps involved) of reasoning required.

A feature specific to Ellis's (2003) taxonomy is the fact that it distinguishes between input and outcome-related task criteria. Among the *input* features, Ellis listed the nature of its medium, classifying input presented in the oral mode as most difficult, followed by input appearing in the written and pictorial form. A second task input factor is code complexity; task input with more complex vocabulary and syntax is expected to pose more difficulty. Cognitive complexity, a third input-related factor in Ellis's framework, defines the task input as more difficult when it is more abstract, includes more elements and relationships, has less clear structure, and requires a there-and-then orientation. The last input feature in Ellis's taxonomy is termed as familiarity, encapsulating the expectation that familiar input eases processing load.

Factors that describe the task *outcome* comprise medium, scope, and discourse mode. With respect to medium, the need to articulate an oral outcome is anticipated to pose greater difficulty than to present an outcome in written form. In turn, a pictorial outcome is deemed easier to deliver than a written piece. Closed versus open outcomes may also influence the level of difficulty. Finally, task difficulty is likely to be enhanced when learners are asked to produce instructions or arguments rather than lists, descriptions, narratives, or classifications.

The present study

As mentioned previously, the majority of empirical studies that have so far investigated task features to inform task grading and sequencing criteria have been grounded in hypothesis-testing, drawing on the task taxonomies outlined in Skehan's and Robinson's models. Little research thus far has attempted to adopt a more bottom-up approach in order to explore

whether variables, besides the ones identified in these models, might contribute to task difficulty. The aim of this study was to help fill this gap by eliciting teachers' perspectives on sources of task difficulty. We asked teachers to (a) judge the linguistic ability required to carry out four pedagogic tasks, and (b) consider how they would manipulate the tasks to suit the abilities of learners at lower and higher proficiency levels. While contemplating the difficulty and manipulations of the tasks, the teachers were asked to say what they were thinking about. To triangulate these data, we tracked the eye-movements of the teachers in an attempt to gain information about the extent to which they interacted with the task instructions and pictorial input. Combining introspective think-aloud data with behavioral eye-tracking data is an innovative aspect of this study. To the best of our knowledge, no study has yet triangulated think-aloud and eye-tracking data in the context of TBLT research.

<div align="center">Methodology</div>

Design

The participants were 16 English as a Second Language (ESL) teachers. They were all asked to think-aloud while first assessing the level and then manipulating the difficulty of four pedagogic tasks. Throughout this process, their eye movements were tracked. The four tasks were presented to the teachers on separate slides using Tobii Studio 3.0.9 eye-tracking software (Tobii Technology, n.d.). Task order was counterbalanced across participants.

Participants

The participants were recruited from two contexts, 10 ESL teachers from the UK and 6 ESL teachers from the US. The mean age of the UK and US teachers were 37.20 (SD=11.67) and 42.33 (SD=7.76) years respectively. Most of the UK teachers were female (n=9), whereas half of the US teachers were male (n=3). Half of the UK teachers were native speakers of

English (n=5), and the rest came from Japanese (n=2), Korean (n=2), or Greek (n=1) first language backgrounds. Among the US teachers, four were native speakers of English, the remaining two had Spanish and Ukrainian as their first language. While the UK teachers' experience varied widely, ranging from 2 to 25 years of language teaching (Median=4.50, Mean=6.50, SD=6.92), the US teachers constituted a more homogeneous and overall more experienced group with a range of 9 to 20 years of teaching (Median=14.50, Mean=14.50, SD=3.20). Overall, the US teachers also had higher qualifications; all of the teachers held a master's degree in TESOL or applied linguistics. A third of the UK teachers had a master's in TESOL or applied linguistics (n=3); the rest were studying toward an MA in these fields (n=6). All of the teachers had some familiarity with TBLT and the notion of task complexity. On five-point Likert scale, they provided average ratings higher than 3 points of their knowledge of TBLT (UK: M=3.60, SD=.97; US: M=3.40, SD=1.20) and task complexity (UK: M=3.20, SD=1.16; M=3.30, SD=1.06), with higher ratings indicating greater familiarity.

Tasks

The four tasks used to elicit teachers' perspectives on task difficulty were all adapted from tasks included in the textbook *New Cutting Edge Pre-Intermediate* (Cunningham & Moor, 2005). Our rationale for selecting pedagogic tasks from a commercial textbook was to increase the ecological validity of the research. In many contexts, teachers often need to adapt textbook materials to fit the needs and ability level of their students.

We selected two decision-making tasks and two information-gap activities (see Appendix for tasks). As part of one of the decision-making tasks, *Jungle Trip*, students were asked to decide which 12 items they would take on a jungle trip, where they have to survive for seventy-two hours without help. The task input included the task instructions and a photo

depicting the set of objects from which learners can choose. The task instructions broke down the task into two phases: first, each learner was asked to explain what items they would take individually; then, students were directed to agree on the best list of items.

The other decision-making task *Facelift* involved learners in deciding in groups what improvements to make to a cafe using a limited budget. Students were encouraged, in particular, to consider how to improve the bar area/equipment, decoration, and furniture. In addition to the task instructions, learners were provided with a picture of how the cafe looked and a plan of the cafe area to assist with planning.

The third task, *New Zealand*, was an information-gap activity, requiring pair work. Both members of the pair were given a map of New Zealand, each containing different pieces of information. The students' task was to find out from their partner where a given list of places were located on the map, and why they were important landmarks. Thus, the task input consisted of the map with labels and the task instructions.

