

# **Responsive Open Learning Environments for Computer-assisted Language Learning**

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Responsive open learning environments (ROLEs) stellen Inhalte und Dienste so zusammen, dass Widgets miteinander kommunizieren können. ROLEs ermöglichen es, existierenden Lernmanagementsystemen ihr Lernangebote zu verbessern und dadurch Teil des ROLE zu werden. Als technischen Machbarkeitsnachweis zeigen wir anhand eines Sprachlernprototypen, der im Rahmen des europäischen Projekts ROLE entwickelt wurde, zunächst, wie die Interoperabilität von Widgets erreicht werden kann, und präsentieren dann, wie die Implementierung von Sprachlernwidgets in eine laufende Lernumgebung an der Shanghai Jiao Tong University in China als institutioneller Machbarkeitsnachweis für die Anwendbarkeit von und Zustimmung zu ROLEs dient.

Responsive open learning environments (ROLEs) compile contents and services in such a way that service widgets can communicate with each. ROLEs thus enable existing learning management systems to enhance their learning offers which in turn become part of the ROLE. As a technical proof of concept we – by means of a language learning prototype developed as a technical proof of concept in the context of the European project ROLE – first show how interoperability of widgets can be achieved and then present how the implementation of language learning widgets into a running learning environment at the Shanghai Jiao Tong University in China serves as an institutional proof of concept for the applicability and acceptance of ROLEs.

## **1 Introduction**

In this paper we introduce the notion of a responsive open learning environment (ROLE). A ROLE is an individually configured learning environment consisting of interoperable resources like tools (widgets) and content resources, among others. The ROLE approach is an approach of radical individualisation of learning environments. Its aim is to optimally support a lifelong learning process in all phases including phases of formal, institutional learning and phases of individual, self-regulated learning.

The paper is structured as follows: in section 2 we motivate and describe the notion of a ROLE, and we introduce the ROLE project. In section 3, we give a technical proof of concept showing how interoperable language learning widgets can be combined to form a language learning application. Then, in section 4, we give an institutional proof of concept showing how ROLE widgets can be implemented and used within an existing learning environment, namely language learning courses held at Shanghai Jiao Tong University (SJTU). Finally, in section 5, we summarise the essentials of this paper.

The research leading to the results reported in this paper has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement no 231396 (ROLE project). The paper is based on a number of ROLE project deliverables, namely D4.1 (Palmér et al. 2010), D5.1-2 (Mikroyannidis, Gillet 2009),

D5.3 (Renzel 2010), D6.1 (Nussbaumer, Fruhmann 2010), ID6.1 (Nussbaumer 2010), ID6.3-4 (Chatterjee, Law 2010) and ID7.1 (Mödritscher, Wild 2010).

## **2 Responsive Open Learning Environments**

Learning is a highly individual activity. Technology enhanced learning (TEL) aims to provide tools to support the learner in her quest of mastering the learning process, e.g. through intelligent tutoring systems, personalised learning resource provision or advanced communication and social support features. Nevertheless, computer-based learning environments do not support the various notions of TEL but, instead, focus on just one or two within an often inflexible environment. New approaches aim to foster and harness the multitude of learning environments by providing responsiveness and flexibility. In this chapter we therefore introduce the notion of responsive open learning environments in order to outline the shift in TEL from a provision-oriented perspective to an individual learner-driven information and service ‘pull’.

### **2.1 Introducing ROLES**

In the past, many intelligent and adaptive educational systems have attempted to support the learner and the teacher by providing meaningful, relevant and appropriate educational content. Research and development in the area of intelligent and adaptive educational systems has made significant progress and the evolution of such technology proceeds continuously. So far, research on such systems focussed on the personalised presentation of contents and adaptive navigation through the contents and not on other components of learning environments like communication and social software approaches. Recently, however, research realised that the learners’ preferences and needs are of crucial importance to personalisation and adaptation of learning environments (Harmelen, 2006). Hence, new approaches that aim to support the personalisation of the entire learning environment, its components, tools, and functionalities have slowly been emerging. The vision behind such approaches is the learner-driven demand for informal and lifelong learning, i.e. allowing learners to control what they learn, how they learn it, and with whom.

Consequently, learners need to be able to create their own computer-based learning environment, e.g. by mashing up the services in their personal learning environment (PLE), either on social network technologies or within collaboration and portal platforms in an enterprise setting (Drachsler et al., 2009). This is of particular relevance in the critical lifelong learning transition phases when inhomogeneous groups of learners are treated in a one-size-fits-all way since there is no way to respond to their individual strengths and weaknesses (Attwell et al., 2009). Even worse, in such transition phases learners are typically required to become accustomed to working with an entirely new PLE.

