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ELLIPS: providing web-based language learning for Higher Education in the Netherlands

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Abstract

This paper presents the overall considerations and pedagogical approach which were at the basis of the development of an innovative web-based CALL application, Ellips (Electronic Language Learning Interactive Practising System). It describes the program's most salient features, illustrating in particular the technical challenges involved in the realization of this multilingual, server-hosted, database-supported language-learning application. Ellips, the product of a cooperative project between four Dutch universities, offers effective web-based support for language learning in Higher Education (HE) institutions. Ellips focuses particularly on grammar training, listening and pronunciation skills; although it can be accessed on its own, it has been created with integration with virtual learning environments (VLEs) like Blackboard and WebCT in mind. As a matter of fact, Ellips offers functionality lacking in these systems, which have not been specifically developed for language learning and offer more assessment than practising opportunities. Moreover, in Ellips all learning materials are coded with language-specific metadata (mainly based on descriptors derived from the Common European Framework), so that developers can easily find and reuse materials and so-called 'semi-adaptivity' is allowed (students automatically receive more exercises on the topics which they have not yet mastered). Other important features of Ellips are full Unicode support, extensive feedback (for every item in an exercise and for the whole exercise), a student-tracking system, the use of (streaming) audio and video, and the possibility to record student input and store it in a portfolio.

1 Introduction

The language departments at Dutch universities, particularly the so-called general universities, are facing a number of problems, to which the answers have yet to be found. Virtually any language can be studied in the Netherlands, in most cases in more than one

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university, but there is a continuous decline in the number of students interested in becoming language specialists studying a language at traditional, philology-oriented departments. One of the major differences with the UK and other European countries is that university language centres and self-access centres catering to the needs of individual language learners have not really caught on in general universities (in technical universities, e.g. Delft, the situation is different) and that foreign languages are not a compulsory subject for students at general universities. Due to the decreasing number of students, staff has also been reduced, and this means that materials development will more and more need to be done in cooperation with colleagues at other universities. Fortunately, this cooperation and exchange of language materials has been facilitated by the adoption of the Common European Framework of Reference for Languages (CEF, http://www.culture2.coe.int/portfolio/documents_intro/common_framework.html). The CEF, developed by the Council of Europe, is increasingly used as a reference framework for language learning in secondary and tertiary education in the Netherlands. In 2001 all Faculties of Arts and Humanities agreed to adopt the CEF for defining the target levels for language learning.

Another innovation which universities are embracing is the use of virtual learning environments (VLEs), especially Blackboard and WebCT. The thrust for innovation here comes mainly from the central university offices and Faculties of Arts and Humanities have to consider how they can make the technology work for them. This top-down approach may not always be compatible with earlier, bottom-up CALL initiatives.

One of these is the *Hologram* project. *Hologram* (Jager, 1998), a LAN-based Toolbook application, was originally created by the University of Groningen, further developed in cooperation with Leiden University and the University of Nijmegen and is currently used at Tilburg University and Utrecht University as well. *Hologram* is the most widely used CALL application at university level in the Netherlands; in the past seven years, *Hologram* materials in twelve different languages have been developed to be used by about 1000 undergraduate students at different universities every year.

Students results can be tracked in the *Hologram* database in great detail; for instance, teachers can see for each exercise what percentage of students have chosen the right or wrong answers, or which unforeseen answers have been entered in fill-in-the-gap exercises. Moreover, a semi-adaptive exercise selection mechanism has been implemented: all exercises have been coded according to the language topic they deal with, so that students will automatically receive more exercises on topics not yet mastered. These two features, together with extensive and context-sensitive feedback (including the possibility to consult an online reference grammar in hypertext form), make this program perfectly suited for self-study. The *Hologram* CALL materials have been positively evaluated by students over the years and are a compulsory part of the language curriculum in many departments. Another aspect worth mentioning is the fact that modules produced are exchanged on a regular basis and made available for use at each of the participating universities.

Hologram is a sophisticated tool, but it also has major disadvantages. First of all, it is an outdated 16-bit application, originally developed for Windows 3.x; it works under Windows XP, but will probably not run on the next Windows version. Second, it is not web-based, which makes it difficult to integrate it in the web-based VLEs currently promoted in Dutch universities. Third, it is not Unicode-compatible: it is virtually impossible to use *Hologram* with a non-Western keyboard. Fourth, it has limited multimedia

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support (only a few audio and video formats can be played) and this hinders future integration with digital language laboratories. Fifth, it supports only four exercise templates (fill-in, multiple choice, multiple correct and drag-and-drop). And, last but not least, the re-use of language learning materials has proved to be difficult because exercises and reference pages were not coded according to a standard system but on the basis of individual developers' descriptions.