The last task that teachers were asked to examine and modify was a traditional *Map* task. Students, working in pairs, were instructed to ask for and give directions based on a map. Both partners were told where they were on the map, and were provided with a list of places to which they needed to ask for directions. The two members of the pair had access to different map versions. Each map clearly indicated the places to which the student needed to give directions, but the names of the locations to which the learner had to ask directions for are missing. Thus, the task input had two main components: the instructions and the map.

When selecting these tasks, we had several considerations in mind. We decided to use two task types, decision-making and information-gap, rather than a single type, in order to enable us to capture a fuller range of task factors. For example, we anticipated that the decision-making tasks would elicit more reasoning-related comments from the teachers than the information-gap activities. Given the eye-tracking component of the experiment, we also

considered the distribution of textual and pictorial input incorporated in the tasks. We opted

to use tasks that contained clearly delineated areas of textual and pictorial input to facilitate

subsequent analysis (see below). Finally, we decided to use materials from the same textbook

to control for, at least to some degree, the language ability needed to complete the tasks.

Also, in this way we were able to eliminate confounds resulting from factors such as

differences in font type and style of layout.

Procedures

The teachers completed the experiment in one individual session, which took between 60-90

minutes. First, we obtained informed consent, then administered a background questionnaire.

After that, the eye-tracking system was calibrated. The eye movements of the UK participants

were captured by means of a mobile Tobii X2-30 eye-tracker with a temporal resolution of 30

Hz. The eye-tracker was mounted to a Samsung laptop with a 17" screen. The US

participants were recorded with a Tobii TX300 integrated eye-tracking system using a

sampling rate of 300 Hz and a 23" screen. The participants were seated facing the eye-tracker

approximately 60cm from the centre of the screen, and their eyes were calibrated using a 9-

point calibration grid. The materials were presented with Tobii Studio 3.0.9 software (Tobii

Technology, n.d.).

Once the eye-tracking system was calibrated, we familiarised participants with the

instructions and procedures in a practice phase. First, the participant read the general

instructions, followed by instructions about how to think aloud. They were asked to consider

the following three questions while examining the experimental tasks:

What level would this task be appropriate for? Why?

How would you modify this task for more advanced learners?

How would you modify this task for less advanced learners?

Next, the participants practised thinking aloud while considering a sample task. In the practice phase, we encouraged the participants to raise any questions they had with regard to the procedures, but few asked for clarifications. Finally, the participants moved on to the actual experiment, and considered, while thinking aloud, the four pedagogical tasks guided by the three questions provided. They completed each task at their own pace. In each setting, the researchers stayed in the same room in case any technical problems arose, and, in a very small number of cases when it was needed, reminded participants to think aloud. Otherwise, the researchers sat at a discrete distance and worked on their computer to try to avoid distortions in the think-aloud data caused by the researcher's presence.

Data analyses

Think-aloud data

The analysis of the think-aloud data included five phases. First, the data were transcribed by a research assistant. Second, the same research assistant reviewed all the think-aloud comments and identified emergent categories by annotating the data. The first author also coded 20% of the dataset following the same procedure. Percentage agreement between the first author and research assistant for category identification was found to be high across all four tasks (Jungle Trip=.85; Facelift= 91; New Zealand=.94; Map=.96). Third, the first author grouped the annotations to form macro categories through establishing patterns in the data. In the fourth step, the resulting categorisation was double-checked by the first author. Finally, a frequency count of all the annotations was computed for each task by summing up the annotations falling into a particular category.

Eye-tracking data

The eye-movement data were analysed utilizing Tobii Studio 3.0.9 (Tobii Technology, n.d.). For each task, the data were segmented into three parts, according to whether the teachers were talking about (a) the proficiency level appropriate for the task, (b) modifications that could make the task more difficult, or (c) modifications that could make the task less difficult. In all cases, the teachers' think-aloud comments clearly indicated which of the three questions they were considering. In a few cases, the teachers only addressed two out of the three questions, resulting in a smaller number of segments. The areas of interest (AOI) were specified as those parts of the slide that included the task instructions (AOI Instructions) versus those parts that provided students with the pictorial input (AOI Pictorial) (see Appendix). Next, raw fixation durations and counts were exported for each AOI. The raw data then were corrected for time-on-segment, in other words, we divided the total duration and number of fixations by the amount of time teachers spent on each segment (i.e., one of the three questions)[2]. When the task instructions or pictorial input consisted of more than one area of interest, the data for these were combined for the purposes of further analyses (e.g., data for cafe plan and picture of cafe were merged as they together constituted the pictorial input for the Facelift task).

<div align="center">Results</div>

Think-aloud data

This section presents a list of the task factors that emerged from the content analysis of the think-aloud comments. Six macro-categories were identified across the four tasks: conceptual demands, linguistic demands, interactional demands, procedural demands, modality, and task outcome. Some of these were further broken down to subcategories. Table 1 provides

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[2] Although the eye-trackers at the two data collection sites differed in screen size, pixels were not affected on the screen. Thus, no scaling was deemed necessary.

examples for each macro-category and some of the subcategories, according to the three questions posed. The rest of this section gives the frequency counts for each macro-category and sub-category by the three questions for the four tasks.