This is where responsive open learning environments (ROLES) come into play: they enable the individual learner as well as groups of learners to adapt the learning environment to their very specific needs and, more importantly, enable the system to adapt its functionalities and components to the concrete and individual demands concerning learning environment and learning strategies (Kirschenmann et al., 2010). ROLES also allow learners (individually or in groups) to generate, i.e. to mash up, new

components and functionalities on the basis of existing web-based software tools, so-called web services.

An example will make the role of a ROLE clear: Mia studies English Language and Literature at a German University. For her course on Creative Writing she needs to work on a sonnet about a specific topic. She uses her computer to find the respective information on the topic, poems in general and sonnets in particular, writes several versions, hands one in and gets her grade. Instead of using only the university's learning environment, she complements her learning environment with additional services, e.g. communication to tutors, better literature recommendation tools, discussion forums, dictionaries, etc. Naturally, the university's learning environment is part of Mia's personal learning environment. Because Mia is using her personal learning environment quite often, it 'knows' about her, is able to react on her new demands, tailors itself to Mia's way of learning and guides her in her quest of mastering the learning process itself, e.g. through self-reflection tools. It provides her with documents tailored to her way of learning, suggests contacts for tutoring and discussion and helps her to understand just how to improve her learning process.

This example clearly outlines that the architecture of ROLES needs to ground on an open source approach, which enables an integration of ROLE functionalities into a personal learning environment independent from software systems and technologies. ROLES must be 'open' in this respect. Such a generic framework provides the learners with adaptivity and personalisation in terms of content and navigation as well as adaptivity and personalisation of the entire learning environment and its functionalities (Wolpers et al., 2010). A ROLE responds to the learner's activities, habits, needs and preferences. Thus, learners are motivated and equipped with the ability to generate new (adaptive) tools and functions according their personal needs, supported and guided individually.

From a technical point of view, ROLES should be build on a generic framework so that there is no need to bring all learning tools and technologies into one infrastructure as it is the approach of today's service-oriented architectures or peer-to-peer-integration of technologies. There is strong need for a flexible composition of technologies by the end user in the sense of mashing up learning tools and technologies at the 'clients' side. The best features of all virtual learning environments need to be combined into one, created by the learner herself; 'best' here means best for an individual learner or a specified group of learners.

## **2.2 The ROLE Project**

The approach of responsive open learning environments is directly addressed within the FP7 Integrated Project ROLE<sup>1</sup>. The objective is to create a flexible, web-based, open environment for the federation and mash up of learning services on a personal level. The project aims to create an individual world for learning with personalisation intelligence on the user's side (learner and teacher). Personalisation intelligence in this case concerns the adaptation of learning processes, the intelligent content selection and sequencing, the personalised skills management and individual learning as well as

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<sup>1</sup> <http://www.role-project.eu/>

focussed teaching. In comparison to a central and instructional driven approach ROLE tries to create one that is more effective adaptivity- and personalisation-wise by using the intelligence and user profiles of the learners and teachers in combination with organisational requirements. ROLE uses technologies to federate and mash up services and tools, e.g. LMSs, wikis, blogs, repositories etc., in an intelligent way. The project's goal is to enable the learner to easily construct and maintain her own personal learning environment consisting of a mix of preferred learning tools, learning services, resources and other related technologies that combine the best features of TEL-push and TEL-pull. In this way the level of self-control and responsibility of learners will be strengthened, which is seen as a key motivation aspect and success factor of self-paced, formally instructed as well as informal/social learning.

One of ROLE's main aims is to provide learners with a choice of interoperable, institution-independent learning tools. Furthermore, new tools will constantly emerge as learners are able to recombine provided learning tools to form new ones. Another aspect that is dealt with is the empowerment of the learner by transferring responsibility for the choice and configuration of the learning environment from the teacher to the learner. ROLE also tries to make the learning tools responsive to events in the context of the learner including responsiveness to events in the learner's social context, i.e. the different tools and services used have to be interoperable. Finally, by freeing the learner's workplace from its strict binding to a prescribed learning setting and to a fixed institution, the ROLE infrastructure is meant to empower the learner for true lifelong learning across institutional boundaries. The integration of learning with other parts of the learner's social life is considerably facilitated, thus increasing motivation for and effectiveness of learning.

In a nutshell, a ROLE is a compilation of services and contents used for learning by an individual user. Furthermore, the services are accessible as widgets and are able to communicate with each other, thereby overcoming the burden of an existence in isolation as being found in today's learning environments. Key services of a ROLE include pedagogically-driven support services, e.g. widgets utilizing self-reflected learning or competence and result-oriented portfolios. The services are accessible and ready for integration out of the box, provided by widget stores that resemble today's application stores as we know them for mobile phones.

