The Linguacuisine Project: A Cooking-based Language Learning Application

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1. Introduction

In this article, we present the Linguacuisine app, which was a product of the Erasmus Plus-funded project 'Linguacuisine'. The EU project funding ended in October 2018, but the project is still ongoing, using internal funding. The app and a wealth of project materials can be found on https://linguacuisine.com. Linguacuisine is the third generation of digital technology we have produced, the first two being the French and European Digital Kitchens. Rather unusually, we start the introduction with a comic, which provides an introduction to the Linguacuisine concept and procedures in graphical format, and use comics to illustrate concepts throughout.

Figure 1. Linguacuisine app.

Linguacuisine tackles the universal problem of classroom language teaching, namely that students are rehearsing using the language in classrooms, rather than actually using the language to carry out real-world actions. It also tackles the difficulty of bringing the foreign culture to life, and the issue of how to motivate people to learn languages. A

significant challenge for nations worldwide is how to improve the foreign language proficiency of its workforce and students. In countries like the UK, the number of students gaining a qualification in a foreign language has decreased significantly, so the question is: how can we engage people with language learning?

At Newcastle University, a group of linguists and computing scientists have been working together for the last 10 years on what language learning might look like if we asked what young people today are interested in as our starting point. Clearly, they are interested in using digital technology, in overseas travel, in global cuisine and cooking, in hands-on experiences and doing things. We used these interests as the design basis for our solution. Many technological approaches to language learning involve learning in a virtual, online world, but we wanted to use language to carry out a real-world, practical, engaging task with a tangible end product. We chose cooking as it's a universal physical activity which has considerable resonance with both language and culture. It's so enjoyable that countless TV programmes are devoted to it! It involves all five senses, you can work with friends and eat the end product. But what can you learn while cooking? We found you can learn aspects of a foreign language and culture, as well as digital skills while cooking. But why would anyone want to learn a foreign language while cooking? Because of the intimate connections between language, cuisine and culture. If you think of your favourite festival in your own country, then there will be particular food and language associated with it, which will give a direct window into the culture. Ayeomoni (2011, p. 51) suggests that "the relationship among language, food and culture in a society is an inextricable one". Many adult learners are motivated to learn languages through their interest in foreign cuisine and culture, and this project taps into this motivation. Also, many people find technology an inherently motivating tool for learning, as evidenced by the vast range of digital materials available for learning via a variety of platforms. We also found that you learn foreign words better when you are physically touching food and cooking utensils and using them to prepare food. When you are cooking, you involve all of your senses in the learning experience – touch, smell and taste as well as hearing and seeing.

2. Pedagogical principles

This section (based on Seedhouse, 2017) explains the pedagogical principles underlying Linguacuisine systems, materials and procedures. The pedagogical design is based on the principles of Task-Based Language Learning and Teaching (TBLT) (Ellis, 2003). Tasks are divided into 3 phases: *pre-task*, *during-task* and *post-task,* providing a clear design structure for materials, for conduct of sessions and for evaluation of performance. Seedhouse (2017) demonstrates how the phases are implemented in practice by Conversation Analysis of interactional transcripts of learners working through the cycle. It is argued that the project realises some of the advantages of TBLT using digital technology in a real-world setting outside the classroom. This section explains how the concepts of TBLT were operationalised in the Linguacuisine app.

2.1. What is Task-Based Language Learning and Teaching (TBLT)?

The pedagogical design of Linguacuisine employs TBLT, a well-established approach to language learning which prompts learners to achieve a goal or complete a task (Skehan, 1998, 2003). TBLT seeks to develop students' language through providing a task (such as asking for directions) and then using language to solve it. According to Ellis (2003, p.

9) the criterial features of a task are that: a task is a workplan; meaning is primary (language use rather than form); a classroom task relates directly to real world activities; a task can involve any of the four language skills (speaking, listening, reading and writing); tasks engage cognitive processes; task completion is a priority and assessment is done in terms of outcomes. Samuda and Bygate (2008, p. 7) see TBLT as involving holistic activity in that all sub-areas of language are employed to make meaning. They argue that it is in such holistic language work that key language learning processes take place. It is generally assumed (Ellis, 2003, p. 263) that tasks are carried out in pairs or small groups in order to maximise interaction and autonomy.

There has been a substantial programme of research in relation to TBLT, summarised in Skehan (2003). From the perspective of the Linguacuisine project, the major advantages of TBLT as pedagogy were the following. There was a natural match with the chosen activity of cooking, which could be easily conceptualised as a task, as described above. TBLT has well-developed procedures and principles for task design which could be followed and which blended well with HCI (Human-Computer Interaction) design principles. Johnson (2003, p. 96) stresses the importance of an iterative development cycle when designing language learning tasks. He examines the cyclic episodes that task designers actually go through, listing actions such as 'compare'; 'evaluate'; 'reject'; 'modify' and 'review'. This iterative cycle is very much in harmony with the user-centred design cycle used in pervasive computing and HCI. Dix et al. (2003) specify the cycle as 'identify needs, analysis, design, prototype, evaluate, implement, deploy and recycle. It therefore proved easy to integrate pedagogical and technological design from this perspective. Tasks form a useful basis for designing research as well as pedagogy.

TBLT has so far predominantly been based on tasks to be undertaken within the classroom which simulate real-world tasks. Some innovations in TBLT have combined language learning with other, non-linguistic skills in a similar way to this project. Paterson and Willis's (2008) *English through Music*, for example, aims to help children to absorb English naturally as they enjoy making music together. However, there have been few attempts to employ TBLT in naturalistic settings outside the classroom; the project described here is innovative in combining TBLT and digital technology in a naturalistic kitchen setting outside the classroom. Whereas classroom-based TBLT may engage the learners' senses in terms of sight, sound and touch, Linguacuisine also engages the senses of smell and taste as well, delivering a vivid, kinesic language learning experience.

Figure 2. Linguacuisine – learning with all your senses.

In relation to TBLT and digital technology, Thomas and Reinders (2010, p. 7) refer to the relative dearth and 'marginalization' of CALL research on tasks. Their collection tackles this issue by identifying and developing a range of areas involving technology-mediated tasks; these are reviewed in chapter 2 of Seedhouse (2017). The Linguacuisine project therefore contributes to the research agendas of both TBLT and technology-mediated TBLT.

2.2. *The principles of TBLT and Linguacuisine design*

The overarching main cooking task in the kitchen was designed according to Ellis's (2003) criterial features quoted in section 2.1 above, in the following ways: we designed it to encourage learners to focus on meaning rather than purely language – that is, they use the language to complete a culinary task, rather than focusing primarily on the language itself. Secondly, learners must employ all four language skills in a holistic manner to achieve the task. Thirdly, the task is situated in an authentic real-world context, namely the kitchen. The task is goal-oriented, involving the production of a dish. Fourthly, cooking tasks are carried out in pairs. In some cases, this generated interaction in L2. In the UK context, for example, we paired foreign learners of English who did not share an L1, compelling them to communicate in English L2. Finally, learners can measure their own success by non-linguistic goal completion, through cooking and consumption of the food. A further characteristic of the Linguacuisine task is that it is a focused task, in that it is necessary for learners to recognise the spoken form of named L2 vocabulary items in order to carry out the task. Learners are pushed to use these items in L2 talk with each other, but are not compelled; Ellis (2003, p.17) notes that learners can always use communication strategies to avoid using the target feature. Ellis (2003, p.142) suggests that focused tasks are of value because they involve both reception and production and provide a means of teaching language items communicatively, under real operating conditions.

