Cambridge Handbook of Task-Based Language teaching

From needs analysis to task selection, design, and sequencing

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Introduction

An ever increasing number of teachers and programs around the world have adopted tasks as units of their teaching. While we do not have exact figures on the use of tasks as units either in task-based programs (Long, 2015) or in task-supported ones, any quick use of library search engines or more general search engines will confirm the exponential growth of reporting on the use of tasks in programs worldwide since the 1980s. Tasks are defined here as goal-oriented processes driven by meaning and which draw on communicative and cognitive resources in order to achieve an outcome. Tasks are susceptible to pedagogic intervention and they are sequentiable.

Motivated by an interest to provide solutions to L2 use and development, it is not surprising that most of the research effort behind tasks has been geared towards task design in order to understand and meet learners' communicative needs. When the decision to adopt a task-based approach has been made, the very first question teachers and syllabus designers are faced with is what it is that learners need to learn. One possible solution, which we embrace here, is to conduct needs analysis (NA) in order to obtain

information about learner present and future needs. The idea of investigating and adapting to learners' needs has existed since the 70s (Munby, 1978; Wilkins, 1976; see Long, 2005 for a historical overview and a comprehensive criticism), but it is only in the last two decades that it has been conducted from a theoretically task-based perspective (Long, 2005; Serafini, Lake & Long, 2015), in which task is the unit of reference around which NA is organized. The idea of adapting instruction to the tasks learners need to carry out in real life is coherent with what a number of administrative bodies have demanded and encouraged, such as the European Union and its Common European Framework of Reference[1] (2001), or the OECD (2012, 2015), in a long continuum from a focus on academic achievement (US) to a focus on personal development (EU) (Holmes, Anastopoulou, Schaumburg & Mavrikis, 2018).

However, while there has been considerable attention to both NA and to task design separately, less reflection and empirical work has been devoted to the transition from needs analysis to design (see Malicka, Gilabert & Norris, 2017 for an exception), which will be the focus of this paper. This transition is about the crucial interface between what we learn about learners' needs and our macro and micro decision-making during task and syllabus design. Below we first define NA and address relevant theoretical and methodological issues relating NA first to the issue of task selection, and how needs analysis may aid the highly complex decision regarding how tasks may be selected into a program. We then move on to inspect how NA may directly and indirectly inform task design. Finally, we address the issue of how task sequencing may also be aided by the information obtained through task-based NA.

[1] CEFR (2001:1): "…It provides the means for educational administrators, course designers, teachers, teacher trainers, examining bodies, etc., to reflect on their current practice, with a view to situating and co-ordinating their efforts and to ensuring that they meet the real needs of the learners for whom they are responsible."

1- What is task-based needs analysis? Challenges and advantages

Needs Analysis is defined as a professional, in-depth inquiry into what learners need to learn (Long 2005, 2015; Serafini et al. 2015). By taking 'task' as a unit of analysis, NA identifies the specific tasks a particular community of learners need to be able to perform in the foreign or second language. Task-based needs analysis uses multiple sources and methods to detect, analyze, and describe the tasks and sub-tasks (Gilabert, 2005) learners will need to perform within a specific community.

Needs analysis is challenging for a number of reasons. First and foremost, while desirable, needs analysis is not always possible, and often teachers and syllabus designers are left to their own resources to intuitively predict, try to capture, or directly imagine what their learners' needs may be. In many institutions teachers and syllabus designers often find out about their students' needs once they get to know them when teaching has started, which may be late for introducing major changes in the curriculum or even in instructional design and materials. Many contexts directly do not allow for enquiries prior to course start. Even if institutions are willing to carry out NA, time or economic constraints (e.g. liberating teachers to get involved in data collection for NA) may hinder any attempts at conducting needs analysis. Additionally, communities of learners may range from relatively stable, homogenous, and 'predictable' student populations to dynamic communities with changing social and language learning needs (e.g. migrants, displaced persons and refugees). Finally, even if NA happens, the information obtained from NA may not always transfer to task design if it clashes with the interests of a community (i.e. students' wants -- e.g. engineers may not find it interesting to learn about

engineering tasks after 12 hours of working on engineering tasks --, or institutional goals -- e.g. implementation of TBLT in China, Saoquian & Baoshu, 2013).

Even if those challenges are overcome and NA does indeed happen, it is an issue whether and how information coming from NA can be transferred to task and syllabus design. As Malicka et al. (2017) have pointed out, there exist a number of unresolved issues in this respect such as how to exactly to transfer the information obtained from NA to actual design, how the information about the variables that confirm the tasks' internal complexity as well as its perception of difficulty by users can be used to inform pedagogically sound task design, as well as pedagogic task sequencing and grading.

1.1.Theoretical underpinnings

Beyond the work of Long (2005, 2015) and Serafini et al. (2015) there has been limited reflection on the theory and methodology behind task-based needs analysis. At a theoretical level, it will suffice to say here that task-based needs analysis feeds on at least two major fields of knowledge: discourse and textual studies, and second language acquisition.