Although *Hologram* still offers adequate support to language learning, there was a growing need for a new application. When we started developing this new application, we took into account two aspects mentioned earlier. First of all, there is a distinct need for collaboration among Dutch universities, not only to counteract the high cost of producing ICT-supported language learning materials, but also to foster innovation through the exchange of ideas and information. Second, there is a tradition of ICT in language learning, which must be considered, when introducing new technologies such as VLEs.

2 The Digitalenklas project

To deal with the issues raised above, in October 2001 four Dutch universities (Utrecht University, University of Groningen, Tilburg University, Leiden University) started working together in a two-year project, Digitalenklas. Digitalenklas ("Digital Language Classroom"), with a pun on *digitaal* ("digital") and *taal* ("language") aimed at furthering the use of computers in language learning at HE level. The major objectives were a redesign of language curricula, with particular attention to the ways in which multimedia web-based applications could support the language learning process, and the development of a specific web-based CALL application, *Ellips*, to be used in conjunction with VLEs such as Blackboard and WebCT. *Ellips* focuses particularly on grammar training, listening and pronunciation skills. During the project language learning materials for four languages (English, Spanish, Dutch and Arabic) have been developed and tested with students, both in the VLEs and in *Ellips*. A commercial partner was responsible for the *Ellips* software development.

Although VLEs have now been adopted by all HE institutions in the Netherlands, they are not yet widely used for language learning purposes. Very few language teachers have created courses with VLEs, because they do not have the technological or pedagogical expertise, or simply because they do not have enough time to implement changes in the curriculum. At present, most VLEs courses developed to support language learning only contain information about the course organization (calendar, announcements, requirements, learning objectives, etc..) and general resources (like collections of links, grammatical explanations, word lists and other information that was previously only offered in readers). VLEs are hardly ever used to deliver tasks or assignments, to communicate with the teacher or with other students as part of a language learning task or for self-diagnostic grammar or vocabulary tests.

Most VLE- based language courses are thus instances of the Content + Support Model defined by Mason (1998). This model is based on the distinction between course content and tutorial support and is characterized by "relatively unchanging content materials which can be tutored by other teachers than the content authors. Rudimentary amounts of collaborative activity amongst students, peer commenting and online assessments". The two other models described by Mason, the Wrap Around Model and the Integrated

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Model, are characterized by a larger amount of time being spent on online interaction and discussion and give more freedom and responsibility to the students. The Integrated Model, in particular, is the most innovative and the opposite of the Content + Support one; the course is constructed around participating in discussions, carrying out group and individual assignments, processing information and the course contents are "largely determined by the individual and group activity". Britain and Liber (1999: 10) notice that the Integrated Model "implies that both staff and students are prepared to adopt an educational approach that is inherently more pro-active from the students perspective and that is in turn less pre-structured and more responsive to students requirements from the teachers perspective". Such a model, which is the most adequate to fully accommodate language learning autonomy issues (Little, 1991), is quite difficult to implement in VLEs. From a functional point of view, VLEs like Blackboard and WebCT are better described as VTEs, virtual teaching environments. They are more teacher centred than learner oriented and students have limited possibilities to create personal learning paths or to add contents to the course (Godwin-Jones, 2003). On the other hand, these systems also offer functions that can be implemented effectively for language learning purposes. In particular, the asynchronous and synchronous communication tools (e-mail, discussion boards, chatting) that make it possible to exchange documents and ideas, are most suited to support a task-based pedagogy and collaborative activities.

Another point, more closely related to language learning pedagogy, is that VLEs were not originally developed for language learning purposes and are not conceptually based on a CALL methodological framework (Hubbard, 1992; 1996), on considerations about didactic functions (Colpaert & Decoo, 1999), feedback use (Bangs, 2003), CALL interface design (Hémard & Cushion, 1999) or on recent SLA insights (Levy, 1997, Chapelle, 2001). From a more technical perspective, Arneil and Holmes (2003: p. 63) point out that VLEs offer more assessment than practising possibilities, due to their server hosted architecture.

Against this background, the Digitalenklas project started. One of the first tasks was to determine in which ways web-based applications could offer true "added value" to the learning activities, taking into account both methodological principles (Chapelle 2001; Corda & Westhoff, 2000) and practical constraints (learning setting, learning materials developers' time, computer availability, etc.). Then a distinction was made between course elements that could be supported by VLEs effectively and those for which a specific CALL application would be needed. VLEs were found to be more suitable for open tasks that need feedback from peers or from the teachers. This was implemented in several courses. At Tilburg University, for instance, constructivist, collaborative tasks based on the WebQuest model (Dodge, 1995; Koenraad & Westhoff, 2003) were developed for use in Blackboard. For the evaluation of the tasks the criteria outlined in Chapelle (2001: 55, 68) were applied. For closed tasks, a dedicated CALL application was considered more useful. To this end, *Ellips* has been constructed. It complements VLEs by offering support for closed tasks, in which students automatically get feedback, and for pronunciation exercises in which students record their voice and upload the audio file to their personal portfolio for reviewing by the teacher. Templates for multiple choice, multiple correct, pick and click, fill-in and transcript exercises are also available, in addition to content pages in which background information can be presented. Exercises and content pages are coded with metadata based on

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descriptors from the CEF. The metadata are essential to allow re-usability of the learning materials and to make the adaptive mechanism for additional exercises work. Another very important element in the project is that the existing *Hologram* learning materials can be imported into *Ellips*, so that they can be re-used in a web-based environment and material developers do not have to enter all the data again. Figure 1 shows the student environment.