Figure 3. Linguacuisine – explanations of how the system works.

Ellis (2003, p.21) provides a systematic framework for describing the design features of tasks, in which one must specify the goal, input, conditions, procedures and predicted outcomes. These are applied to the Linguacuisine task as follows:

Table 1. Task Design Features of Linguacuisine	
Goal	• To cook a meal following L2 instructions; • To learn a vocabulary set related to tools, materials and processes; utensils, ingredients and cooking processes.
Input	• L2 spoken, written, video and graphical input provided by the Linguacuisine system; • Contextual information is provided by the kitchen environment.
Conditions	• This is a convergent task in that users must agree on how to cook the meal and a single outcome is targeted. All users receive the same basic information, but receive individualised feedback according to their choices and task progress.
Procedures	• The task is intended for pairwork and for users to collaborate and produce some L2 talk related to cooking procedures.
Predicted Outcome	• A meal from the L2 cuisine which can be eaten. • Linguistically, it is predicted that some specific L2 vocabulary items will be learnt.

| | • Specifically, there will be concrete items (e.g., utensils and ingredients) manipulated during the task. |

2.3. Phase framework

In order to operationalize TBLT in this setting, we adopted the cyclical pedagogic TBLT framework put forward by Skehan (1998) and Ellis (2003), which divides activity related to the completion of a task into 3 phases: *pre-task*, *during-task* and *post-task*. This provided both a clear design structure for materials and a guide to implementation. The *pre-task* functions as a preparation stage for the main activity to be carried out in the during-task phase. The *during-task* phase involves the performance of the main task set. The *post-task* phase is designed to manipulate attention through reflection on and analysis of during-task performance, identification of what has been learnt, and as a period of evaluation of the task outcomes.

2.3.1 Pre-task

The *pre-task* functions as a preparation stage for the activity to be carried out in the during-task phase. This may include the presentation of new language, the mobilisation of existing language knowledge and clarification of the type of knowledge that would be required (Skehan, 1998, p. 138). All three features directly relate to preparing or priming the learners' attentional resources and are based on the operations involved in processing information in the short-term and working memory. The learners should get an indication of the purpose of the task and the kind of task it is. The *pre-task* in Linguacuisine involves a dual focus on cooking and L2 skills and is divided into presentation and preparation of the L2 items and cooking. Firstly, learners could (where available) watch a purpose-made video recording with optional sub-titles of a native-English speaker making the chosen dish for the project, *English Scones*. This familiarised them with both the cooking procedures required and with the English language to be employed. This facility enabled individualisation of learning. In TBLT terms, this aspect of the pre-task framed the main task, motivated the learners and focused their attention on the L2 words which they would encounter during the main task. It introduced them to the process by which they would generate the task output, namely the dish.

Secondly, the learners were able to see photos of the different utensils and ingredients they would need to make the dish and hear their names pronounced in the L2 via an audio file, in order to familiarise them with the specific L2 vocabulary required for the task this is 'list all ingredients/utensils' on the interface. This introduced new language and mobilised existing resources.

Thirdly, seeing photos and listening to audio files of the different utensils and ingredients also constituted instructions to locate these items and prepare them for cooking. So, whereas the first two pre-task elements were passive and involved listening, the third element involved learners in actively preparing equipment and ingredients. This element focuses them both on the language required and on the physical materials required for the cooking.

The role of the pre-task in the overall cooking session is to prepare the users for the cooking activity. Its pedagogical aim is to provide input about cooking and language through the notions of *preparation* and *presentation*. In TBLT, these introduce learners to the linguistic and procedural knowledge required to complete the task. In Linguacuisine we re-specified the notions of presentation and preparation to a dual focus on language and cooking. In TBLT terms, the pre-task obliges users to notice and process specific vocabulary items in the input. The content of the feature is provided by the requirement to locate and move the object itself onto the work surface and the linguistic form is salient as it is supplied by the system several times in both spoken and written forms.

2.3.2 During-task

The *during-task* phase involves the performance of the main task set. The *during-task* phase of course entails cooking the dish. It involves step-by-step instructions on how to prepare the dish, together with a range of relevant help. The instructions are verbally communicated by the app as and when required by the learners, using the app interface by pressing relevant buttons. The cooking task instructions are formulated in such a way as to include cooking-specific vocabulary on which we expect learners would focus most of their attention, having been introduced to the items in the pre-task. The learning environment provides a range of possible supports or scaffolds to cater for a variety of learning styles and L2 proficiency levels, and learners can decide for themselves which to make use of. Videos, photos and audio are available, as well as instructions as written text.

2.3.3 Post-task

The *post-task* phase is designed to manipulate attention through the analysis of during-task performance and reflection, as a period of evaluation and consolidation after the completion of the task. It can also involve identification of what has been learnt, and evaluation of the task outcomes. Skehan presents the post-task as an alternative to what he calls "within-task interference", that is the disruption that might be caused to the preservation of the communicative purpose if learners were too focused on attention to language features in the performance of the during-task phase (1998 : 148). This is similar to the 'plenary' section of a school lesson where a teacher goes through the learning objectives of a lesson and pupils identify 'what they have learned'. The *post-task* in Linguacuisine focuses on evaluation of what the users had learnt, as well as sampling of the task outcome, namely the dish produced. Targeted vocabulary can be re-visited by the learners through looking at the equipment and ingredients again on the app and checking their L2 names. So, whilst the focus *during-task* was on meaning and task completion, the focus *post-task* can be partly on linguistic form and on the language used, as well as on the dish itself. Moreover, the post-task phase provides an opportunity for reflection and discussion.

There are also other possible post-task activities which may be added to the app under 'extras'. Films or pdf files relating to culture, history, language and cuisine may be added for supplementary use in the post-task phase. A good example of a film is about Italian regional cuisines and can be found with the Italian recipe 'Involtini'. A good example of

a supplementary non-digital activity is provided on https://linguacuisine.com/larkspur-primary-visit-july-2019/ in which primary pupils produced paper menus in French.

2.4. Relating the principles of TBLT to the Linguacuisine tasks

Ellis (2003, p. 276) introduces eight principles of TBLT which can be used to guide implementation and design of participation. In this section, we see how these were implemented in relation to Linguacuisine.