TABLE 1 ABOUT HERE

Jungle Trip task

For the Jungle Trip task, the content analysis generated 84 annotations altogether. From the comments teachers made when assessing the proficiency level appropriate for the task, 23 annotations emerged. As shown in Table 2, the teachers most frequently mentioned linguistic demands as determinants of task difficulty (n=14). Within this category, the teachers listed lexis most often (n=8), and a smaller number of teachers also referred to grammar (n=3). Conceptual demands emerged as the second most frequent category from the think aloud comments (n=8). In particular, teachers reflected on the extent of reasoning required by the task (n=5) and the amount of background knowledge assumed (n=3). Finally, one teacher also took a procedural factor into account: whether planning time was made available.

A total of 33 annotations concerned the modifications that teachers would make to increase task difficulty. The large majority of the annotations considered ways to enhance the conceptual demands of the task (n=23). More than half of the teachers suggested manipulations involving the items to take on the jungle trip (n=14), and a considerable number of the teachers proposed increasing conceptual demands by requiring learners to reason (n=9). The second most frequently-suggested type of modification included comments related to the task outcome (n=5). Two additional categories emerged from the content analysis: interactional (n=3) and procedurals demands (n=2).

When coding the modifications recommended by the teachers to decrease task difficulty, 28 annotations were made. These were grouped into two main categories: linguistic (n=17) and conceptual demands (n=11). Most teachers suggested lowering linguistic demands by providing key lexis to students (n=15). Two teachers additionally proposed decreasing the linguistic complexity of the instructions. Moving onto conceptual demands, several teachers mentioned provision of more extensive background information (n=6) as a possible means to decrease task demands. The rest of the think-aloud comments were concerned with how manipulating the items might lower cognitive load (n=5).

TABLE 2 ABOUT HERE

Facelift task

The coding of the think aloud comments for the Facelift task resulted in 66 comments. Of these, 17 annotations were concerned with the suitability of the task for a particular proficiency level. As Table 3 demonstrates, teachers most often cited linguistic demands when contemplating the proficiency required to carry out the task (n=12). The majority of the comments were concerned with lexis (n=5), followed by grammar (n=2) and genre type elicited (n=2). Factors related to the conceptual demands posed by the task also featured in a considerable number of think-aloud comments (n=5). In particular, teachers listed the extent of reasoning needed to carry out the task (n=2), the complexity of the pictorial input (n=1), the number of elements to consider (n=1), and the amount of background knowledge assumed (n=1) as factors determining their judgment about task difficulty.

In analysing the teachers' think-aloud comments about how to increase task difficulty, 25 annotations emerged. The majority of the teachers suggested increasing the conceptual complexity of the task through either increasing reasoning demands (n=12) or altering the

pictorial input (n=5). Comments related to the task outcome constituted the second most-frequently cited category (n=6). Finally, two teachers proposed asking students to work in pairs rather than groups (n=2).

When the think-aloud comments about decreasing task difficulty were coded for the Facelift task, 24 annotations were created. The majority of the annotations referred to linguistic demands (n=14). Most teachers suggested that, in order to reduce task difficulty, learners should receive support with lexis (n=11), possibly as part of a pre-task phase. Two teachers also recommended providing students with access to grammatical constructions that are relevant to the task. Conceptual demands-related comments also emerged from the think-aloud data, although less frequently (n=6). Teachers mentioned manipulating the pictorial input (n=2) and allowing students more freedom to select what areas they would like to renovate (n=2). Finally, several teachers noted that the task would probably pose less challenge if learners engaged in pair or group work or worked together as a class (n=4).

TABLE 3 ABOUT HERE

New Zealand task

The think-aloud data for the New Zealand task yielded 63 annotations (see Table 4); 21 of these were derived from the think-aloud comments recorded while teachers were considering the proficiency level needed to carry out the task. The largest category, including half of the annotations, made reference to linguistic demands, such as the complexity of lexis (n=6), grammar (n=3, and sentence structure (n=1). One teacher also mentioned task genre as a factor determining task difficulty. Eight annotations were concerned with conceptual demands, making this category the second most frequent. When considering cognitive task complexity, most teachers assessed the complexity of the map (n=6), whereas a smaller number of teachers took into account the level of background knowledge assumed (n=2).

17

Two teachers also referred to interactional demands as a variable potentially contributing to task difficulty.

When coding the teachers' think-aloud comments about ways to increase the difficulty of the New Zealand task, 17 annotations emerged. Factors related to conceptual task demands appeared in the teachers' think-alouds most frequently (n=8). Several teachers proposed making the pictorial input more complex by including more information to share (n=5). Besides manipulating the pictorial input, teachers also suggested requiring learners to reason more (n=2) and presenting them with an unknown map (n=1). Another category emerging from the comments related to the task outcome. Some teachers thought that the task could be made more complex if learners were additionally asked to create a presentation about New Zealand, prepare an itinerary for travel, or plan a trip. Altering the interactional (n=2) and procedural demands (n=2) were, too, mentioned by a small number of teachers. In particular, they recommended group instead of pair work as well as removing the instructions. Finally, two teachers proposed that the introduction of a writing component could make the task more difficult.