Regarding discourse and textual analysis, needs analysis springs from the idea that language (Swales, 1990) is contingent and specific, to the point that Long (2005) has suggested that every language course should be a course for specific purposes. Only an accurate description of the tasks, processes, procedures and language associated with each task will make it possible for the design to reflect the specificity of discourse. Needs analysis is coherent with SLA principles in that it does not assume that learners should learn in a cumulative way and actually looks at the kinds of cognitive and

communicative characteristics each task will require from learners. It integrates the idea that by performing tasks learners will advance through developmental sequences at different paces (Pienemann, 1998; Pienemann & Kawaguchi, 2005). Also within SLA, NA has fed on the tradition of syllabus design, and the very useful distinction by Wilkins (1976) that in analytical syllabi learners analyze the language rather than synthesize it as in more traditional synthetic syllabi.

Since readers can already access an in-depth reflection on theoretical and methodological issues in the work of Long (2005) and Serafini et al. (2015), what we highlight here are a number of key concepts in task-based needs analysis that have proven crucial for their transferability to task selection, task design, and task sequencing. First and foremost, the distinction between *target tasks*, task prototypes and pedagogic tasks (Long, 2005) has been crucial to our understanding of what actually ends up confirming a task-based syllabus. While target tasks are the real life tasks we wish learners to be able to perform successfully in the second language, programs and syllabi typically contain the pedagogic versions, approximations to real tasks that will prepare learners for the complex performance of target tasks outside the classroom. In Long's view, task prototypes are the intermediate abstractions between target and pedagogic tasks that make it possible to adapt to heterogenous groups with limited time in a course. As we will see in more detail in the next sections, this distinction is important for all areas under inspection here, since it affects selection, design and sequencing. Secondly, the distinction between tasks (i.e. major highly complex tasks – e.g. creating an advertising campaign) and sub-tasks (i.e. smaller tasks conforming the major task – e.g. emailing the client, organizing campaign strategic meetings, giving presentations, calling suppliers) (Gilabert, 2005) has been useful in creating task 'maps' of major complex tasks with associated sub-tasks. Based on our long experience in

different task-based course creation in various domains[2], we would like to claim that when classes are heterogenous in their needs, actual sub-tasks (e.g. e-mailing, calling, meetings, videoconferencing, socializing, coffee breaks, among others) in preparation for larger target tasks may actually be shared by many different domains than very specific target tasks (e.g. a campaign in advertising or a fire extinguishing campaign -- the campaigns are not comparable but some of the sub-tasks might). Sub-tasks may be used for the generation of task prototypes from which then pedagogic tasks are derived. There is a clear scarcity of studies in this area, which would benefit from systematic research since heterogeneous classes willing to use communicative tasks are not uncommon. A third useful methodological concept coming out of the theoretical reflection on NA is the use of multiple sources and methods. As will be seen in Section 1.4., in order to capture the multidimensional nature of tasks, multiple sources and methods need to be recruited for a meaningful and successful NA to proceed. The complex and multidimensional description of tasks cannot be addressed from a single method (e.g. surveys, as was mostly done in the 70s with early needs analyses) but a multiplicity of data collection techniques, such as face-to-face interviews (where sources verbally report task descriptions), direct observations of tasks (which sometimes confirm and others contradict what sources may say about them during face-to-face interviews), or surveys (which, if done massively, may help researchers to confirm the frequency and need for training of each of the identified tasks), need to be combined in order to guarantee an accurate description of each task. As Long (2015) has pointed out, triangulating information coming from a variety of sources during NAs will also guarantee a more accurate and precise description of each task which will overcome

[2] Beyond general language course Gilabert has directly participated or collaborated in the creation of task-based courses in the areas of journalism, advertising, public relations, international relations, business, medicine, and tourism among others. Malicka has created or collaborated in task-based courses in the area of Business English, tourism, CLIL in both face-to-face and online modalities.

opposing views on their description (e.g. the idealized vision of bosses/supervisors may have as to how the task is performed and what actually happens according to the domain experts directly involved in their performance). One of the outcomes of methodological reflections and actual data collection is that domain experts, who are directly involved in the performance of target tasks, tend to be the most accurate informants and so should be central sources in NAs (Serafini et al. 2015).

1.2. Empirical findings

The point of this section is not to provide a complete research synthesis covering all studies that have been conducted from a task-based needs analysis perspective, but rather to point out how empirical findings may inform further NAs. Exactly as the specificity they try to capture, the outcomes of NAs are by nature also specific. Typically what applies to one context, to a specific community of learners, does not apply to others. If well-conducted, the outcomes of NAs should be contingent and highly specific. This does not mean that empirical findings are to be discarded altogether because they are not generalizable. What may allow for a higher degree of transferability and generalizability are the step-by-step decisions leading researchers from the information obtained through NA to the different aspects of task selection, task design, and task sequencing.

