SPREADSHEETS FOR LANGUAGE LEARNING
Creative Ideas for Informatics and Foreign Language Lessons

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Abstract: On the one hand, spreadsheets are a very useful tool for language lessons, but unfortunately almost unknown by language teachers, often due to missing ICT-competences. On the other hand, spreadsheets are taught in informatics or ICT lessons, but mainly in a mathematical or an economical context; even thought, it could also be taught in many other context, especially for languages. This paper will give some creative ideas to benefit both subjects: Ideas for the use of spreadsheets in foreign language learning are presented, not only for writing vocabulary lists, but also for language games and oral exercises. These tasks as well as some ideas for interdisciplinary projects may be applied also in informatics for revising and introducing functions of spreadsheet analysis software in informatics. Interdisciplinary learning, especially ICT-supported language lessons are seen as more interesting and motivating than lessons related only to one specific subject.

1 INTRODUCTION

On the one hand, spreadsheets are a very useful, but unfortunately, almost an unknown tool for language learning, perhaps because of missing competences of language teachers in this software application. On the other hand, spreadsheets are taught in informatics or Information and Communication Technology (ICT) lessons, but, mainly in a mathematical or an economical context; even though it could also be taught in a language context.

This paper will show some possibilities for both informatic and language lessons including interdisciplinary projects as well. First, it will present some creative ideas for the use of spreadsheets in foreign language lessons, not only for writing vocabulary lists, but also for language games and oral exercises.

Next, the topics of foreign languages will be used as a basis of informatics exercises and lessons about spreadsheets. Some ideas will be given for teaching basic functions as well as complex functions with projects for advanced learners.

2 MOTIVATION

The idea for this paper was born because of my own experiences as an informatics and language teacher in a vocational school as well as a lecturer at a University and a teacher training college offering in-service training for language and informatics teachers.

The use of spreadsheets for language learning and interdisciplinary projects has many benefits not only for language teachers but also for teachers of informatics and computer science.

First of all there is the aspect of motivation, which is an essential precondition of the learning and memory process. It is confirmed by neuro-didactics based on brain research (Sabitzer (2011a and 2011b) that motivation is higher when

- the students are interested in the learning contents and/or enjoy the exercises, e.g. games or competitions,
- the learning contents and exercises relate to the personal world of the students, so that
- they recognize the purpose and benefit of the topics, and
- the learned knowledge, competences, or the created products can be used in their real life. (Herrman, 2009)

Interdisciplinary tasks and projects also satisfy some principles of neurodicatics,. They may foster creativity as well as cross-linked thinking and offer

possiblities of revising and applying learned knowledge and competences. Interdisciplinary learning may be a distinctive and proven way of learning (Repko, 2008). As mentioned in Sabitzer (2011b) referring to different studies, "interdisciplinary tasks and projects as well as ICT-supported language lessons are seen as more interesting and more motivating than lessons related only to one specific subject".

A good reason for the use of spreadsheets, as exercise books or vocabulary lists, is the principle "write once use many", derived from "Write Once Read Many" or WORM, a data storage device, well known by informatics teachers. Based on simple vocabulary lists, many exercises and games can be created, for practicing written as well as spoken language. Furthermore, the spreadsheets can be used as a basis for mobile learning via smartphones or tablet PCs, a way of leaning that may be very attractive for our students.

3 SPREADSHEETS IN PRACTICE

The proposals in this chapter are directed to foreign language teachers as well as to informatics teachers. I also want to encourage language teachers who feel that they may not have enough computer skills. They can ask the students to do the exercises on their own or they can take them as an impetus for the cooperation with informatics teachers who are often pleased to get new ideas for their lessons.

All the exercises and tasks presented in this paper were developed and accomplished in my own classes, some of them during the language and/or informatics lessons. Other tasks, like the writing of vocabulary lists, were done by the students at home.

I also encourage teachers to make the students create their own learning material. Based on my experience and the feedback of my pupils, I know that they like being active and creating learning products like playing cards, crosswords or games. That is why I motivate them to write vocabulary lists in a spreadsheet program like Excel or Google, because they can easily be used for creating exercises, games or puzzles.