Turning to suggested manipulations to decrease task difficulty, the dataset generated 25 annotations. Most think-aloud comments referred to conceptual demands (n=15), proposing to decrease task difficulty either by increasing learners' familiarity with the task content (n=10) or manipulating the pictorial input (n=5). The category that emerged with the second most annotations was linguistic demands (n=5). Teachers suggested adding a pre-task activity during which key grammar (n=4) and lexis (n=3) would be provided. Several think-aloud comments mentioned procedural factors (n=4), and one teacher recommended utilising group instead of pair work to ease interactional task demands

TABLE 4 ABOUT HERE

Map task

For the Map task, 59 annotations emerged from the analysis of the think-aloud comments. Table 5 shows that twenty annotations came from the stage when teachers were contemplating the proficiency level required for the task. Conceptual complexity was found to be the most frequently mentioned factor, accounting for more than half of the total annotations (n=11). Among cognitive factors, teachers most often considered the complexity of the map (n=5). Additional cognitive factors referred to were the complexity of the directions that learners were expected to give (n=1) and the extent of learners' familiarity with the task type (n=1). The second most frequently-cited category consisted of linguistic demands (n=5), more precisely, the complexity of the lexis needed to complete the task. A small number of teachers also took into account procedural (n=2) and interactional (n=2) task demands when judging task difficulty.

In analysing the teachers' think-aloud comments in response to the question what modifications they would make to increase task difficulty, 28 annotations were generated. The majority of the comments suggested enhancing conceptual complexity (n=17). Most teachers argued that this could be achieved by manipulating the map (n=12) or increasing reasoning demands (n=5). Besides enhancing conceptual demands, several teachers thought that task difficulty would rise if the task materials incorporated more complex lexis (n=4) and required participants to interact on their mobile phones as opposed to face-to-face (n=4). Finally, two teachers suggested adding another task outcome, and one teacher proposed increasing the social distance among participants.

Based on the teachers' think-aloud comments about how to decrease the difficulty of the Map task, 11 annotations were created. Lowering the conceptual demands of the task emerged by far as the most frequently-mentioned proposal (n=7). The specific comments

related to conceptual complexity were parallel to the teachers' recommendations about how to increase task difficulty. Four teachers suggested modifications to the map, and two teachers proposed providing learners with the opportunity to practice direction-giving tasks prior to completing this task version. Making the directions less complex was, too, raised by one teacher as a possible manipulation to ease cognitive demands. The second most often mentioned modification type concerned the task procedures (n=2). Adding planning time and removing time pressure each were proposed by one teacher. Finally, one teacher contemplated providing assistance with lexis, and another suggested a change to modality in order to lessen the challenge posed by the task

TABLE 5 ABOUT HERE

Eye-tracking data

Table 6 summarizes the descriptive statistics for the total duration and number of fixations within our areas of interest, AOI Instructions and AOI Pictorial, for each question across the four tasks. To ease interpretation, we also calculated a ratio of fixation durations and counts for each segment, by dividing the fixation durations and counts for AOI Instructions by those for AOI Pictorial. The resulting index captures how long and how often teachers gazed on the instructions as compared to the pictorial input. Thus, higher values indicate greater amount and number of eye fixations on the instructions, with indexes higher than 1 associated with longer and more gazes made on the instructions than the pictorial input.

As Table 7 shows, for each task, participants fixated proportionately longer and more often on the instructions when assessing the proficiency level required to complete the task, as compared to when they were considering modifications to lessen or increase task difficulty. The AOI Instructions to AOI Pictorial ratios also demonstrate that, on the Jungle

and Map tasks, teachers looked proportionately longer and more frequently at the instructions in the process of contemplating how to increase, as opposed to, how to decrease task difficulty. On the other hand, on the Facelift and New Zealand tasks, similar AOI Instructions to AOI Pictorial proportions were observed for both fixation durations and counts regardless of whether teachers thought aloud about enhancing or lowering task difficulty.

Discussion and Conclusion

To complement previous hypothesis-testing research, the goal of this study was to explore whether L2 teachers' introspections while assessing and modifying task difficulty reflect current theoretical views and/or generate new insights about criteria for task grading and sequencing. To address this goal, we asked a group of English L2 teachers to think aloud while judging the proficiency level required to carry out a set of pedagogical tasks and to consider possible task modifications for learners with lower and higher proficiency. We also recorded participants' eye movements while they were examining the tasks to obtain a fuller picture about the extent to which they took into account various components of task input.

The think-aloud data revealed that the large majority of the factors to which teachers referred when gauging and manipulating task difficulty are included in the Limited Capacity Model, the Triadic Componential Framework (2001, 2011), and/or Ellis's (2003) task framework. This is a reassuring finding for task researchers, confirming that these theoretical models, often invoked to guide research on task difficulty, do indeed incorporate a considerable number of the variable types that, according to the teachers' reflections in this study, may influence task difficulty. It is also worth pointing out, however, that not all the task dimensions that the teachers mentioned features in all three models. A notable example is linguistic demands, which most of the teachers took into account during the think-alouds. This dimension is included in the Limited Capacity Model and Ellis's taxonomy but not in the

Triadic Componential Framework, the most researched model of task complexity. Naturally, teachers' focus on linguistic demands might have been an artifact of their previous training or prior experience with commercial language teaching materials, which often follow or at least include a linguistic syllabus.

Another intriguing observation concerns the frequency with which linguistic demands were brought up by teachers in response to the three questions they were asked to consider. In the process of assessing the difficulty of the task, the teachers' think-aloud comments most often made reference to linguistic demands across the tasks; the only exception to this trend was the Map task. Among linguistic features, lexis emerged as the most frequently mentioned subcategory on all tasks, with the majority of teachers referring to this aspect of linguistic complexity. It is interesting to triangulate this finding with the pattern that, across all four tasks, participants gazed proportionately more and more often on the instructions than the pictorial input at this stage, as compared to when they contemplated ways to decrease or increase task difficulty. A possible explanation for this might be that teachers based their task difficulty judgment, at least partially, on the linguistic complexity of the instructions and the amount of language support inherent in them.