This was the goal of a NA reported by Malicka et al. (2017) in the tourism sector; more specifically, in a hotel receptionist's job. The objective of this study was four-fold: (1) to gain knowledge about the typical real-life tasks performed in this domain (*task selection*), (2) to use the information about perceived task difficulty to single out variables which can be manipulated in the pedagogic versions of the real-life

tasks (*task difficulty*), (3) to decide on the order in which pedagogic tasks should be administered in the classroom (*task sequencing*), and (4) to gain an insight into the language used to perform these tasks (*discourse analysis*). By means of ten semi-structured interviews and three observations, both with domain experts and domain novices, fifty target tasks were identified and classified into task types such as 'greeting and saying goodbye to clients' or 'providing information'. Two noteworthy findings regarding the difficulty of real life tasks were: (1) tasks which are performed on a regular basis and which have a certain routine to them, for example if the receptionist elicits a series of pieces of information from a client, are easy (e.g., check-in and check-out), and (2) there are tasks whose difficulty depends on a number of factors. For instance, factors which render 'making a restaurant recommendation' complex are the receptionist's familiarity with the area, their familiarity with the types of restaurants, and the number of options to choose from.

The insights obtained about target tasks and their difficulty were the first step in the development of a NA-based pedagogic unit called 'Overbooking' . Made up of a sequence of three pedagogic tasks, this unit brings together the findings from a task-based needs analysis and insights from current task complexity theorizing (Triadic Componential Framework; Robinson, 2005; Robinson & Gilabert, 2007). Three versions of this task were developed, with differing levels of complexity. The manipulated factors were +/- reasoning demands (understood as the mental operations required to successfully perform the task), and +/- number of elements (characteristics of room and hotels). While the simple task required the receptionist to describe a few options of rooms the hotel offered, in the most complex task they had to describe multiple options, apologize for the situation of overbooking, recommend the best

alternative, and justify their choice[3]. Importantly, this study shed light on how the information obtained from NA can be used for both macro decisions (task selection: which real life tasks to build a pedagogic unit around) and micro decisions (variables subject to manipulation in an individual pedagogic task, and the order in which they are presented to learners).

Let us contrast this study with two other NA reports which were concerned with determining the difficulty of real life tasks. Chaudron et al. (2005) carried out an NA with the objective of designing pedagogic tasks for students of Korean. The analysis of survey responses and discourse samples revealed 'giving directions' and 'shopping for clothes' as particularly relevant to this group of learners. NA was used to identify factors contributing to the complexity of these tasks. In the direction giving task, these were the size of the area (small vs. big) and number of directions to give (few vs. many). In the shopping task the number of purchase decisions (e.g., size, design, type, color, and price negotiation) determined complexity. In another study, Serafini and Torres (2015) carried out an NA to design a business course for students of Spanish. Forty target tasks were identified through an online survey administered to business professionals and graduates. Business majors then rated those tasks for frequency and difficulty on a 5-point Likert scale.

Because their focus was on NA itself, neither of these studies articulated whether, and how, the information obtained through NA translated into pedagogic task design. Also, neither of them tapped into the factors which made real-life tasks easy or difficult; in other words, they were more concerned with *between/across-task difficulty*

[3] See Malicka et al. 2017 and Malicka 2018 for full operationalization of complexity and task instructions.

(i.e. relative difficulty of one target task in relation to other tasks), but not *within-task difficulty* (i.e. conditions under which a task is simple vs. complex).

To our knowledge, beyond Serafini et al. (2015) systematic research synthesis on methodological advances no research syntheses or meta-analyses of NA have been conducted yet that gather and analyze empirical findings. The fact NA has began to emerge as an avenue of research in its own right, however, is evidenced by the amount of scholarly literature produced to date, both researchers' and language education professionals' sustained interest in NA, as well as the methodological literacy and rigor found in reports of empirical studies.

1.3. Dimensions of NA

As target tasks are complex and holistic processes, NA should aim to identify as many aspects of tasks as possible to ensure their thorough and precise description. What follows is a non-exhaustive list of dimensions of tasks that may be targeted during needs analysis (table 1). It should be noted that not all dimensions apply to every task or sub-task, and other dimensions not included here may be necessary to describe certain particularities of tasks. These general dimensions may then be subsequently helpful at different stages of syllabus design: task selection, design and sequencing.

Table 1 here.