One more word on how to implement ROLES in today's existing learning infrastructures: not necessarily does the notion of ROLES impose a complete paradigm shift; instead, ROLES enable existing LMS installations to enhance their learning (service) offers. Thereby, they automatically become part of the ROLE of the individual learner. Vice versa it is also possible that LMS-provided services are captured as widgets and provided through respective application stores to learners, either within the respective organisational learning ecosystems or publicly available ones.

### **3 Interoperability: CALL Widgets**

To show the potential of the ROLE project a first demonstrator was set up (Renzel et al., 2010). A language learning scenario was chosen as a concrete use case as it allowed ROLE's widget approach to be tested. The prototype is based on a server-sided widget

engine integrating the widgets from different sources. An important issue that had to be solved was widget interoperability and inter-widget communication. Several possible components required for such an infrastructure were identified and tested. The solution consisted of not hard-wiring the widgets to one another but to notify all widgets of all events and leaving the reaction up to the widgets. This means that all widgets are notified of all events that happen inside of a widget. Using this approach leads to a loose coupling of the widgets and makes the development of new widgets independent of other developers. Further, the widgets can be wrapped into containers for integrating them into existing systems like LMSs. To generate recommendations and provide self-evaluation services the user behaviour is monitored based on the Contextualised Attention Metadata (CAM) schema ((Wolpers, 2007) (Schmitz et al, to appear 2011)). Having this information recommendations can be generated based on the user's own previous behaviour or on the usage history of other users. Further, the evaluation of the user behaviour enables students and teachers to monitor their own learning activities. A detailed description of all technical aspects, implementation decisions and problems that occurred is given by Renzel and colleagues (2010).

The scenario used for the demonstrator deals with Tim, who works in the sales department of a book store and often goes to international fairs where he has to talk to distributors, publishers and other business partners. He therefore wants to improve his business English. His learning strategy consists of first reading texts in English and then having a closer look at any words he might have had difficulties with. As Tim wants to use the English news pages that he reads online everyday as his text sources, he decides to integrate the language learning into his PLE. Hence, he selects three widgets that support this task: a *Language Resource Browser*, a *Translator* and a *Vocabulary Trainer*. In the news texts that he reads in the *Language Resource Browser*, Tim can mark any word he does not know and send it to the other two widgets: the *Translator* will display possible translations of the term and the *Vocabulary Trainer* will store it for later learning. The text a term was taken from is stored as a source within the trainer widget so that Tim can always recall the context it was taken from.

Figure 1 shows a screenshot of the three widgets as they have been implemented for the prototype. In the *Language Resource Browser* users can read texts or work with other media and mark any terms unknown to them to be send to the other widgets. The *Language Resource Browser* offers four different tabs: *Text*, *Own Text*, *Media* and *Help*. The *Text* tab works like a web browser by displaying a page for the given URL in an iframe<sup>2</sup> allowing the user to select terms and contexts of terms at the bottom of the widget. The source of such a term will be the URL of the page. In the second tab called *Own Text* the user can add her own text taken from any online or offline resource (e.g. web pages, emails, docs or pdfs). Again, the user can select terms and contexts. The indication of a source is, in this case, optional. Within the third tab the user can access different media such as videos or audio files. While watching or listening to the media, the user can enter any term she hears in the field given and send it to the other two widgets. For terms from media files the source will be the URL of the media and the context will be defined as “media context”.

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<sup>2</sup> [http://www.w3schools.com/tags/tag\\_iframe.asp](http://www.w3schools.com/tags/tag_iframe.asp)



Figure 1: three language learning widgets from the first ROLE demonstrator

The *Translator* widget translates terms or sentences either entered directly by the user or those that are sent from the *Language Resource Browser*. Four web services have been combined in the widget: (a) Wikipedia<sup>3</sup> for definitions, (b) the Google Dictionary<sup>4</sup> for translations and pronunciations, (c) Google Translate<sup>5</sup> for translations of terms and sentences and (d) dict.org<sup>6</sup> for translations, a thesaurus and definitions. The prototype implementation only supports English-to-German, the language pool could, however, be extended to all languages supported by the services listed above.

For the *Vocabulary Trainer* a slightly modified Leitner system (Leitner, 1995) has been implemented. The vocabulary training method works with five different boxes. A newly added term will always be put into the first box. If the user knows the translation, the term will be moved to the next box, if not, it will be moved to the previous one (or stay in the first). The web services used to check translations are the same ones used in the *Translator*. The *Vocabulary Trainer* has four functionalities represented by four tabs: *List*, *Add*, *Train* and *Stats*. The vocabulary lists can be managed by the user in the first tab where an overview of the stored lists is given. Lists can be created or deleted and the content of the different boxes can be looked at. Links to the sources of the terms are also provided. The *Add* tab allows users to manually insert a new term or sentence, the context of that term, and its source. It will use the translator Web services to give translation suggestions and as an addition a Flickr<sup>7</sup> connection is used to suggest pictures matching the term(s). In combination with the *Language Resource Browser* widget, the sent term item automatically appears in the *Vocabulary Trainer* widget

<sup>3</sup> <http://www.wikipedia.org/>

<sup>4</sup> <http://www.google.com/dictionary>

<sup>5</sup> <http://translate.google.com/>

<sup>6</sup> <http://www.dict.org/>

<sup>7</sup> <http://www.flickr.com/>

together with its term, context and source. The third tab, *Train*, is where the actual practice sessions take place. A user can choose any of the boxes to train its terms. By looking at the source of a term she might get some help in finding the right translation. The images might also support her in this task. The *Stats* tab shows statistics of the training sessions by giving a global as well as a list score.