Unlike during the initial stage of task assessment, teachers made no or hardly any reference to linguistics demands when asked to suggest manipulations to increase task difficulty. Most of their think-aloud comments were concerned with ways in which the conceptual demands of the tasks could be enhanced. The majority of teachers thought that this could be achieved via manipulating the pictorial support (e.g., items, maps) included in the task input. The second most often cited proposal was to raise the reasoning demands posed by the tasks, for example, by requiring students to provide explanations for their decisions. These trends are well aligned with the eye-movement data: Teachers fixated proportionately more on the pictorial task input when considering modifications to increase

difficulty as compared to when they were judging task difficulty. This pattern only differed for the Facelift task, where most comments also focused on conceptual demands when pondering this task, but increasing reasoning demands was more frequently proposed as a means to enhance task difficulty than to make alterations to the pictorial prompts. The eye-movement data, too, reflect this difference for the Facelift task: Although, as on the other tasks, participants fixated proportionately more and more often on the pictorial input when deliberating about increasing than assessing task difficulty, this difference for this task was less pronounced. Possibly, this discrepancy was due to the fact the pictorial prompt included in the Facelift task was less elaborate than the images in the other tasks.

The think-aloud comments about modifications to decrease task difficulty paint a more diverse picture. In proposing factors to lower task demands, teachers mentioned both conceptual and linguistic factors (among others). The distribution of these two categories, however, differed across tasks. Conceptual demands appeared more often in teachers' think-aloud comments when studying the New Zealand and Map tasks, whereas linguistic demands were considered with greater frequency by teachers when deciding on how to lower the difficulty of the Jungle Trip and Facelift tasks. This disparity might have resulted from the differential linguistic demands posed by decision-making and information-gap tasks. Teachers might have perceived the decision-making tasks (Jungle Trip and Facelift) as requiring more creative and, thus, more linguistically complex language use, resulting in an increased need for language support at lower levels of proficiency. For this question, the eye movement data are not entirely aligned with the think-aloud comments. Nevertheless, they capture the fact that teachers considered the pictorial input to the least degree when reflecting on ways to increase the difficulty of the Facelift task.

It is interesting to reflect on the distribution of the linguistic and conceptual demands-related comments with respect to the Limited Capacity Model (Skehan, 1998) and the

Cognition Hypothesis, a model associated with the Triadic Componential Framework (Robinson, 2001, 2011). While the Limited Capacity Model proposes that task sequencing decisions should be based on both linguistic and conceptual task demands, the Cognition Hypothesis calls for exclusively relying on cognitive task complexity when grading and sequencing tasks. Based on the current dataset, it appears that teachers' think-aloud comments about decreasing task difficulty are closer to the Limited Capacity Model 's conceptualization of task difficulty, as teachers made reference to both linguistic and cognitive factors. The Cognition Hypothesis, however, seems to be more well aligned with the think-aloud comments addressing the question of how to increase task difficulty, as they predominantly suggested enhancing task demands through manipulating cognitive factors. It is worth noting that Skehan (2015), drawing on Levelt's (1989) model of speech production, reached a similar conclusion, suggesting that the Cognition Hypothesis might be a more suitable framework for describing task effects at higher proficiency levels.

Now let us turn to a language-related suggestion for modification that has consistently occurred in the think-aloud comments but has been the object of relatively little empirical research: Teachers often proposed introducing lexis in the pre-task phase in order to ease subsequent task demands. Reflecting this idea, Newton (2001) argued that, indeed, targeting key vocabulary in the pre-task phase may enable learners to allocate more attention to meaning during the actual task performance since potential problems with encoding and decoding lexis would be dealt with prior to task performance. Ellis (2003), however, warned that pre-teaching vocabulary might prompt learners to view the task as a platform for practicing vocabulary rather than an act of communication. It would be worthwhile to investigate in future research what the actual impact of pre-teaching vocabulary would be on the cognitive processes in which learners engage.

Another fruitful avenue for future task-based research would involve examining the effects of altering the interactional set-up of tasks, for example, by changing pair work into group work or vice versa. Although modifying interactional demands was frequently considered by teachers as a way to influence task demands, task-based research on this factor is sparse to date.

Limitations

Last but not least, let us turn to the limitations of this research. This study included a relatively small number of teachers (n=15) , who had diverse language teaching experience but were familiar with TBLT to some extent. It would be worthwhile to investigate whether the findings here would differ depending on the amount of language teaching and specific TBLT experience teachers have. Another limitation concerns the limited number of task types the study included, future research is needed to explore whether the results found here would transfer to other task types. Finally, an important direction for future research would be to triangulate teachers' perspectives about task difficulty with those of learners. Although a few studies have begun to explore learner perceptions of task difficulty via introspective methods (e.g., Kim, Payant, & Pearson, 2015), more research of this kind is needed to inform theoretical and empirical work about task grading and sequencing, especially given the potentially important implications of this line of research for practice.