3.1 Foreign Language Learning

This chapter is mainly directed to language teachers presenting ideas for learning material which is not difficult to create. It may also serve to motivate informatics teachers who introduce or repeat basic

functions of spreadsheet analysis software. Therefore, the used functions are indicated as well.

3.1.1 Working with Vocabulary Lists

The basis for most of the presented tasks is a **vocabulary list**. The more extensive it is, the more possibilities it offers. Just a simple vocabulary list with two columns – one for the native and one for the foreign language – can be used for some nice vocabulary exercises and games.

Figure 1 shows the vocabulary list "family" and the **matching exercise** created by the students. The original list (columns A and B) is copied and pasted in the columns D and E. The English words are sorted in ascending alphabetical order, the Italian words in descending order.

	A	B	C	D	E
1	family	la famiglia		family	la famiglia
2	parents	i genitori		aunt	lo zio
3	mother	la madre		brother	la zia
4	father	il padre		children	la sorella
5	children	i figli		daugther	la nonna
6	son	il figlio		father	la madre
7	daugther	la figlia		grand-father	la figlia
8	brother	il fratello		grand-mother	il padre
9	sister	la sorella		grand-parents	il nonno
10	grand-parents	i nonni		mother	il fratello
11	grand-mother	la nonna		uncle	il figlio
12	grand-father	il nonno		parents	i nonni
13	uncle	lo zio		sister	i genitori
14	aunt	la zia		son	i figli

Figure 1: Vocabulary list and matching exercise "Family".

The matching exercise can be printed (only the selected columns D and E) or done on the computer when the columns A and B are hidden.

Students who have an Android Smartphone can use Google spreadsheets as a basis for some free **learning apps** like *Flashcards* from iUbiquity and a *vocabulary trainer for google docs* from eLibera. (Sabitzer, 2011b) When the applications are installed on the smartphone, the Google spreadsheet with the vocabulary to learn can be opened directly.

The same vocabulary list can be used for creating a **tandem-exercise, as shown in Figure 2** by copying and pasting the original list and erasing some fields in a way that student 1 has the solution of student 2 and vice versa. The students work in pairs where each partner gets a different worksheet. In the following example student 1 begins and has to translate the first word *family* in Italian. Student 2 can help or correct him/her because he/she has the solution *la famiglia*. Then student 2 translates his/her next word *parents*, and student 1 his/her next word *father,* and so on.

	A	B	C	D	E
1	Student 1			Student 2	
2	family				la famiglia
3		i genitori		parents	
4	mother				la madre
5		il padre		father	
6	children				i figli
7		il figlio		son	
8	daugther				la figlia
9		il fratello		brother	

Figure 2: Tandem-exercise "Family".

The tandem exercises are a good possibility to make the students speak in the foreign language. Instead of vocabulary, the worksheets can contain also parts of sentences to complete, dialogues, different schedules or points for discussion.

With the free **Tandoku** Generator (Ferry, 2007), a template programmed in Excel, you can easily create Tandokus (sudokos with words instead of numbers) by copying and pasting 9 words of the list into the template. These tandokus can be printed out or solved on the computer in Excel and are a good alternative to traditional vocabulary exercises.

	la sorella	i figli			la madre	il figlio
	la madre					
		i figli		i nonni	il padre	la figlia
il padre			i figli	la madre		i genitori
		la sorella		il padre		
la madre		la figlia	il figlio			il padre
	la madre	i genitori	i nonni		la sorella	
					la figlia	
la sorella	i figli			il figlio	il fratello	

Figure 3: Tandoku "Family".

Certainly, the vocabulary lists can also be used in other downloadable or online **software for education** like Hot Potatoes, Puzzlemaker or Lingofox. Unfortunately, a description of these possibilities would go beyond the limits of this paper. The following Figure 4 shows a word serpent, created by copying and pasting the original vocabulary list.

Figure 4: Word serpent "Family", created by Lingofox.