Table 1. Dimensions of NA and their description

The dimensions NA may uncover are divided into seven broad categories:

- general aspects of tasks. These are concerned with aspects such as the tasks' goal, frequency, outcome, topics, sub-/target tasks.
- participants and interaction. This group of dimensions is concerned with information exchange and communication between participants involved in a task, the rules of interaction, psycholinguistic aspects, intercultural communicative aspects, and non-verbal aspects (Bosswood & Marriott, 1994; East, 2012; Pica et al., 1993).
- physical space where tasks take place. This dimension includes factors which have to do with the spatial and psychosocial setting of tasks (Bosswood & Marriott, 1994).
- tasks' cognitive demands. This category is concerned with tasks' attentional and memory demands, mental processes, and perceived difficulty of tasks, as well as the recruiting of higher and lower order skills (Robinson, 2001, Robinson & Gilabert, 2007; Skehan, 1998, 2009; Bloom, Engelhart, Furst, Hill & Krathwohl, 1956).
- tasks' linguistic demands. These include the linguistic resources necessary to complete a task (Palotti, 2019; Gilabert & Castellví, 2019).
- communication and technology. This category taps into the communication channels and technological tools and platforms associated with performing a task (González-Lloret 2014, González-Lloret & Ortega 2014).
- other dimensions. This category includes assessment, task support, and tasks' non-verbal aspects, attitudinal values, concepts, and norms, and sequence of procedures.

Before we discuss the relevance of obtaining information about these dimensions to task selection, design and sequencing, we would like to point out that target tasks are not entities that are somehow fixed by their description through NA, as in a still picture. Tasks are dynamic processes, which are susceptible to change and adaptations in ever changing social, academic and professional environments. Ideally, NA in any institution should be able to incorporate the possibility of sustained updating

of task descriptions. NA should aspire to achieve some degree of predictability as to how tasks will be performed while keeping in mind that these may be transformed by changing conditions.

1.4. NA dimensions and their relevance to task selection, pedagogic design and task sequencing

Often the outcome of needs analyses is a long list of reasonably complex task descriptions that an academic, professional or social community needs to carry out. But what do we gain from obtaining such detailed information when it comes to selection, design, and sequencing? The outcomes of needs analysis are raw material, in most cases possibly not quite directly usable for immediate, unprocessed task design. What we would like to highlight here is that each dimension that is relevant to a particular task will impact its selection, design and sequencing in a reciprocal way, whereby for example selection decisions will depend on both information from NA as well as considerations affecting design and sequencing.

2- From needs analysis to task selection

2.1.Target task descriptions: outcomes of NA

NA outcomes are the basic material that will feed decision-making during task integration into a syllabus. Both macro- and micro- design decisions will enormously facilitated by the information collected during NA. There are however no guidelines based on any systematic research in the literature about how tasks coming out of a NA

may be selected for their inclusion in a syllabus. As a consequence, task selection on the basis of NA may depend on a number of factors. If information about tasks has been collected from a variety of sources (e.g. not only from heads and bosses but also domain experts) and through an array of methods (e.g. interviews, observations, massive surveys, among others), task descriptions will necessarily have to go through a process of analysis, interpretation and description by researchers and/or syllabus designers. This job may require to look forward to task design (i.e. to check if task design will be feasible) and sequencing (i.e. to check if it will fit the syllabus in terms of distribution and time requirements) in order to be completed.

2.2.Target tasks and sub-tasks

One of the lessons learnt over the years of empirical research is that often target tasks may have the form of a core supercomplex task with a constellation of sub-tasks (i.e. fully rounded tasks with a goal, communicative and cognitive steps, and an expected outcome but are subsidiary to other larger and more complex tasks) leading to such a core task (Gilabert, 2005). Take as an example the organization of an academic, business, industry, or political, conference, where the supercomplex target task is the conference itself, with tens to hundreds of presentations, talks, workshops, coffee breaks, all of considerable complexity. But leading to it there are tens, maybe hundreds of sub-tasks making such a complex human event possible (e.g. sending out calls for papers, invitations, finding and training reviewers, among many others). Once typically a long list of tasks and their associated sub-tasks have been identified, analyzed, and described, they need to be grouped into target task prototypes (e.g. information to be requested over e-mail, mobile, social media or face-to-face) that will make their

inclusion into the syllable more feasible. But how general or how narrow should the focus of those task prototypes be? Do we create an e-mail task that may help learners across contexts (i.e. in a heterogeneous group of learners learning general English four various contexts) or do we choose one specific context as an example that can be generalized to others? There is probably no single answer to this question. The course designer needs to find a balanced and reasonable match between the scope of those prototypes and the course conditions and learner characteristics (i.e. a heterogenous interest group or a homogenous group of students working within the same area). Based on task prototypes, pedagogic design may proceed so that specific decisions about what task should look like for teaching purposes.

2.3. Factors for task selection

If the NA was well conducted (Long, 2005; Serafini et al. 2015) the long list of target tasks and sub-tasks should contain information about the frequency, difficulty and need for training (based on their importance or priority) of each of the tasks. Frequency provides an accurate temporal picture of the tasks that the end users of the syllabus will surely need to be able to perform in the second language. Important as it is, however, frequency cannot be the only criterion for selection since some tasks may be highly frequent and others may be infrequent yet critical, requiring some intense training. Through the use of massive surveys Gilabert (2005) reported validating the difference between frequency and need for training, since some tasks rated low in frequency but very high in need for training, which helped with the decision to select them as candidates for the syllabus. As seen in Section 1.3. above, another important criterion may be the degree of perceived difficulty and factors of complexity by domain experts.