Two widgets that extend this prototype are shown in Figure 2. The *CAM* widget continuously records all events that are sent from one widget to the other and stores them into a database. The user can decide whether the data are stored locally on her computer or in a central repository or whether the recording is switched off. The data can then be analysed and evaluated. On the one hand the user can only use her own data but on the other hand, if the widgets are used as part of a language learning group, users can be compared to one another. The analysis and evaluation results can then be visualised in the *Monitor* widget. The results could, for example, be the progress a user made on a certain task or recommended learning material based on other user experiences that could be useful to advance in the task.

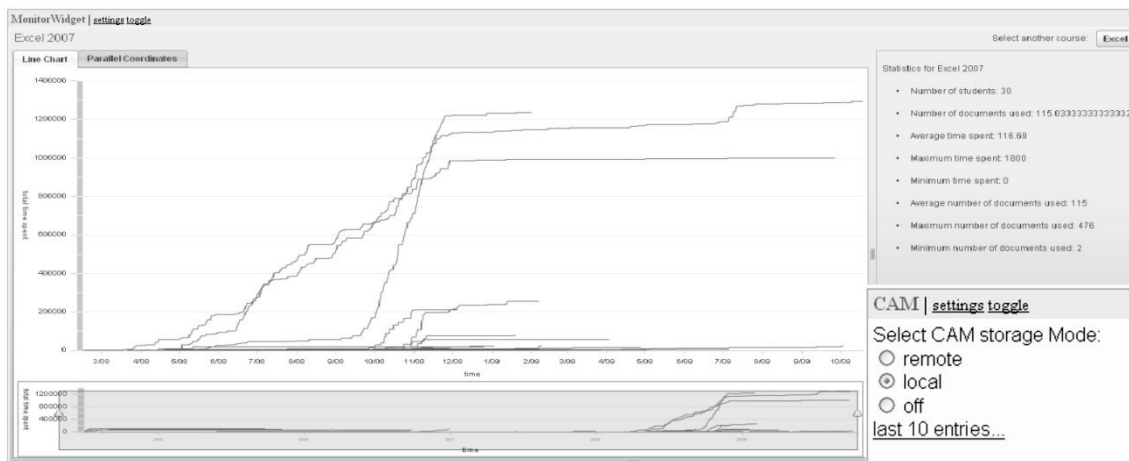


Figure 2: two additional widgets for the first ROLE demonstrator

To take stock: the language learning prototype serves as a technical proof of concept. It demonstrates how interoperability of learning widgets can be achieved so that such widgets can be combined to form a personalised language learning application.

#### 4 Test-bed: language learning at SJTU

One of the test-beds of the ROLE project is the School of Continuing Education (SOCE) at the Shanghai Jiao Tong University (SJTU) in China. Most students at SOCE are adult learners that already have a full-time job but would like to improve their competencies with an additional degree or certificate training. To increase their chances in the highly competitive Chinese job market as well as to climb the social ladder, a good education is deemed essential. Only one quarter of all students that apply for the university entrance exam is accepted; that implies that 18,982,000 students (i.e. the other three quarters) are not. The Chinese government therefore established a number of online institutions (SOCE being one of them) and in collaboration with Shanghai Telecom SOCE launched 20 broadcasting channels to provide two million ADSL users in Shanghai with live learning content. In order to also support the still under-developed

regions in Western China, SOCE makes its courses accessible to more than 20 universities in that area where more than 30,000 students have benefited from this programme so far.

#### 4.1 Test-bed description

The courses offered at SOCE are very similar to those offered as part of regular university programs. The main differences are that courses take place in the evening or on weekends in order to cater for those students having a full time job and that they are offered as face-to-face courses and as distant courses broadcasted over the Internet. The broadcasting system records the video and audio of the lecturer and also presents the slides with any additional comments. Students can either follow the course live or replay the lecture later. In both cases the students can choose whether they would like to have the video channel, the slides channel or both of them visible on the display (see Figure 3). When attending the live version of the course, a chat channel is available allowing the students to ask questions or to give feedback during the lecture.