- *Ensure an appropriate level of task difficulty.* This was implemented by having a wide range of available resources (recipes) and an optional introductory video with a range of options, so users could tackle the task by choosing the resources suitable to their own level.
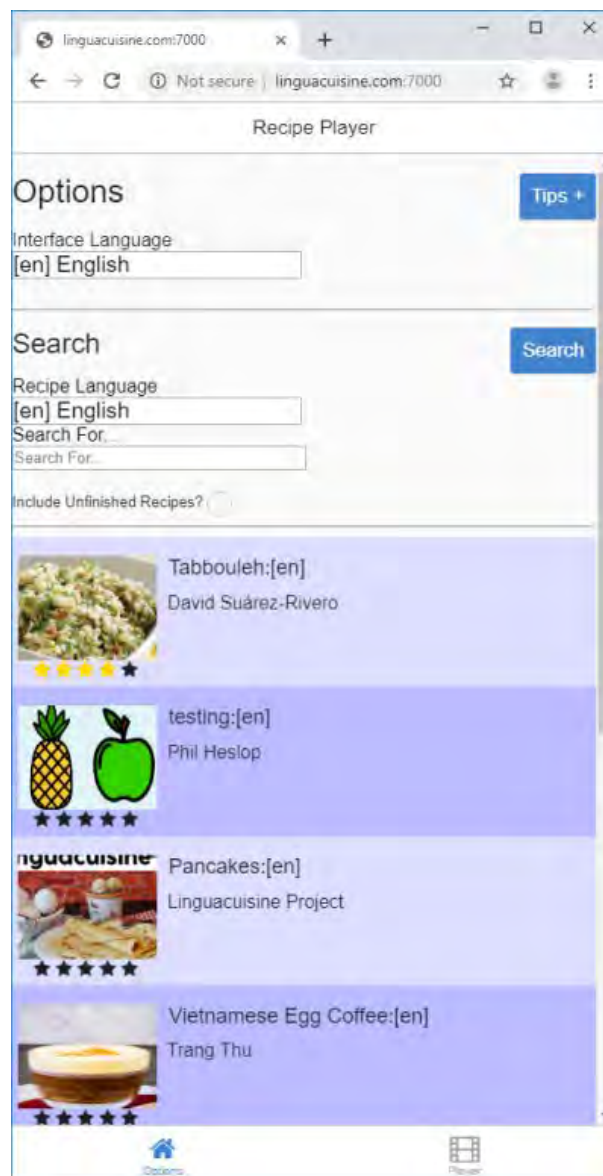

Figure 4. Linguacuisine recipes.

- *Establish clear goals for each task-based lesson.* The main goal of cooking a dish was implemented by showing the video of the dish being prepared, including the final result. Goals for vocabulary learning were established in the pre-task by introducing the target items in both photo and audio formats.
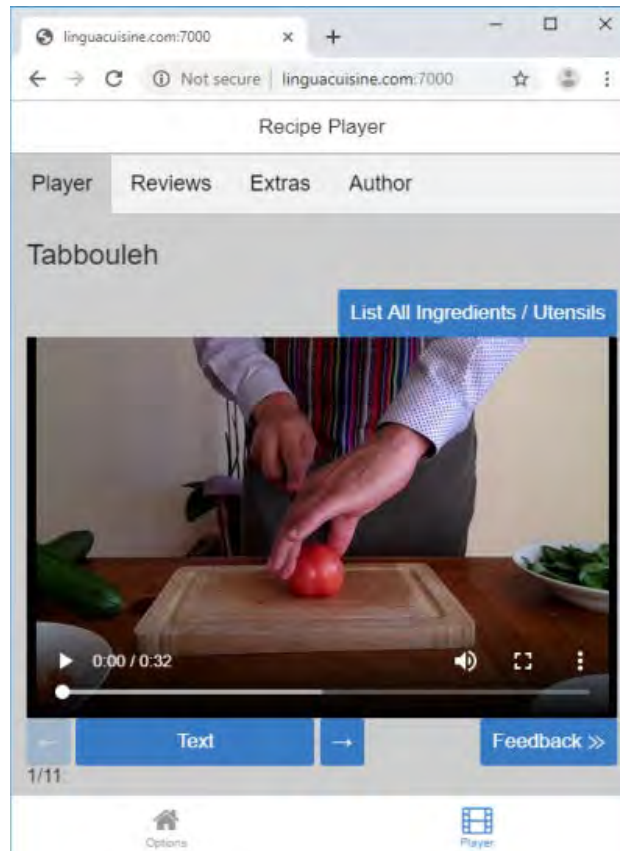

Figure 5. Video of a dish being prepared.

- *Develop an appropriate orientation to performing the task in the students.* This was developed by supplying information about the task in advance of the session to users, by preparing them for the task in the pre-task and reflecting on it in the post-task.
- *Ensure that students adopt an active role in task-based lessons.* The system was designed to require the users to take decisions and perform physical actions on their own initiative. There is normally no teacher present, although there can be if required.
- *Encourage students to take risks.* Users are told that they can make their own decisions as to which resources to make use of in order to complete the task.
- *Ensure that students are primarily focused on meaning when they perform a task.* Users must focus primarily on carrying out the physical task by manipulating utensils and ingredients.
- *Provide opportunities for focusing on form.* Users are able to summon help when they have problems in understanding L2 instructions. The help facility provides help in the linguistic form of the L2 target item in both spoken and written forms.
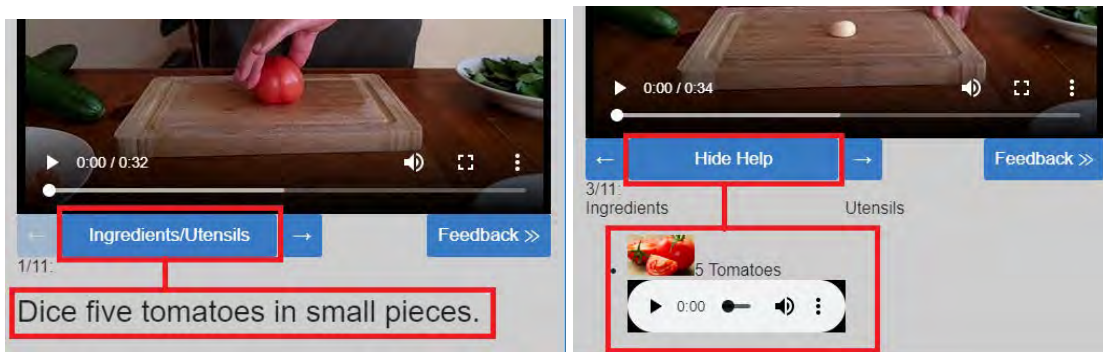
Figure 6. Help provided with linguistic form.

- *Require students to evaluate their performance and progress*. In the post-task users may reflect on and evaluate their task completion and their learning.

So, it has been possible to implement TBLT principles and procedures in the design and implementation of tasks for Linguacuisine.

2.5. Digital competency

As well as a language learning purpose, the apps were designed with participants to improve their digital competency. In order to create a coherent recipe, authors need basic video editing skills, need to know how to upload files to the internet and need to understand some of the underlying technological structure of a recipe (steps, ingredients, utensils and extras). Working with a group of digitally marginalised participants during the design phase, we tested the participants pre- and post-designing and using the app on their disposition towards technology using questions taken from the digital competence framework (Carretero et al., 2017).

Figure 7. Linguacuisine – supporting different competences.

3. Findings

In this section, we present empirical findings in relation to: firstly, digital competencies and attitudes; secondly, vocabulary learning.