Some tasks may be perceived as difficult or higher stakes by experts and hence requiring more mental effort. Those target tasks are better candidates for selection than simple tasks or sub-tasks that may be more frequent but which may not need so much training. Such information obtained during needs analysis and this can greatly facilitate the decision-making process about which tasks should be selected into the syllabus. Again, the decision about selection cannot only be based on the outcomes of NA alone. Designers will need to consider each task or sub-task feasibility in terms of design and sequencing in the actual syllabus. To our knowledge no systematic reporting of selection criteria exists and so this aspect of the transfer from NA to actual selection remains a subject for further investigation.

3- From needs analysis to task design

Of all the areas of syllabus design we have mentioned (i.e. NA, selection, design and sequencing), task design is by far the area that has received the most attention in task-based research. While there is a lack of reflection on task design per se (see conclusions for further development of this point), the drive to empirically research the effects of design on language comprehension, production, or development has been stronger and wider than any other area.

3.1.Task goals

One of the most basic and fundamental contributions of NA to task design is to identify task goals. A well-conducted NA targets not only the identification of real-life tasks (‘raw material’ mentioned before), but also an in-depth analysis of each one of

them. The most general but key objective of such an analysis is to determine task goals. By ‘task goal’ is meant the ultimate objective of the real-life task, and sample general task goals may include for example ‘solving a problem’, ‘reaching an agreement’, ‘convincing someone of one’s point of view’, or ‘selling a product’.

3.2.Task design features

In the previous section we saw how the information obtained in a NA can be used to take informed decisions about task selection. The immediate product of a NA is an ostensibly exhaustive inventory of authentic situations encountered in professional, occupational, and social domains, the conditions under which these situations take place, the steps needed to solve them, and the performance standards associated with them. However, there has been scant reflection in the NA and TBLT literature on how exactly the information obtained through NA can be translated into pedagogic task design. Here we will consider the contribution of NA to task design from three complementary perspectives: interactive, linguistic, and cognitive.

Tasks which are pedagogically sound from the interactive point of view take into account the idiosyncrasies of interactional scenarios and conditions detected via NA. In this sense, the information gathered in a NA can inform decisions about aspects such as the *number of participants* in a task (individual vs. two or more people), or the *information flow* between them (one-way, two-way, multiple-way). Consequently, pedagogic task versions can fall into two broad categories: *monologic* (e.g., delivering a presentation in the business context of selling a service) or *dialogic* (e.g., multiple-way decision-making about the best launch event of a new product in the domain of advertising). Furthermore, certain NA methods, such as participant observation, can

prove informative when it comes to identifying typical profiles of parties involved in professional situations, or these parties' status. These considerations can be incorporated into pedagogic versions of tasks by assigning different psychological profiles and positions of power to different participants. For example, in a salary negotiation task, the participant playing the role of the employee could be attributed with a lower status compared with the employer, and each could have specific characteristics assigned to them which they should stick to when performing the task (patience and empathy vs. assertiveness and inflexibility).

Of pivotal importance to task design are the linguistic demands of real-life tasks. In the broadest sense, two implications of NA for task design here are (1) what language is required for task completion to begin with; (2) which skills should be incorporated into pedagogic task design: productive, receptive, or both. Once these macro instructional decisions have been taken, pedagogic approximations of real-life tasks should ideally incorporate concrete language detected through NA, such as terminology specific to a sector (e.g., air traffic controllers), discourse features (e.g., pragmatics), grammatical features (e.g., asking questions), or speech acts involved in performing a task (e.g., requesting information, or apologizing for a situation).These and other linguistic features can be built into pedagogic tasks at different stages of task design: as an introduction to/warm-up before the main task (pre-task: repeated exposure to new items, for example via rich listening and reading comprehension input presented by means of input processing techniques, such as input flooding or input enhancement), main task (task cycle: successful task completion is only possible using specific terminology/ structures), or language reflection stage (post-task: gearing students' attention to novel linguistic aspects, for example by having them reflect on non-target like forms, etc.); or during task re-design.

Regarding the cognitive perspective, a well-conducted NA should inform us of the attentional and memory demands real-life tasks place on those who perform them. NA should help us discover specific attributes of tasks such as what mental operations are required to perform it, how many pieces of information need to be stored in working memory at the same time, or whether tasks are done under time pressure or there is time available to plan. These attributes of real-life tasks can then be translated into pedagogical variables which can be manipulated in task design. For example, in the academic context, the task of 'writing a summary of an article' requires relatively low reasoning compared with the more cognitively demanding task of 'writing an academic article' (while the former involves low order skills such as. understanding, gathering, and classifying information, the latter involves the higher order skill of applying one's expertise to create something new). Very importantly for task design, NA should also tell us how these cognitive factors are perceived in terms of their relative difficulty by those who perform them. Establishing a continuum of levels in these mental operations is a possible point of departure when it comes to organizing tasks in a curriculum. This is covered in more depth in the next section.