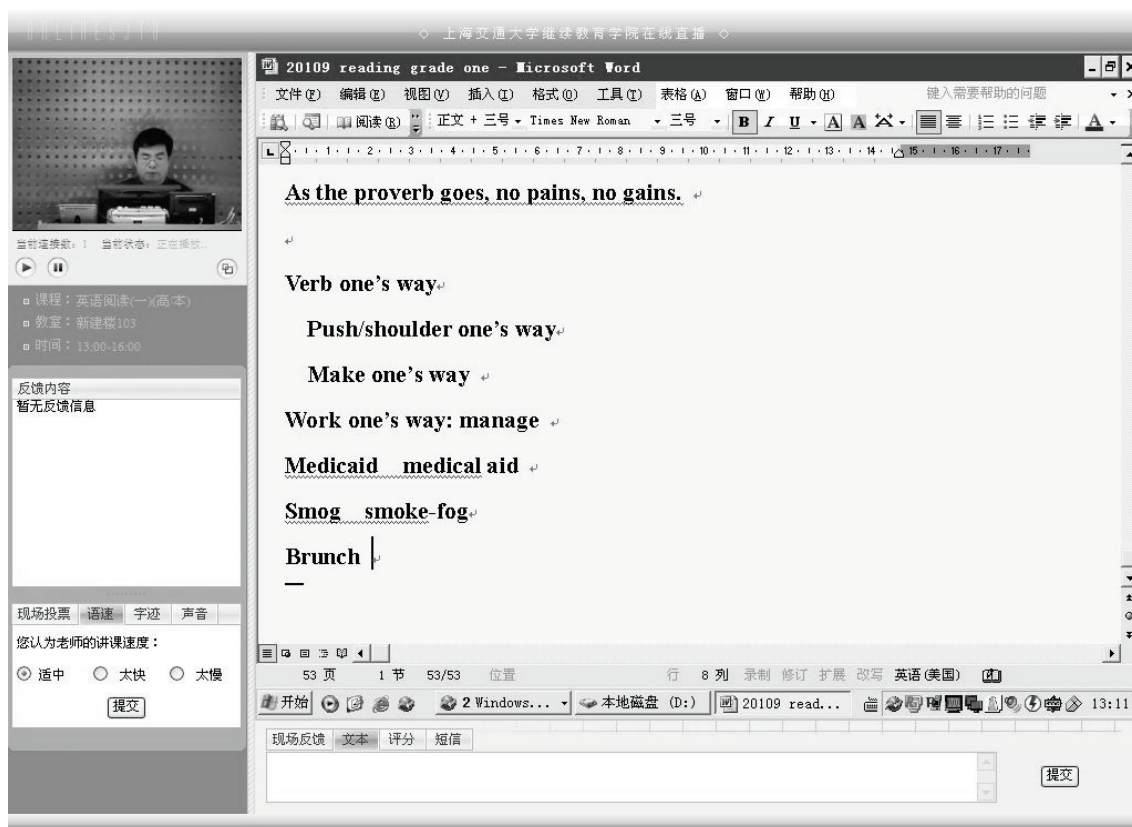


Figure 3: screenshot of the live lecture recording at SJTU

The gaps existing in the current learning processes are common for many Chinese educational settings. Students are usually very degree and certificate oriented, i.e. the formal acknowledgement is the goal, not the mastery of the subject. Due to many students participating remotely group work is also hard if not impossible. Practical exercises and application of learned skills is thus not put into action. Many students have extreme difficulties communicating with native speakers as they are very insecure and shy. Existing tools, e.g. online dictionaries, pronunciation help or micro blogging

sites, are often not known to them. At SJTU it is deemed very important that the Chinese learners get the chance to actively apply the learned knowledge, e.g. to produce spoken language while learning a foreign language and to use the target language as a tool of communication. One of the main advantages of Web 2.0 is that it encourages the production of spoken language through various websites and hence supports peer learning on a much larger scale than in the past because it enables collaborative learning across countries and continents. When deciding on material for the courses, it needs to be available in several languages, concise and clearly show the benefits of using technology as students will otherwise not use it. Showing example PLEs and how they are used to solve tasks the users will encounter in their private or business life has proven to be a successful method. SJTU end-users have limited time at their disposal and will seldom browse through the materials driven by curiosity, but rather driven by specific needs/problems. Showing them how using technology can be part of their private life is a very important aspect. Chinese web censorship results in popular services not being accessible. This problem can be overcome by utilizing local services. When creating and publishing multimedia training materials, it is thus compulsory for the SJTU test-bed to guarantee access to the material from multiple redundant sources.

The main goal is that students are engaged into the course. In contrast to the traditional way of teaching in China where students just learn to pass the exam, the aim of this test-bed is that students become more engaged and active in the course. This is especially relevant for language learning, as Chinese students often are unable to have fluent conversations. Furthermore, as the typical teaching methods are teacher centred, students are not used to self-directed learning. This is a severe limitation in their business life, which ROLE is aiming to overcome.