3.1. Findings on digital competencies and attitude (design cohort)

We tested the design cohort (digitally marginalised participants) with a pre- and post-questionnaire about their digital competencies and their general attitude to the learning process:

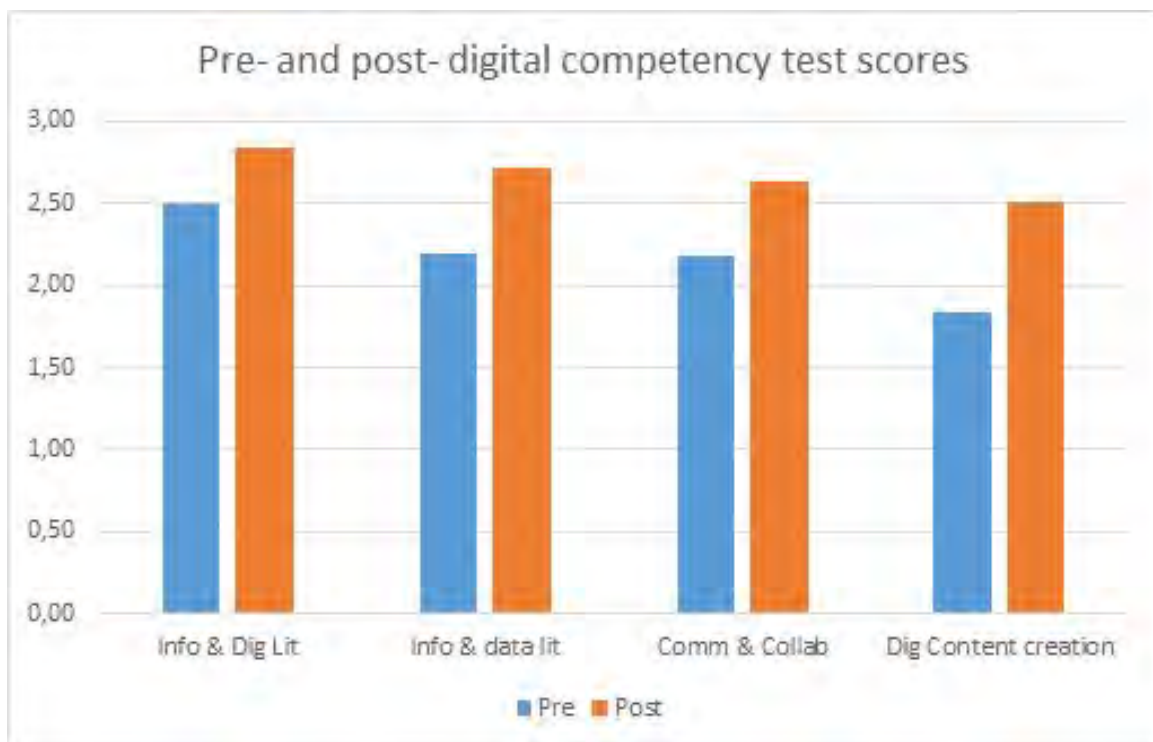| Table 2. Digital competency questionnaire results			
	Pre	Post	T. Test
Information & digital literacy	2.50	2.84	0.013
Information & data literacy	2.19	2.72	0.004
Communication & collaboration	2.18	2.64	0.017
Digital content creation	1.84	2.51	0.001
Average	**2.18**	**2.68**	
Standard Deviation	**0.745**	**0.724**	

Figure 8. Digital competencies results.

The Digital Competencies questionnaire (Table 2 & Figure 8) showed significant changes in all areas. This reflected the participants' perception of how they felt they had improved on key digital skills. There was no objective assessment of whether skill was measurably improved.

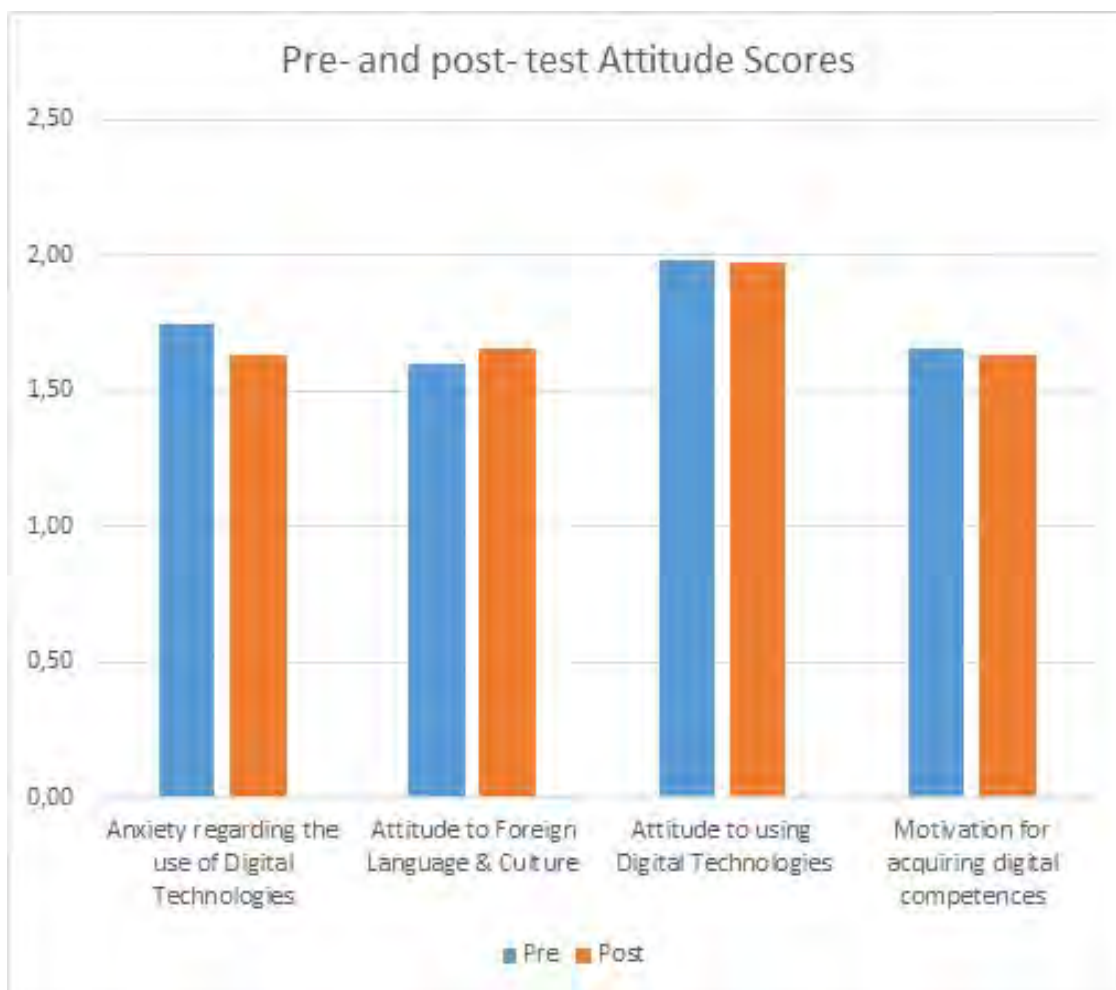| Table 3. Attitude questionnaire results			
	Pre	Post	T.Test
Anxiety regarding the use of Digital Technologies	1.75	1.63	0.215
Attitude to Foreign Language & Culture	1.60	1.66	0.528
Attitude to using Digital Technologies	1.99	1.97	0.882
Motivation for acquiring digital competences	1.66	1.63	0.723
Average	**1.75**	**1.72**	
Standard Deviation	**0.527**	**0.412**	

Figure 9: Attitude results.