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Table 1. Examples for macro-categories of task dimensions

Factors determining proficiency required to complete task	
Conceptual demands	Alright, so, this could be umm for high intermediate students because they have to explain the reason why they choose those items. *(Jungle trip, reasoning demands)*
	I think these maps are quite simple actually because they aren't very complex, because they, they don't have a lot of, umm, places, like, umm, shops, and uhh, the elements are relatively few, so I think these maps are for pre-intermediate students. *(Map, complexity of map)*
Linguistic demands	I think it's targeted to intermediate, to advanced, umm the conditional, is quite a, would probably, feature in this, umm, conversation. *(Jungle Trip, grammar)*
	The vocabulary, they, they require is not too complex, like for example, 'so far', or, like, 'table', it's not, not difficult vocabulary. *(Facelift, lexis)*
Interactional demands	Each one of them are going to have an idea of what they want to do, with the money, and, umm since they have to work in groups, and they have to come up with a specific plan. *(Facelift)*
Procedural demands	So they'd have different numbers like student B's number one is not student A's number one [short laugh], and I can imagine that going kind of bad really quickly, being like, being some sort of 'who's on third' kind of thing, where, where student B thinks number one is whatever it is, Cooke Strait, but, or, well or just the opposite, and then student A, yeah, student B thinks that number one is the Bay of Islands and then student A thinks that number one is Crooke Strait, and then they're going back and forth saying 'number one, number one' and talking about different things. *(New Zealand)*
Modifications suggested to increase task difficulty	
Conceptual demands	So I would include more, way more items in the picture, or, or, a list of items and I would ask the students to take a limited number of items, and to explain why they are taking those, and no the others. *(Jungle Trip, manipulate items)*
	I would give more conditions too, so, for the students to consider them, instead of, giving them, ok, here is five hundred dollars, you can do whatever you want, it's going to be not easy, but, it's going to be easier for them, to think about, because, they can just do whatever they wanted, but if there is a regulation or law that they have to consider, it will be more complicated. *(Facelift, reasoning demands)*
	I would use a bigger map probably one that you could get from Google Earth, or something like that, to make it more realistic and more complicated. *(Map, manipulate map)*
Linguistic demands	I would also change the vocabulary, so instead of having only supermarket, and hotel, and the station, this is easy, very easy vocabulary, so I would also add probably a town hall, uhh, I would add more difficult, vocabulary. *(Map, lexis)*

Interactional demands	Changing the groups, umm, so you could do it in pairs, and then you could, umm swap those. *(Jungle trip)*
	I suppose, to make it more complex, you could increase, increase it from pairs to groups. *(New Zealand)*
Procedural demands	You could make it timed, to make it more complex, for example, say, 'okay, you got five minutes to agree on the best list. *(Jungle Trip)*
Modality	Instead of pictures, we can give them some kind of situation in a text, a written text, so that they have to read it and it will all be more complicated, because they don't have many picture items. *(Jungle Trip)*
	You could turn it, to make it more complex, into a telephone conversation. *(Map)*
Task outcome	You could get them to write up a newspaper article, or do like a role play of a news report. *(Jungle trip)*
	I probably I would ask them to write a budget, break budget, for each item, so that the total item would be five hundred dollars. *(Facelift)*

Modifications suggested to decrease task difficulty	
Conceptual demands	Reduce the number of items. *(Jungle Trip, manipulate items)*
	Go over, introduce the topic, umm, you could show, for example, episode of, clip from the series from 'Lost', where they all get lost on an island, and ask if anyone's seen it, and what they had to do. *(Jungle Trip, background knowledge)*
	I would ask them to use a map, to give information about their country, about a place that they already know, not about New Zealand, unless they were from New Zealand. *(New Zealand, task content familiarity)*
Linguistic demands	A way to make it less complex would be to go over vocabulary or any grammar that may be needed to complete the task. *(Facelift, lexis and grammar)*
	I would change the vocabulary, for example, I would keep, uhh, words like, 'lake, island, beaches, city', I would keep these words and, I wouldn't use words like 'scenery, wildlife, volcano' and, I wouldn't also use, uhh, the superlative, like 'the highest, uhh, the biggest'. *(New Zealand, lexis and grammar)*
Interactional demands	I would make it a class activity because, it would be difficult for them to discuss and decide on little things, so I would guide them in class. *(Facelift)*
	I would maybe possibly get them, umm, student A would be two students, and student B would be two students, so that they can alternate when they are asking questions, so that the pressure is not too much on one person. *(New Zealand)*
Procedural demands	To make it easier, you could give students preparation time, pre-task planning. *(New Zealand)*

Table 2. Factors mentioned by teachers when assessing and manipulating the difficulty of the Jungle Trip task

Category/subcategory[1]	N[2]	%[2]
Factors determining proficiency required to complete task	23	100%
Linguistic demands	14	61%
Lexis	8	35%
Grammar	3	13%
Conceptual demands	8	35%
Reasoning demands	5	22%
Background knowledge	3	13%
Procedural demands	1	4%
Modifications suggested to increase task difficulty	33	100%
Conceptual demands	23	70%
Manipulate items	14	42%
Reasoning demands	9	27%
Task outcome	5	15%
Interactional demands	3	9%
Procedural demands	2	6%
Modifications suggested to decrease task difficulty	28	100%
Linguistic demands	17	61%
Lexis	15	54%
Complexity of instructions	2	7%
Conceptual demands	11	39%
Contextual support	6	21%
Manipulate items	5	18%