The need of the test-bed is to enrich and enlarge the now rather traditional knowledge transfer process to the following aspects: students should (a) engage more into the courses, (b) learn more self-regulated, (c) be able to transfer learned skills to professional life, (d) be enabled to master the Web 2.0 tool usage, (e) learn how to communicate better with foreigners, (f) collaborate more and share best practice. The collaborated and individual work should be connected and cross-cultural effective learning should be supported. Another requirement of the SJTU test-bed is that the students are supported in their learning processes and that they get feedback regarding goal achievement. Students should understand what they learn instead of just memorising.

The example scenario takes place in a language learning lecture, for instance French for beginners. The lecture has several aims: mastering the first steps in spoken and written French, and also learning about and mastering tools that help students in their working life. This second aim is supported by activities that require using the tools. More specifically, the teacher sets up a template of a learning environment which contains a dictionary, a translation tool, a spell checker, a pronunciation/text-to-speech tool and a voice/video recording widget. Directly giving the learners a task that can only be solved by using the tools will not be successful – from experience gathered in previous courses we know that students will be overwhelmed and simply ignore the task. Therefore, the teacher has to carefully demonstrate the tools and to motivate the usage by giving a

meaningful task, such as making a self-introduction. Starting with an English (or Chinese) sentence, such as “Hello, my name is Tianxiang”, the teacher shows how to use a translation tool to get a first rough French translation, and how it can be refined by using a dictionary and spell checker. The French sentence is read aloud by a text-to-speech tool and repeated by the student until it can finally be recorded. This recorded introduction can then be uploaded to learning networks such as iTalki<sup>8</sup>. In this way, students start to appreciate the value of tools and might become motivated to experiment with their own learning environment. At a later point in the lecture, the students will receive a similar task, such as describing their job without being shown how to use the tools.



Figure 4: partial screenshot of the PLE used at SJTU

The PLE that was used by the test-bed for the described task is shown in Figure 4. The text-to-speech widget is on the left-hand side, the spell checker on the top right. Below it is a recording tool that allows the student to practice their pronunciation. Not visible in the figure are the translation and the uploading tool.

#### 4.2 First usage of ROLE widgets at SJTU

The PLE was used at the SJTU test-bed in the classes French I and French II over the three semesters of Spring 2009 (*S1*, June–August 2009), Summer 2009 (*S2*, September–November 2009), and Spring 2010 (*S3*, March–June 2010). The classes were taught in French and English. Precise numbers about students enrolled for the French lectures are difficult to give as the school administration has figures about the total numbers of

<sup>8</sup> <http://www.italki.com/>

students in each tier, but no information about which precise course the students selected. Students can choose between German, French and Japanese. The *S1* tier (in which French I was taught) counted 128 students, *S2* 474 students (347 French I tier, 130 French II tier) and *S3* 369 students (178 French I, 191 French II). The students progress from French I to French II. This means that the *S2* French II students are mostly identical to the *S1* French I students, etc. Similarly, concrete numbers about attendance are not available: students do not attend regularly due to their busy schedule. They can come to class in person, watch live via their browser or download the video of each class later. On average, about 20–30 students attended the French I lectures in the classroom and about 10–15 students attended the French II lectures. An indication of participation is given by the numbers of students who took the final exams: 33 for *S1* (French I), 106 (French I: 72, French II: 34) for *S2*, 95 (French I: 37, French II: 56) for *S3*. This is about 23% of the total numbers in each tier. These numbers are typical for the second language (which is deemed as rather unimportant by the students). The lecturer was popular among the students and received good grades in students' evaluations.

The screenshot shows a web page with a dark navigation bar at the top containing links like 'French Tools', 'Homework: Translation', 'Practice Writing', 'Content', 'Les articles', 'Exercices: Verbes', 'MCQ Exercises', and 'MCQ Exercise'. Below the navigation bar, there is a breadcrumb trail: 'SJTU > French II > Exercices: Verbes'. The main content area has a title 'Le verbe' and a sub-header 'Le verbe être et les verbes en -er' with a small frog illustration. The page contains a 'Return to: Quiz Menu' link and a set of instructions for a fill-in-the-blank exercise. The exercise asks for the correct form of the verb 'être' in five different contexts, with a '?' button next to each blank for checking the answer.