The Attitude questionnaire (Table 3 & Figure 9) did not show significant improvements in attitudes, although the trend is towards improvement. To understand this aspect of the study, a deeper qualitative thematic analysis was undertaken on participant interviews.

3.2. Findings on vocabulary learning: two studies

One problem for any holistic environment for language learning is how to assess language learning precisely (Seedhouse, 2017). A pervasive digital language learning environment is intended to be a holistic one, in which learners autonomously access resources to

complete a task and thereby learn aspects of a language as well as other skills. However, this does pose certain problems when it comes to the precise evaluation of the learning effectiveness of such an environment. Exactly which aspects of a language have been learnt? How do we know participants did not know an item previously and what is the evidence that it has now actually been learnt? More generally, if we are trying to create an autonomous, holistic environment, would this not be disrupted by testing procedures? Ideally, the evaluation of a holistic environment would itself be holistic and evaluate all aspects of language learning together. In Seedhouse (2017), for example, we provided a holistic illustration of learning processes in the French and European Digital Kitchens by presenting representative episodes from a complete task cycle. In this article, by contrast, we decided on a narrow focus on one specific component of language learning for evaluation. This would enable us to see whether there was concrete evidence of learning in one narrowly delineated component of the overall language learning system. The main research question was: to what extent does learners' ability to verbally produce specific vocabulary items change as a result of a cooking session in this pervasive digital environment? The basic research design (described below) was a pre- test/ post- test of specific vocabulary items, carried out on 72 learners of Chinese in China and 24 learners of Vietnamese in the UK. The intervention which was intended to promote learning of the items was the complete experience of a cooking session using the Linguacuisine app, lasting about an hour.

Both the Chinese and Vietnamese studies followed the same basic research design to determine evidence of L2 vocabulary learning.
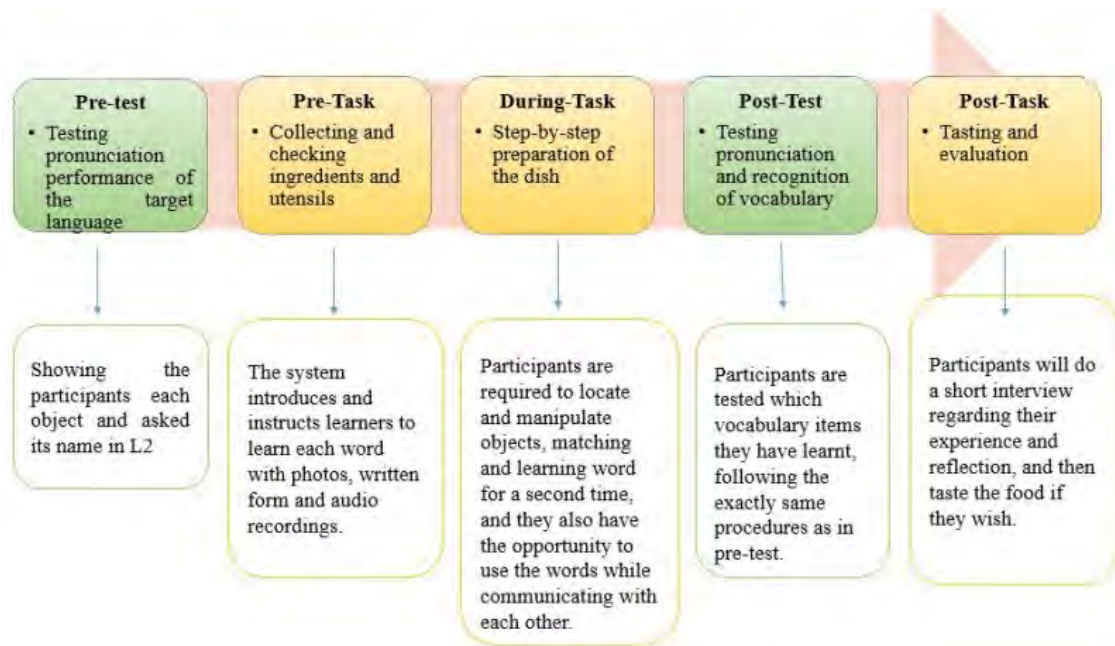

Figure 10. The tasks and tests cycle.

According to Figure 10, we showed the testee each object in order and asked its name in L2, using an audio recorder to record what they answered, if anything, for each item. We therefore established the extent to which each individual was able to actively produce each item prior to their cooking tasks, using the rating scale in Table 4. After they finished their cooking task, each individual completed the post-test immediately and also

separately following the same procedure as the pre-test. This could therefore enable us to record granular evidence in terms of individual changes in active production of learning the specific vocabulary items during their completion of tasks.

The rating scale employed in the present study was an adaptation of the Lexical Production Scoring Protocol-Written (LPSP-Written) (Barcroft, 2002) as shown in Table 4.

Table 4. Rating scale for Linguacuisine vocabulary test	
Score	**Speaker Spoken Production**
0.00 points	The speaker says nothing at all or states that s/he is unable to answer.
0.25 points	The speaker makes an attempt to name the target object which is unintelligible and is very difficult to understand in relation to the target object.
0.50 points	The speaker produces the target lexical item partially, or in a way which can only be understood to relate to the target object with some difficulty, with a major problem in pronunciation and/or clarity. Or the speaker tried to describe the object rather than name it.
0.75 points	The speaker produces the entire target lexical item in an intelligible way, but with a minor problem in pronunciation and/or clarity, or in delivery.
1.00 points	The speaker produces the entire target lexical item with precision and clarity.

3.2.1. Chinese vocabulary learning study

There were 72 international students of L2 Chinese resident in Xi'an, China, where the present study was conducted during March to May 2019. All the participants were assessed on the same 27 vocabulary items (related utensils and ingredients) on 2 occasions (pre-test and post-test) with 5 rating options. The recipe was a traditional Chinese recipe: Eggplant Stir Fry. Participants were 43 males and 29 females in total, age ranged from 18-40 years old, and their exposure to Chinese varied between 2 months and 68 months (5 years and 8 months), with a mean of 13 months (1 year and a month). We tried to pair the participants so that one had a higher language proficiency than the other.

In most cases, the two participants did not have a common L1 and spoke Chinese L2 or English L2 (beginners level participants were allowed to speak English due to their limited language abilities in Chinese) the whole time. Participants who had a common L1 were requested to speak Chinese L2 / English L2, whereas it happened sometimes that they spoke a mixture of Chinese and English.