4- From needs analysis to task sequencing

As can be seen in Chapter ??? by Robinson in this Handbook, task sequencing may be based on the variables selected for task design, which are in turn based on the design needed to prepare learners for the successful performance of target tasks. Task sequencing needs to feed both on the information coming from NAs and task design decisions.

4.1.The unresolved issue of task sequencing

Task sequencing is indeed an unresolved issue because, like task selection or task design, it involves complex decision-making. Several proposals have been put forward to address this issue, with sequencing based on the following criteria:

- mainly (or even solely) *cognitive complexity factors* (Robinson, in this Handbook, 2005; Baralt, Gilabert & Robinson, 2014);
- dimensions of *task difficulty*: code complexity, cognitive complexity, communicative stress and learner factors (Skehan 1998: 2009)
- *linguistic difficulty* (Palotti, 2019) in combination with *task complexity* in the case of morphologically complex languages (Gilabert & Castellví, 2019).

As will be seen in Section 4.4., task sequencing could be placed in a continuum that may range from NA-based human decision-making to fully automatized machine driven process, in which computerized systems use learner analytics to obtain information about what is simple or complex, which is already used in both the gaming industry and in serious games. Whichever the theoretical position of the designer may be, all the information necessary for sequencing decisions can be retrieved from the different dimensions described in Section 1.3.

4.2. Cognitive factors aiding task sequencing decisions

A number of dimensions can assist the decision about sequencing tasks. As we saw in Section 3, there are several cognitive variables that can be used up and down a scale of task complexity in order to obtain simple or more complex versions of tasks. If like Robinson (2005; in this Handbook) or Baralt et al. (2014) the choice is to use

cognitive complexity as the main reference for sequencing, then NA analysis can greatly assist by identifying resource-directing variables such as the number of elements, the degree of reasoning, the amount of perspective taking (Robinson, 2001; Robinson & Gilabert, 2007), the time pressure under which the task is performed, or the familiarity with it (Skehan, 1998, 2009). Typically more cognitively demanding tasks along resource-directing variables will engage also higher order skills, and if this were considered during task design, the decision could be to sequence tasks in a way that learners first deal with simple versions, which require little reasoning and lower order skills, to progressively move toward complex tasks requiring higher order skills. Again, sequence length will depend on a number of factors, such as course length, goals, content, learner population, among others, and the decision to create a shorter or longer sequence will probably benefit from feedback during and after syllabus implementation in the actual classroom. Two dimensions that may also may be factored in when deciding on sequencing are the perceived difficulty and factors of complexity by domain experts (e.g. mental effort required by the task, stages or anxiety generated by the task).

4.3. Linguistic factors contributing to difficulty

Most researchers would agree that the cognitive load of a communicative task will not only be determined by its intrinsic cognitive configuration but also by the linguistic elements required to perform the task. The linguistic dimension of tasks may be determined by the objective and measurable difficulty of different linguistic features (Palotti, 2019) or by how easy or how hard it is to process them (Peinneman, 1998; Pienemann et al. 2005). Our claim here and elsewhere (Gilabert & Castellví, 2019) is

that while maintaining cognitive complexity as the main organizing principle for task sequencing, still the weight of the linguistic component necessary for task completion needs to be considered, since it may affect the tasks' affect overall cognitive load.

Recent work by Palotti (2019) has suggested that different features of a language, as well as features across languages, may display different levels of linguistic difficulty that may contribute to overall task complexity. Certain linguistic dimensions, such as morphology, may vary considerably among languages. Since in most languages we have a partial picture of what are easy and difficult linguistic features (e.g. the present tense is learned earlier than the past tense in the L1, but can this be considered a sequencing criterion for adult L2 acquisition?), it may not be possible to create a complete map of what features are easy or difficult in absolute terms. We propose here the consideration of just the number of linguistic features. In the same vein, we only have a partial picture of developmental sequences (Pienemann, 1998; Pienemann, Di Biase & Kawaguchi, 2005) about most languages in the world, which would make sequencing decisions on the basis of the processability of each linguistic dimension a very challenging endeavor. What we would like to suggest here is that with all cognitive features of tasks being equal, tasks that require few simultaneous linguistic features (e.g. use of the present and use of articles) should be taught first, to be followed by tasks requiring a greater number of linguistic features (e.g. several verb tenses, reference to several declensions, different types of prepositions, a number of pragmatic dimensions, among others) . Again, feedback during and after implementation may help evaluate the efficiency of the sequence.

4.4. Other factors contributing to sequencing decisions

So far what we have seen is that task sequencing decisions may be aided by the information we obtain from NA as well as task design. But we have also pointed out the lack of theoretical reflection into, or empirical findings of, what a task sequence should look like, how long it should be, and what its efficiency is in promoting L2 use and development. We have suggested that feedback obtained during and after syllabus implementation may help refine task design and task sequencing decisions. This is a laborious job which will take several course implementations before it is completed, and quite possibly may only be successful under very stable conditions (e.g. same course designers, similar groups of students with similar goals over a number of years).