Return to:  
[Quiz Menu](#)

*Le verbe être et les verbes en -er*

**Directions:** Fill in each blank with the correct possessive adjective. After you fill in a blank, click anywhere on the page to check your answer. All the incorrect letters will be erased leaving only the part of your answer which is correct. Click on the ? button to see the correct answer. (If you have typed in the correct answer, nothing will change.) In order to type in an answer, the cursor must be visible inside the blank. Use the *TAB* key or the mouse.  
[How to make accents on your computer](#)

*Ecrivez la forme correcte du verbe entre parenthèses.*

- Nous  étudiants. [être] ?
- Je  dans la classe de français. [être] ?
- Mireille et Marie-Laure  françaises. [être] ?
- Le musée du Louvre  à Paris. [être] ?
- On  français en Europe et en Afrique. [parler] ?

Figure 5: content from existing web sites embedded in PLE using an iframe

For the experiments at the SJTU test-bed, a PLE based on the portal Liferay<sup>9</sup> was applied. Liferay is an open source portal system that enables the creation of groups, group-specific pages, and the population of pages with widgets. In the SJTU setting groups for each class (French I, French II, computer science) as well as user accounts for each student in class and for each teacher were created. The teachers then added a number of pages for each of their lectures. For instance for French I, the pages *Tools* (a number of tools helpful for translation and speaking practice tasks) and *Grammar* (a

<sup>9</sup> <http://www.liferay.com/>

grammar book that was collaboratively created during class) were created and extended with a large number of exercise pages that contained multiple choice exercises for testing several aspects of the French language.

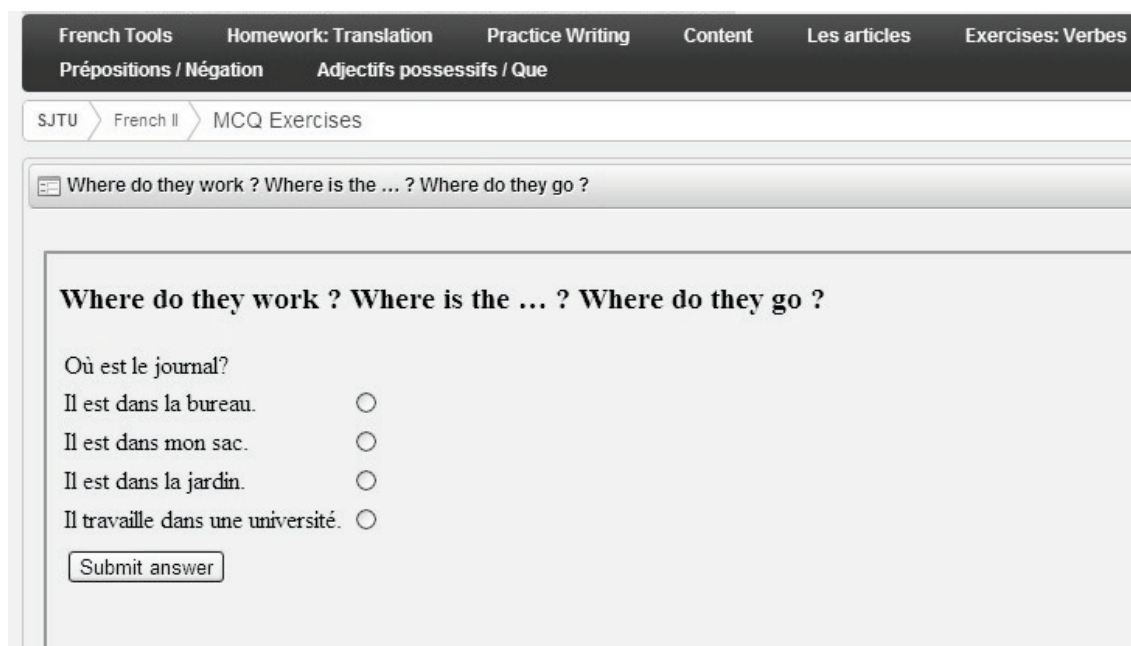


Figure 6: embedded multiple choice exercise based on QTI player

The PLE included the following widgets: An online translation, a spell checker, a text-to-speech engine, a business dictionary, a conjugation tool, a recording tool and an online collaborative editor<sup>10</sup>. It also included exercises from existing language learning web sites, which were embedded using iframes (see Figure 5), and multiple choice exercise based on a QTI player<sup>11</sup> (see Figure 6).