Table 5. Background information of participants			
Kyrgyzstan (*n*=6)	Surinam (*n*=1)	Italy (*n*=1)	Uzbekistan (*n*=5)
South Korea (*n*=4)	Kazakhstan (*n*=12)	Sudan (*n*=1)	Pakistan (*n*=19)
Ukraine (*n*=1)	Japan (*n*=3)	Morocco (*n*=1)	Norway (*n*=2)
Russia (*n*=3)	Tajikistan (*n*=5)	Benin (*n*=1)	Belgium (*n*=2)
Nigeria (*n*=1)	Mauritania (*n*=1)	Turkmenistan (*n*=1)	Afghanistan (*n*=2)

In order to find the participants' language proficiency level, their HSK (HanYu ShuiPing KaoShi) test results were established. This is the standardized test of Standard Chinese Language Proficiency of China for non-native speakers such as foreign students and overseas Chinese (see Appendix for HSK to CEFR Description). There were 18 participants at beginner (HSK 1-2), 26 at intermediate (HSK 3-4) and 28 at advanced level (HSK 5-6).

In all cases, to determine the changes in participants' learning outcomes between the pre-test and post-test, we ran a t-test. In the present study, the null hypothesis is that the mean score of pre-test minus the mean score of post-test is equal to 0, which means there is no significant difference between pre-test and post-test. The alternative hypothesis is that the difference in means is not equal to 0, which indicates there is a significant difference.

As shown in Table 7, we found that the t-statistic is 5.581 and p value is < 0.05. The larger the absolute value of the t-value, the smaller the p-value, and the greater the evidence against the null hypothesis. The null hypothesis was therefore rejected and we accepted the alternative hypothesis. Furthermore, the mean score of the pre-test is significantly smaller than the mean score of the post-test.

Figure 11 shows the pre-test and post-test scores for an aggregation of the whole cohort and all the individual lexical items. The horizontal number, from 1-27, represents the exact same order as in the test. The vertical axis number gives the mean test scores for each individual item using the rating scale showed in Table 4, therefore, the minimum score is 0 when participants said nothing at all or stated he/she was unable to answer. By contrast, the maximum goes to 1 which represents that the participants produced the entire lexical item with precision and clarity.

Figure 12 and Table 6 show that the mean score of an aggregate of all the 27 items for the entire cohort rose from 10.465 in the pre-test to 16.872 in the post-test. These differences were all statistically significant (See Table 7). The vertical axis in Figure 8 shows the maximum score would be 27.
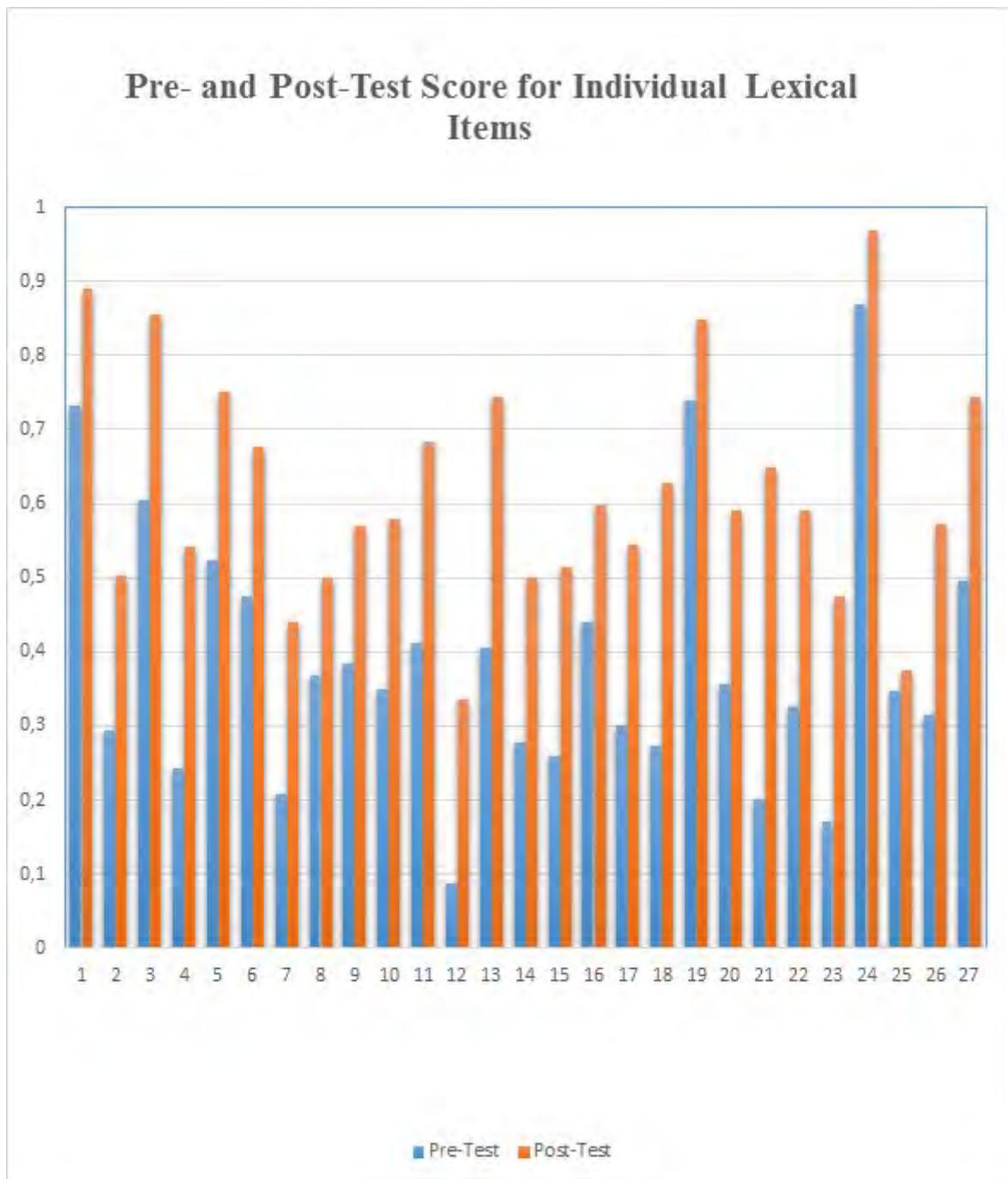
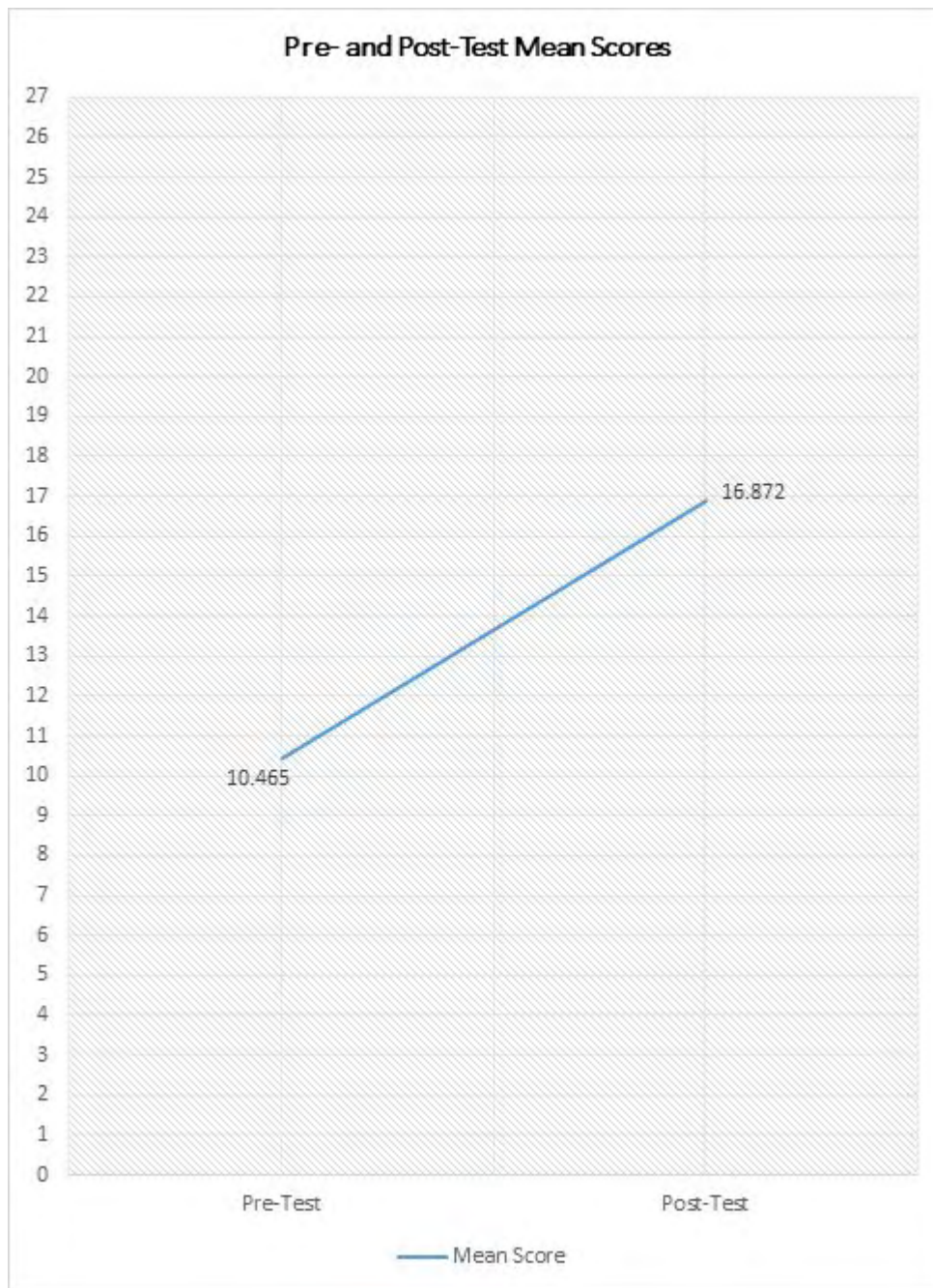Figure 11. Pre-test and post-test scores for individual lexical items in *Chinese Digital Kitchen.*