[1]Value in general categories may be higher than the sum of annotations in the subcategories, as some teachers only mentioned the more general category.
[2]N and % refer to the number and percentage of annotations

Table 3. Factors mentioned by teachers when assessing and manipulating the difficulty of the Facelift task

Category/subcategory[1]	N[2]	%[2]
Factors determining proficiency required to complete task	17	100%
Linguistic demands	12	71%
Lexis	5	29%
Grammar	2	12%
Genre	2	12%
Conceptual demands	5	29%
Reasoning demands	2	12%
Complexity of pictorial input	1	6%
Number of elements	1	6%
Background knowledge	1	6%
Modifications suggested to increase task difficulty	25	100%
Conceptual demands	17	68%
Reasoning	12	48%
Manipulate pictorial input	5	20%
Task outcome	6	24%
Interactional demands	2	8%
Modifications suggested to decrease task difficulty	24	100%
Linguistic demands	14	58%
Lexis	11	46%
Grammar	2	8%
Conceptual demands	6	25%
Manipulate pictorial input	2	8%
Allow students to select focus	2	8%
Interactional demands	4	17%

[1]Value in general categories may be higher than the sum of comments in the subcategories, as some teachers only mentioned the more general category.
[2]N and % refer to the number and percentage of annotations

Table 4. Factors mentioned by teachers when assessing and manipulating the difficulty of the New Zealand task

Category/subcategory[1]	N[2]	%[2]
Factors determining proficiency required to complete task	21	100%
Linguistic demands	11	52%
Lexis	6	29%
Grammar	3	14%
Sentence structure	1	5%
Genre	1	5%
Conceptual demands	8	38%
Complexity of map	6	29%
Background knowledge	2	10%
Interactional demands	2	10%
Modifications suggested to increase task difficulty	17	100%
Conceptual demands	8	47%
Manipulate pictorial input	5	29%
Reasoning demands	2	12%
Task content familiarity	1	6%
Task outcome	3	18%
Interactional demands	2	12%
Procedural demands	2	12%
Modality	2	12%
Modifications suggested to decrease task difficulty	25	100%
Conceptual demands	15	60%
Increase task content familiarity	10	40%
Manipulate pictorial input	5	20%
Linguistic demands	5	20%
Grammar	4	12%
Lexis	3	4%
Procedural demands	4	16%
Interactional demands	1	4%

[1]Value in general categories may be higher than the sum of annotations in the subcategories, as some teachers only mentioned the more general category.
[2]N and % refer to the number and percentage of annotations

Table 5. Factors mentioned by teachers when assessing and manipulating the difficulty of the Map task

Category/subcategory[1]	N[2]	%[2]
Factors determining proficiency required to complete task	20	100%
Conceptual demands	11	55%
Complexity of map	5	25%
Complexity of directions	1	5%
Task type familiarity	1	5%
Linguistic demands: lexis	5	25%
Procedural demands	2	10%
Interactional demands	2	10%
Modifications suggested to increase task difficulty	28	100%
Conceptual demands	17	61%
Manipulate map	12	43%
Reasoning demands	5	18%
Linguistic demands: lexis	4	14%
Modality	4	14%
Task outcome	2	7%
Interactional demands	1	4%
Modifications suggested to decrease task difficulty	11	100%
Conceptual demands	7	64%
Manipulate map	4	36%
Task type familiarity	2	18%
Reasoning demands	1	9%
Procedural demands	2	18%
Linguistic demands: lexis	1	9%
Modality	1	9%

[1]Value in general categories may be higher than the sum of annotations in the subcategories, as some teachers only mentioned the more general category.
[2]N and % refer to the number and percentage of annotations

Table 6. Descriptive Statistics for Fixation Durations and Counts for the Four Tasks

Area of interest	Measure (s)	Jungle			Facelift			New Zealand			Map		
		N	M	SD	N	M	SD	N	M	SD	N	M	SD
Proficiency required to complete task													
Instruction	Fixation Duration	13	.59	1.00	15	.36	.17	13	.25	.10	14	.35	.15
Pictorial	Fixation Duration	15	.90	2.29	16	.31	.32	14	.27	.18	15	.22	.17
Instruction	Fixation Count	13	1.96	2.41	15	1.52	.67	13	1.00	.38	14	1.42	.44
Pictorial	Fixation Count	15	2.64	4.70	16	1.27	1.00	14	1.12	.53	15	.85	.56
Modifications to increase difficulty													
Instruction	Fixation Duration	14	.17	.15	14	.29	.17	1	.12	.12	13	.20	.17
Pictorial	Fixation Duration	15	.52	.51	15	.35	.15	12	.37	.21	16	.35	.19
Instruction	Fixation Count	15	.60	.40	14	1.17	.56	1	.42	.31	13	.66	.43
Pictorial	Fixation Count	15	2.18	2.55	15	1.47	.89	14	1.47	.92	16	1.33	.71
Modifications to decrease difficulty													
Instruction	Fixation Duration	14	.23	.21	13	.31	.13	7	.13	.10	11	.28	.23
Pictorial	Fixation Duration	15	.40	.24	14	.38	.29	12	.47	.24	13	.26	.20
Instruction	Fixation Count	14	.88	.80	13	1.22	.53	7	.57	.42	11	.98	.67
Pictorial	Fixation Count	15	1.61	.97	14	1.43	.53	12	1.71	.74	13	1.12	.87

Table 7. AOI Instructions to AOI Pictorial Ratios for Fixation Durations and Counts

Measure	Jungle	Facelift	New Zealand	Map
Proficiency required to complete task				
Fixation Duration	.65	1.14	.93	1.63
Fixation Count	.74	1.19	.89	1.66
Modifications to increase task difficulty				
Fixation Duration	.57	.83	.28	1.08
Fixation Count	.54	.86	.33	.88
Modifications to decrease task difficulty				
Fixation Duration	.33	.84	.32	.59
Fixation Count	.28	.79	.29	.50

*Higher values indicate greater amount and number of eye fixations on task instructions.