Our limitations in terms of task sequencing in the TBLT field, however, may be approached from advances in other areas, such as the field of educational technology. Two expanding constructs are those of personalization and adaptivity (Holmes et al. 2018). Personalized learning and its algorithmic instantiation adaptivity allow for adaptation to individual learners' needs and abilities (Vanbecelaere, S. & Benton, L., forthcoming). The idea of adapting to individual student needs is not a flashy and attractive idea afforded by new technologies, but it is actually tightly coherent with the principles of TBLT and SLA findings, since we know learners in accordance with their own internal syllabi take individual paths at different paces in the development of their interlanguage. The use of adaptive algorithms in technological infrastructures allows for the massive collection of task performance data and such data may be indicative of task difficulty or complexity, which in turn can inform sequencing decisions (Serra & Gilabert, forthcoming). This, we believe, may be an interesting road for TBLT studies to take in the near future.

5 Conclusions and recommendations

In this chapter we have defined NA and pointed out some of its challenges and advantages in relation to task selection, pedagogic design, and task sequencing. We have done so by first identifying what we believe are general areas for inspection in NA and subsequently pointing out how such areas may aid decisions about what tasks or sub-tasks to select, how to use NA information to design them, and NA may assist our sequencing of tasks in syllabus. In terms of task selection, we have seen that task selection may be enormously aided by information about the frequency, difficulty, and need for training about each task. Domain experts may point out such dimensions which then can be corroborated by massive surveys, and then decide whether they prioritize the teaching of most frequent tasks or those that will require more serious training because they are reported as difficult. Additionally, course designers will need to consider which tasks will be selected into the syllabus by also considering their design and what their sequence may be, and hence a balance between NA information and course conditions and constraints must be struck. As for pedagogic design, NA may provide information about the number and type of participants and how information may flow between them, monologically or dialogically. Also the receptive and/or productive language together with the skills associated with task goals can be identified by NA and incorporated into pedagogic task design. The more or less specific terminology, pragmatic and discourse features, grammatical features, phonological features, and other linguistic features can be detected by NA and inserted into tasks at different stages of pedagogic task design. The attentional and memory attributes, as well

as the lower and higher order skills obtained through interviews and task observations that real-life tasks demand from task users can also be factored in during task design. Finally, in terms of task sequencing, we can see that tasks and sub-tasks may be placed in a logical sequence of increasing task complexity and/or task difficulty, while also taking linguistic difficulty into consideration. Tasks may be placed in a continuum from simple tasks to progressively more complex ones, and their design does not need to be random but well informed by NA. If the option is to consider task difficulty, which also includes code complexity, task conditions and learner factors (as per Skehan, 1998), all those pieces of information may be extracted during in-depth NA. All cognitive aspects being similar, then linguistic demands (in terms of number of simultaneous linguistic features) and difficulty may be a criteria for also organizing tasks in a continuum. Current alternative ways of having data-driven NA within technological environments have also been sketched as a new road to take in the near future.

While advances in the domain of artificial intelligence may complement or eventually even replace NA altogether by applying algorithms and consequently gaining instant access to information about the needs of a particular learner community, currently NA stands as a theoretically and methodologically solid approach to identifying such needs. The information obtained via NA can be programmatically applied to different stages of TBLT curricular design, regarding both macro and micro pedagogical decisions. This chapter has focused on the so far unexplored synergy of the affordances of needs analysis and task-based educational agenda at three levels: task selection, pedagogic task design, and task sequencing. We have seen how NA can be a useful tool in choosing which real-life tasks should be included in the curriculum, how the information gathered can be built into the pedagogic approximations of real-life tasks by converting features of observed reality into manipulable task parameters, and

finally, how NA can shed light on decisions regarding sequencing tasks in a curriculum. However, the information obtained in NA may also illuminate other components of TLBT curricular design not discussed here, for example methodological implementation, assessment or evaluation. Substantially more theoretical reflection and empirical work targeting these aspects is necessary if TBLT language programs are to take full advantage of the potential NA holds as an approach to determining language needs of learner communities. While NAs are carried out in authentic workplace settings and involve gathering insights from experts in domains which do not have to do with language, we cannot stress enough the role of language teaching professionals such as teachers and syllabus designers in the process of doing a needs analysis because they will be ultimately responsible for task design. Although doing NA is a time-consuming and expensive endeavor, the resources invested in NA means incalculable time gained in syllabus and task design.