Figure 12. Mean scores on 27 items for the whole cohort in pre- and post-test in Chinese Digital Kitchen.

Table 6. Mean scores and standard deviation			
Overall Score	*Mean*	*Std. dev.*	*N*
Pre-Test	10.465	6.736	72
Post-Test	16.872	7.031	72
Improvement	6.407	3.465	72
Table 7. Statistical significance in relation to the tests			
		P Value	**T Value**
Pre-Test	Post-Test	< 0.05	5.581

Therefore, we can conclude that in the current study, while working with the international university students learning Chinese, there was a significant gain in the mean score between pre-test and post-test for these items when aggregated. The task-based protocol employed in the present study worked effectively, in that the pre-task phase made participants become aware of their lexical gap and their need to focus on form.

The degree of gain for individual items showed considerable variation; and there is a prima facie case that this variation was related to the degree of prior knowledge of the vocabulary item, although other influences cannot be excluded.

3.2.2. Vietnamese vocabulary learning study

Twenty-four participants who had no prior knowledge of Vietnamese language and culture were selected for this study. They were Newcastle University students (7 undergraduates and 17 postgraduates) with 7 different nationalities (Table 8). There were 4 male and 20 female participants, whose ages ranged from 20 to 32, as shown in Table 8. These individuals were randomised into pairs by using "permuted-block randomization" into four groups of six.

Table 8. Sex and age of participants

Sex	Number	Percentage	Minimum age	20
Females	20	83.3	Maximum age	32
Males	4	16.7	Mean	23.9
Total	24	100.0	Standard deviation	2.76

Table 9. Nationality of participants

China (*n=13*)	Romania (*n=1*)
Indonesia (*n=3*)	India (*n=1*)
Singapore (*n=3*)	British (*n=1*)
Malaysia (*n=2*)	

The recipe used in this study was "Vietnamese Egg Coffee" (Figure 13). Five vocabulary items of utensils and 5 vocabulary items of ingredients were assessed. Each individual lexical item was marked based on Table 4.

Figure 13. Vietnamese egg coffee.

In this study, the test results from pre-tests and post-tests underwent one-way ANOVA (analysis of covariance) conducted in Excel program to test for statistical significance and differences between the four independent groups. These quantitative data are helpful to compare participants' vocabulary knowledge prior and post treatment.