Task: Decide what you need for a jungle trip

AOI Instructions

AOI Pictorial

The TV show *Survival!* is sending a group of people to the island of Bedaira. Each person will be sent to a different part of the island. They need to survive for seventy-two hours without help from the others.

Imagine you are going to take part in *Survival!*

a Work in groups. Each person explains to the rest of the group which **eight** items he/she would take and why.

b Try to agree on the best list of twelve items. Explain your group's choice to the rest of the class.

Task: Facelift!

AOI Instructions

The owner has given you $500 to improve the Paradiso Coffee Bar. Work in groups and decide what improvements to make. There is a plan of the coffee bar area to help you. Think about the things below.

Bar area / Equipment

Decoration

New furniture

AOI Pictorial 2

sink

kitchen area

counter
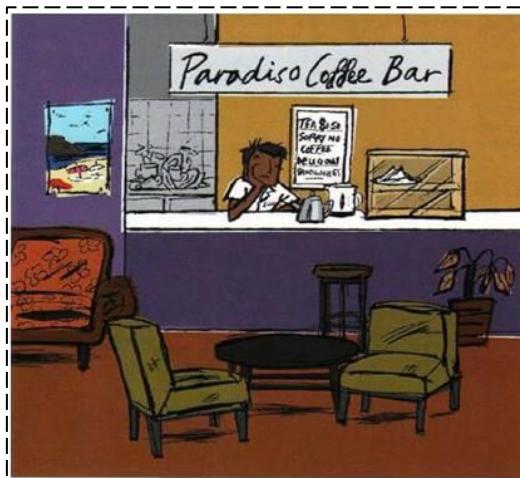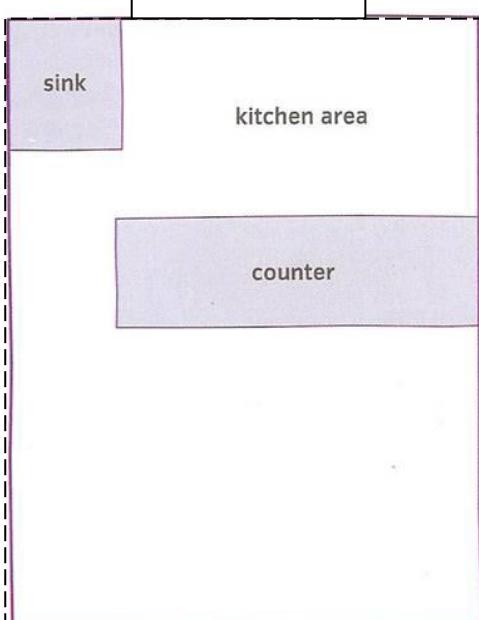
AOI Pictorial 1

Task: Complete a map of New Zealand

Student A

1 Look at the map below. It has information about North Island. Student B has a map with information about South Island. Find out where the following places are and why they are important. Mark them on your map.

- Southern Alps
- Christchurch
- Stewart Island
- Mount Cook
- Cook Strait
- Lake Wanaka

2 Now answer Student B's questions.

Student B

1 Look at the map below. Answer Student A's questions.

2 Student A has a map with information about South Island. Find out where the following places are and why they are important. Mark them on your map.

- Bay of Islands
- Mount Ruapehu
- White Island
- Auckland
- Lake Taupo
- Wellington

AOI Instructions 1

AOI Instructions 2

Work in pairs, Student A and Student B. You are going to find out more about New Zealand.

Student A: Look at the map of New Zealand on page 142 and follow the instructions.

Student B: Look at the map of New Zealand on page 144 and follow the instructions.

AOI Pictorial

Asking for and giving directions

AOI Instructions 1

Work in pairs, Student A and Student B. You are asking for and giving directions. Decide whether you are:

- on a mobile phone.
- in the street.
- in a car.

Student A: Look at the map on page 143. Find the station. Ask for directions to:

- a bank.
- a book shop.
- a car park.
- the Odeon Cinema.
- Rosehill Park.
- Fast Save Supermarket.

Then answer Student B's questions.

Student B: Look at the map on page 146. Find the station. Give Student A directions to the places he/she asks for. Then ask for directions to:

- a garage.
- a good Italian restaurant.
- The Corndale Shopping Centre.
- a good Chinese restaurant.
- Jay's Coffee House.
- the Plaza Hotel.

AOI Instructions 2

Student A

Look at the map and ask Student B for directions to:

- a bank.
- the Odeon Cinema.
- a book shop.
- Rosehill Park.
- a car park.
- Fast Save Supermarket.

AOI Instructions 3

Student B

Look at the map and ask Student A for directions to:

- a garage.
- a good Chinese restaurant.
- a good Italian restaurant.
- Jay's Coffee House.
- The Corndale Shopping Centre.
- the Plaza Hotel.

AOI Pictorial 1

AOI Pictorial 2