#### 4.3 Development of a second ROLE prototype for SJTU

After the development of the first ROLE demonstrator (see chapter 3) and a first usage of ROLE widgets at the SJTU test-bed, the next version of an open learning environment with widget technology is currently being developed. The technology and widgets developed in ROLE for this prototype are not specifically developed for Liferay. Instead, ROLE technology is based on the OpenSocial<sup>12</sup> standard and can thus be integrated in all systems (containers) that support OpenSocial (which includes Liferay, but also iGoogle<sup>13</sup> and other systems). For the new version, the widgets embedded in Liferay are extended with OpenApp<sup>14</sup>. This allows the recording of how students interact with the tools. One difficulty is that the PLE reuses a significant amount of existing widgets that are not under the control of the partners. For instance, the text-to-speech widget was developed by a third-party company outside the ROLE consortium and is embedded using the HTML iframe tag. To be able to reuse existing

<sup>10</sup> <http://etherpad.org/>

<sup>11</sup> <http://code.google.com/p/qti-player/>

<sup>12</sup> <http://code.google.com/apis/opensocial/>

<sup>13</sup> <http://www.google.com/ig>

<sup>14</sup> <http://code.google.com/p/open-app/>

widgets is a significant precondition for a flexible system. However, the reused widgets do not necessarily support OpenApp (a rather new standard) at this time, meaning that if we wanted to capture students' interactions with the widgets we would have to extend them. JavaScript security restrictions do not allow access of content embedded in an iframe if the content is loaded from a different server. In consequence we cannot modify the widget itself but have to include a wrapper that sends out OpenApp events whenever the mouse pointer is entering or leaving the widget. No other information is available. Nevertheless, this data provide input to the recommendation services as they are being realised for the new version. Three recommendation services are implemented: first, a pattern repository that captures interaction data through the OpenApp mechanism and provides a simple statistic about the usage data of the current Liferay page (list of widgets plus one or two simple metrics); second, a content recommendation tool that gathers resources relevant to a user search query (e.g. tour de France, French culture) from different sources; third, a recommendation system for self-regulated learning activities.

At the time of writing, the evaluation of the new SJTU prototype is still ongoing. For the earlier versions, an analysis of the log-files of the PLE server allowed us to gain quantitative data about students' usage of the PLE. While the PLE was introduced and used in class, the students were expected and encouraged to also use it outside of the class. The student accounts were automatically created using the list of students enrolled in each tier. An analysis of the PLE logging data shows that for *S1* and *S2* 49 students logged in at least once which is about half of the 106 students who took the exam in *S2* (recall that this number includes the *S1* students). For *S3*, 38 students logged in at least once. While these numbers appear rather low, they are comparable to the amount of students who handed in homework in other courses. Furthermore, it is very likely that the uptake rate of the PLE is mainly due to how the PLE was introduced in class. For the students it is not sufficient to present a single example of how to use the PLE in class. In itself, this will not enable and motivate students sufficiently to work with the provided tools. In particular, students need to understand how the tasks and services work which can help them to achieve their goals. Each PLE usage needs to be broken down into individual steps. The revised PLE usage is currently being evaluated and while concrete numbers are not yet available, verbal feedback from students indicated that the measure described above significantly increased the perceived value of the PLE. In particular, students asked whether and how they could continue accessing the PLE after the end of the term.

To take stock: the prototypes implemented for training at SJTU serve as an institutional proof of concepts for ROLE. They show how ROLE widgets or – in the future – even entire ROLES can be implemented into an existing learning environment.

## **5 Conclusion: From LMSs to ROLES**

A responsive open learning environment (ROLE) represents a personalised digital learning environment composed of individually chosen services and contents. By addressing the needs of the learner, a ROLE is able to foster advanced learning support like reflection-based learning or constructivism if embedded in respective learning

scenarios. Furthermore, due to the concept of service and content composition, ROLES are transferable among learning scenarios and may range from course to course within one organisation to changing organisations and even spare time-driven and lifelong learning.

In order to demonstrate the feasibility of the ROLE approach, the paper gives a technical proof of concept for ROLES composed of interoperable widgets for language learning. In addition, an institutional proof of concept is given: by employing the ROLE approach within the large Chinese university Shanghai Jiao Tong University, its institutional applicability and acceptance is shown.

The scenarios given in this paper quite clearly show that ROLES will be successful only if they support organisations in their transition phase from today's LMS to future personalised learning environments and ROLES. The ROLE approach consequently takes this challenge up by addressing the needs of organisations (either employer or certifying organisations) and learners (students, employees, etc.) uniformly within the respective organisational LMS and beyond.

The development of the ROLE approach is the core focus of the ROLE project, supported by the European Union within the 7th framework programme. Until 2013, the project will test different notions of ROLES in various scenarios related to lifelong learning, focusing on transition phases among universities, from university to job, and from job to job. A wide range of participating organisations provide test-beds, from RWTH Aachen<sup>15</sup>, the Open University UK<sup>16</sup>, the Festo Lernzentrum<sup>17</sup> to the British Institute for Learning Development<sup>18</sup> and the aforementioned Shanghai Jiao Tong University<sup>19</sup>.

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<sup>15</sup> <http://www.rwth-aachen.de/>

<sup>16</sup> <http://www.open.ac.uk/>

<sup>17</sup> <http://www.festo-lernzentrum.de/>

<sup>18</sup> <http://www.thebild.org/>

<sup>19</sup> <http://en.sjtu.edu.cn/english/index/>

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