3.1.2 Board Games and Playing Cards

Playing cards and other games is a very effective and fun way of learning that can be well supported by spreadsheet analysis software. Some teachers may argue that it takes too much time to create different games. However it is not necessary that all is done by the teacher. Students can also create their learning material on their own. This saves time for the teacher and in a relatively short time many different cards and other games can be created. Furthermore, students are more active when they create the material themselves and this may be more effective than traditional ways of learning. This is also supported by neurodidactical research based on brain research: Knowledge cannot be transferred; it must be newly created in the brain of each learner. That is why learning should always be active. (Herrmann, 2009), (Sabitzer, 2011a)

Creating **playing cards** in Excel or Google tables is very easy, but language teachers often do not think of this possibility. Two variants of the game "Quartet" (a variant of the games "Go Fish", "Authors" or "Happy Families") will be presented at this point. The object of these games is to collect sets of four or six cards that belong together. The number depends on the topic.

Figure 5 is the first example of a real Quartet around the topic "Food" and contains subcategories like *fruit*, *vegetable*, *meat*, *fish* etc.

Figure 5: Quartet "Food".

Figure 6 is a variant with sets of six cards. It is a Sextet concerning the six verb forms of the Italian present tense.

	A	B	C	D	E	F
1	1 a	1 b	1 c	1 d	1 e	1 f
2	io	tu	lui/lei/Lei	noi	voi	loro
3	1a canto	1a	1a	1a	1a	1a
4	1b	1b canti	1b	1b	1b	1b
5	1c	1c	1c canta	1c	1c	1c
6	1d	1d	1d	1d cantiamo	1d	1d
7	1e	1e	1e	1e	1e cantate	1e
8	1f	1f	1f	1f	1f	1f cantano

Figure 6: Sextet "Present tense".

Quiz cards are also easy to create, like the following examples in Figure 7, with questions and answers on the same side. They consist of two cells where the text is rotated in different directions.

131

Figure 7: Quiz cards "Health problems and advice".

Quiz cards can be used alone or combined with **game boards** like Trivial Pursuit or games of dice. In the following Figure 8 you can see the game board created together with the Quiz cards of Figure 7. The students need to know how to format cells and number them automatically.
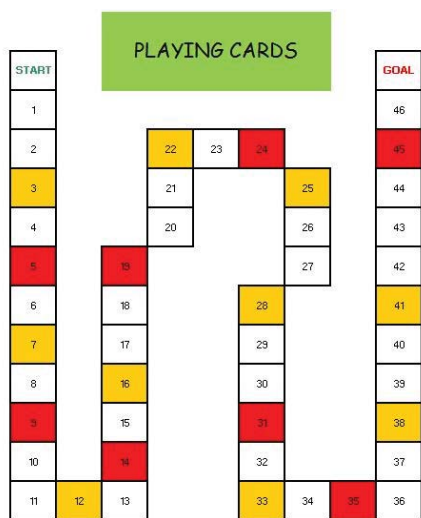

Figure 8: Game board for quizzes.

3.1.3 Competitions with Spreadsheets

If the students may use notebooks or computers in the language lessons, many games and exercises can be accomplished as competitions. A nice possibility to occupy or relax the students during the last minutes until the end of a lesson is the game *scrabble.* Ten minutes are sufficient to play scrabble with verbs. The students have to create a scrabble of verbs using all different regular and irregular verbs and all persons. Each word can be used only once in the scrabble. The winner is the pupil who has the most correct words. The best students may get a good mark for their work.

Before beginning the competitions the students should format the cells so that they are quadratic. Each cell contains only one letter. Figure 9 shows a part of a scrabble containing Italian reflexive verbs.
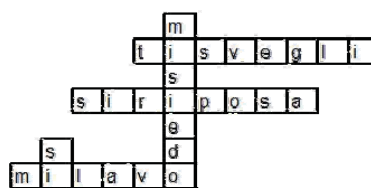

Figure 9 Scrabble – Verbs.