Pre-test vs post-test in the *Vietnamese Digital Kitchen*

Twenty-four participants split equally into four groups did pre-tests and post-tests which involved 10 lexical items. These results were averaged out and plotted to Figure 14 and Table 10, illustrating that the post test results significantly increased. Prior to the learning experience, participants were only able to score 0.061. After the learning session, the post-test score was 0.780 for production. The post-test score shows that the participants improved their vocabulary knowledge.
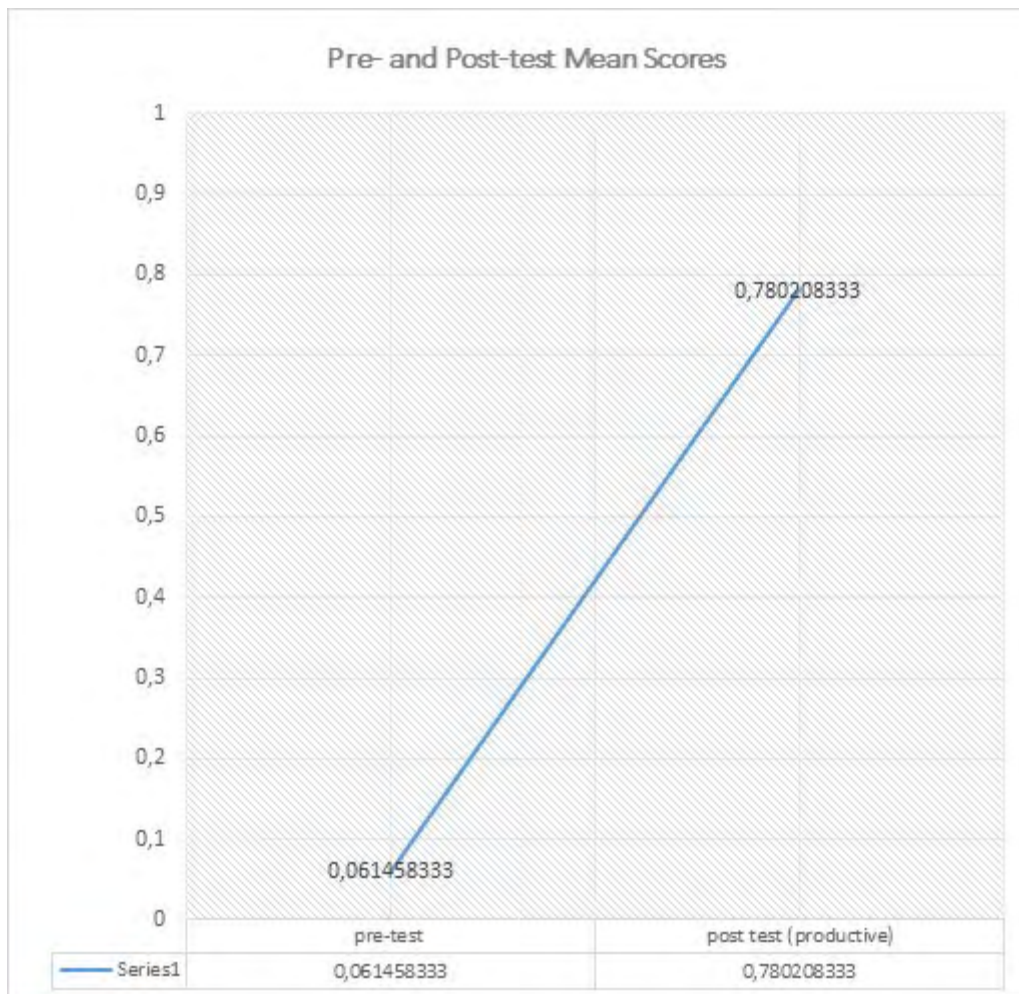
Figure 14. Mean Scores on 10 items for the whole cohort in pre- and post-test
in *Vietnamese Digital Kitchen.*

Table 10. Mean score and standard deviation

Overall Score	Mean	Std. dev.	N
Pre-Test	0.061	0.127	24
Post-Test	0.780	0.013	24
Improvement	0.719	0.121	24

Table 11. Statistical significance in relation to the T-tests

		P Value	T Value
Pre-test	**Post-test**	< 0.05	0.001

In Table 11, T-test was used to assess the significance of the post-test results compared to the pre-test results. Productive and receptive post-test results were considered as significant as p-value < 0.05.

3.3. Vocabulary input in the Linguacuisine task cycle

We now consider how the task cycle of Linguacuisine is intended to provide input to vocabulary learning for the learners. The task cycle is separate from the test cycle, although one is wrapped around the other (figure 6). As we saw above, the task structure consisted of pre-task, main task and post-task. In the pre-task, the system introduces the learners to vocabulary items needed in the main task by instructing them verbally to collect the corresponding object from a different area of the kitchen. If the learners do not understand the word spoken by the system, they may call for help in terms of a verbal repetition and a photograph. This ensures receptive recognition of each vocabulary item. Learners therefore have the opportunity to use both the 'guessing from context' and the 'explicit teaching' methods of vocabulary learning (Schmitt and McCarthy, 1997, p. 3). Following its introduction in the pre-task, each vocabulary item is then repeated verbally by the system at least once during the main task (the cooking session) as part of the cooking instructions, thus providing further input. At each point of the cooking session, learners may also request help, which comes in three steps: a repetition of the initial prompt, a picture, while the third consists of a video clip showing the action to be performed. The participants may also produce the vocabulary items when speaking to each another as they conduct the task. The system therefore provides a basis for the learners to both recognize and produce the linguistic form which relates to a specific object. The system requires the learners to physically manipulate the objects during the tasks, while the task design provides the opportunity (but not the necessity) for participants to employ the vocabulary in their joint dialogue.

In the post-task, the participants sample and evaluate the food that they have cooked. This gives them a further opportunity (but not obligation) to employ vocabulary learnt. So, each learner hears the name of each vocabulary item a minimum of two times from the system, but there is no maximum limit. Learners can continue asking the system to repeat the name of an object as many times as they choose, and this particular word may occur an indefinite number of times in their oral interactions.

4. Discussion and conclusions

This article has introduced the TBLT principles which underlie the pedagogical design of the Linguacuisine app, shown how these were operationalised, and illustrated the interactional and learning processes in which learners are engaged. We can conclude that it is indeed possible to employ TBLT principles outside the classroom, and that these provide a suitable basis for designing a digital environment for language learning using an app. We have also shown that testing cycles can be interwoven with task cycles. The two empirical studies of language learning using the app (Chinese and Vietnamese) demonstrate that vocabulary learning gains are significant. The empirical studies of digital competencies showed significant gains in all areas, whereas attitudes showed gains, but not to a significant degree. A wealth of materials and resources related to the app and its use can be found on https://linguacuisine.com.

Acknowledgements

Figure 15. Linguacuisine recipe authoring software.

References

Ayeomoni, M.O. (2011). Language, food and culture: Implications for language development and expansion in Nigeria. *International Journal of Educational Research and Technology, 2*(2), 50-55.

Barcroft, J. (2002). Semantic and Structural Elaboration in L2 Lexical Acquisition, *Language Learning, 52*(2), pp. 323-363.

Carretero, S. Vuorikari, R. & Punie. Y. (2017). *DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use*. EUR 28558. https://doi.org/10.2760/388

Dix, A., Finlay, J., Abowd, G. & Beale, R. (2003). *User-Centred Design*. London: Prentice Hall.

Ellis, R. (2003). *Task-based Language Learning and Teaching*. Oxford: Oxford University Press.

Johnson, K. (2003). *Designing language teaching tasks*. Basingstoke: Palgrave Macmillan.

Paterson, A. & Willis, J. (2008), *English through music*. Oxford: Oxford University Press.

Samuda, V. & Bygate, M. (2008). *Tasks in Second Language Learning*. Basingstoke: Palgrave Macmillan.

Schmitt, N. & McCarthy, M. (Eds.) (1997), *Vocabulary: Description, Acquisition, and Pedagogy*. Cambridge: Cambridge University Press.

Seedhouse, P. (Ed.) (2017). *Task-Based Language Learning in a Real-World Digital Environment: The European Digital Kitchen*. London: Bloomsbury.

Seedhouse, P., Preston, A., Olivier, P., Jackson, D., Heslop, P., Plötz, T., Balaam, M. & Ali, S. (2013). The French Digital Kitchen: Implementing Task-Based Language Teaching beyond the Classroom. *International Journal of Computer Assisted Language Learning and Teaching, 3*(1), 50-72.

Skehan, P. (1998). *A cognitive approach to language learning*. Oxford: Oxford University Press.

Skehan, P. (2003). Task-based instruction. *Language Teaching*, 36, 1-14.

Thomas, M. & Reinders, H. (Eds.) (2010), *Task-Based Language Learning and Teaching with Technology*. London, New York: Continuum International Publishing Group.

Willis, J. (1996). *A framework for task-based learning*. Harlow, U.K.: Longman.