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NA DIMENSION		DIMENSION DESCRIPTION	EXAMPLE/ INFORMATION OBTAINED THROUGH NA
1 GENERAL ASPECTS OF TASK	Task goal	What is the task's ultimate goal? *Associated information:Steps involved in task performance, Task length, When performed, Need for training*	Solving a problem, reaching an agreement, describing a product, process or service, etc. *Associated information: In how many steps is a task performed, when it is a performed, and whether a task requires training or not*
	Task frequency	How frequently is a task performed?	Frequent versus infrequent tasks; Tasks performed on an hourly/ daily/ weekly/ monthly/ annual basis
	Task outcome	What is the final product of a task?	A written report, a public presentation, a sale, an academic paper, a satisfactory review by a client or customer, etc.
	Topics or subject-matter	What general and specific topics a task may cover?	A list of potential topics which may be tackled in tasks
	Target sub-tasks/ Sequence of procedures	Tasks that may be performed simultaneously or in a predetermined sequence (Gilabert, 2005), step-by-step description of the task (Long, 2015)	Whether the task is stand-alone or there are other parallel tasks accompanying it
2 PARTICIPANTS & INTERACTIOIN	Number of participants	How many participants are involved in a task?	Tasks performed individually, in pairs, in groups (small or large); across groups
	Participant status	What is the status relationship between task participants?	Participants in equal positions vs. different positions (low vs. high) within the organization, institution or company
	Rules of interaction	Set of accepted behaviors during interaction; *do's and don'ts*	The importance of listening, having control over the conversation, floor-taking rules, things to make sure happen, topics to avoid
	Participants' attitudinal values, concepts, and norms	Individual characteristics participants bring to a task	Knowledge, educational training or concepts that are crucial to the successful performance of a task; being patient or sympathizing; aggressiveness, encouragement, or optimism among others
	Psycholinguistic aspects	The way information is shared between participants and each participant's contribution to task (Pica et al. 1993)	One-way/two-way/multiple way information flow, convergent or divergent goals, a single solution or multiple solutions, split or shared information
	Intercultural communicative competence aspects	Are there any intercultural components of the tasks that may be relevant to task design (East, 2012)	Tasks can be neutral or interculturally charged. They may require competence in negotiating differences appropriately using language, as well as relating effectively to the 'other'?
3 PHYSICAL SPACE WHERE TASK TASKS	Spatial setting	The characteristics associated with the physical space in which the task takes place (Bosswood & Marriott, 1994	Behind doors, open office space, meeting room, prive online chat, an open online forum, at home, press conference room, fairgrounds, restaurant/café/bar, planes/trains/car among others
	Psychosocial environment	Factors associated with psychosocial characteristics of the environment in which the task takes place	Noisy vs. quiet; Familiar vs. unfamiliar physical space; culturally close vs. distant setting; relaxed vs. stressful environment

4 TASKS COGNITIVE DEMANDS	Cognitive aspects of the task (Robinson 2001; Robinson & Gilabert, 2007; Skehan, 1998, 2009)	Attentional and memory demands tasks place on those who perform them	-The number of simultaneous elements/items involved in task performance - Whether spatial or intentional reasoning are required - Whether taking a perspective is required - Whether tasks are performed under time pressure - Whether familiarity with the task is important
	Higher and lower (Bloom et al. 1956) required to perform the task	Mental processes necessary for successful task completion	-Sample lower-order skills: gathering info, classifying, or summarizing information, etc. - Sample higher-order skills: establishing relationships and associations, hypothesis-testing, judging, etc.
	Degree of perceived difficulty of tasks Complexity factors	How easy or difficult is a task perceived to be by those who perform it	- Perceived mental effort, difficulty, anxiety or stakes; - Information about what factors or conditions make a task more or less complex (e.g., task features, available resources, time constraints, multi-tasking, interlocutors, or external factors)
5 TASKS' LANGUISTIC	Language associated with performing a task	Linguistic resources necessary for task completion	- Skills: receptive or productive, or both; - Terminology: specific vocabulary items, expressions, idioms; other multi-word units; - Grammatical features - Phonology: features related to tone or intonation; - Pragmatic/ discursive moves, e.g. commands or requests; - Other features: rhetorical devices, turn-taking; style and level of formality; language variation
6 COMMUNICATION & TECHNOLOGY	Technological/digital tools and platforms (González-Lloret, 2014; González-Lloret & Ortega, 2014)	Technology involved in performing a task and its influence on the task	How technology is built into task performance, how it potentially transforms the task in terms of difficulty, the level of digital literacy required from task participants
	Communication channels	What means are used to perform a task	- Face-to-face vs. computer-mediated communication, - Verbally via videoconferencing vs. by phone, via email - Conventional writing on paper or interactive online chats among others
7 OTHER DIMENSIONS	Criteria for assessment	According to domain experts, what constitutes successful task performance?	Qualitative and quantitative Indices/measures of task completion/ performance
	Support during task performance (Mayer, 2009)	Documents, people and other resources one can resort to during task performance	Internet searches, specialized literature (text book, journal, report, technical manuals, visuals), human and online translators, colleagues
	Non-verbal aspects	Aspects of task which do not have to do with language	Dress code, body language, facial expressions, eye-gaze, gestures, distance from interlocutor, non-verbal expression of emotions