Based on this competition, my pupils had to do an exercise at home. They expanded the scrabble to a crossword by using some basic functions. They copied the scrabble and pasted it in another spreadsheet, where all filled cells got a border. Then all words were deleted and the cells, which should contain the beginning letter of a verb, were numbered. As seen in Figure 10, the numbers and the corresponding terms were indicated beside the crossword.
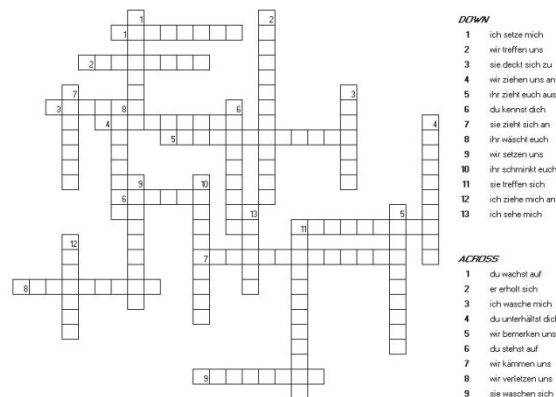

Figure 10: Expanded scrabble to a crossword.

Figure 11 shows a nice quiz game for grammar, vocabulary or knowledge about a foreign country may also be played in a spreadsheet analysis software. In German it is called "Stadt-Land-Fluss" (City-State-River). The pupils prepare a column for each category like the following pattern for Russian verbs:

Figure 11: Quiz game "Russian verbs" in a spreadsheet analysis software.

The rules are as follows: One pupil has a list with verbs that are numbered. This pupil counts silently until another pupil says "Stop!" The number that the first one had in mind is the number of the verb the students have to conjugate and write in the table. Who finishes the line first, gets a point, but only if all forms are correct.

3.2 Informatics Lessons

The tasks and exercises described in 3.1 have the main scope to support language learning. Nonetheless, all of them can also serve as examples for introducing or revising basic functions of spreadsheet analysis software like formatting, sorting, filtering, working with references etc. Certainly, these ideas can be transferred to other learning contents and accomplished, at least partially, with other software like database or for programming exercise in different programming languages.

In this chapter, I would like to animate informatics teachers to integrate varied topics of foreign languages and other subjects in their lessons or exercises. So they can help the pupils create learning products for practical use applications that they really need and that may support their daily life, at school as well as at home. These language content exercises may increase motivation for spreadsheet analysis as compared to only exercises with economical or mathematical content where pupils often cannot see an immediate benefit.

Since interdisciplinary learning is considered to be interesting and effective, informatics teacher should offer their cooperation to language teachers who are often glad to get technical support. There are a lot of possibilities for working together, as described in Sabitzer (2011b). At this point, I will concentrate on examples realized in Microsoft Excel.

The first one is a verb conjugator (Figure 12) that I use for the introduction of the VLOOKUP function. It is based on a list of irregular French verbs and their present tense forms.

Figure 12: French verb conjugator.

A good example for the introduction or revision of complex functions is the following **encyclopaedia** of the Spanish regions and their capitals. This encyclopaedia may also serve as the template for other topics. Figure 13 shows the menu (left) and the query form where the capital can be entered and the corresponding region is shown below (right). There

is certainly another query form for the search in the other direction. The functions needed for this exercise, besides the hyperlinks, are ISBLANK, WHEN, and VLOOKUP.

Figure 13: Encyclopaedia "Spanish Regions".

This encyclopaedia and other lexicons or dictionaries may be used as a basis for various **quizzes** in all subjects and for all topics. They are suitable for the introduction or revision of many different functions as well as the development of forms with drop-down or other fields. The following multiple-choice quiz about the languages of the world contains 15 questions, each of them are on a separate sheet (figure 14) with a feedback to the previous question (in this case "The last answer is correct!").

Figure 14: Question sheet.

The last sheet in this file shows the evaluation of the whole quiz with a comment of: "Very good!" or "You should learn more!!!" like in this example.

Figure 15: Evaluation form.

The necessary functions in the quiz, besides the use of hyperlinks and option-fields, are WHEN, ISBLANK, COUNTA, and VLOOKUP.

4 SUMMARY

This paper is directed to informatics and foreign language teachers and should give some creative

ideas for the use of spreadsheets as a tool for interdisciplinary lessons. The presented exercices and tasks were designed based on neurodidactical principles and combine learning contents of both subjects. Some of the tasks are part of the project "Brain-based Ideas for Informatics", which is presently in progress. It aims at improving the learning outcomes and results of a programming course at the University of Klagenfurt in Austria. The evaluation results will be presented in a further paper.

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