The left frame is used for navigation through the course, the right frame displays information (e.g. grammar explanations) and links to exercises, which are presented in sets (randomized or in a sequential order). Figure 2 shows an Arabic fill-in exercise after checking the answer.

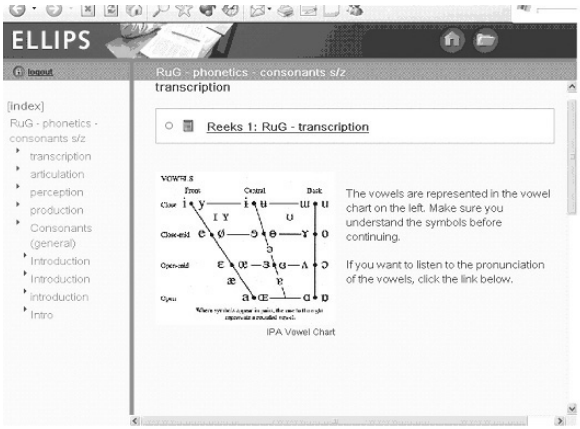


Fig. 1. The *Ellips* student environment.



Fig. 2. An *Ellips* fill-in exercise after checking the answer.

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The instructions are displayed at the top of the screen, together with an audio file. In the middle a gapped sentence in Roman script is presented (the gaps have been filled). The missing words can be typed in a frame at the bottom that automatically disappears after the answers have been checked. The two bars at the bottom right of the screen indicate the exercise score and the score on the set that this exercise belongs to. After filling in the gaps, students press the check button next to the score bars, after which the right answer appears (in this case the exercise score is 100%). After completing a set of exercises, students can compare their results with the results of the whole group. In the next paragraphs we will illustrate in more detail the most innovative aspects of *Ellips*: the use of metadata, the Unicode support and the audio and video support.

3 Towards a learning content management system for language learning

The introduction of VLEs as an instrument in delivering online course materials has stirred the debate about the re-usability of these materials. Although it is not primarily the interest of teachers putting their materials online, re-usability of such materials may be an important strategic consideration for organizations bringing teaching and learning online.

Producing high-quality online content is usually quite expensive. It normally involves freeing up institutional resources, such as teacher time and support, for an extended period of time. To secure the investments made, the content format should not be specific to one particular VLE. To be economically viable the materials should be available on a range of systems. This will not only reduce the dependency on a particular VLE vendor, but it will also make it easier to repurpose existing materials for specific target groups inside and outside the institutions.

Thus, standardization of learning materials has become an important issue in education, particularly in corporate and military education. Major efforts in this area are undertaken by the IMS Global Learning Consortium. IMS works closely with several other organizations involved in standardization (http://www.imsglobal.org/collaboration.cfm) to build on existing specifications and define new specifications collectively. One of the outcomes of this joint effort is the IMS Learning Resource Metadata Specification (http://www.imsglobal.org/metadata/index.cfm).

Metadata are also extensively used in Learning Content Management Systems (LCMSs), which are online repositories of learning materials, which can also be linked to VLEs. In Dutch HE institutions, LCMSs are currently used and tested in different pilot projects, aimed at finding out under which constraints and educational settings these applications can achieve qualitative or financial improvements. Using a LCMS requires a precise definition of the learning objects used in a particular learning situation: they may be course materials, PowerPoint presentations, but also whole courses or digital pictures, audio or video files. Learning objects need to be systematically coded with a coherent set of metadata, to allow findability and re-usability.

Although the concept of re-usability of language learning materials in *Ellips* is different from the perspective described above (we wanted teachers to be able to re-use the materials within one particular application), the IMS Learning Resource Metadata Specification (v 1.2.1 final draft) was adopted for this particular purpose.

In *Ellips*, learning objects are content pages and exercises. Both are coded with metadata. Digital assets (pictures, audio and video files) are not considered learning objects

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and are not coded with metadata. These files (or links to the files) can be uploaded to the Media Resource Centre and shared with other users. Since different HE institutions are considering the adoptions of LCMSs and Digital Asset Management Systems (DAMSs), it may be better to store these assets in separate repositories and then link them to the Resource Centre.

For the metadata used in *Ellips* we were fortunate enough to build on the implementation provided by the Language Centre of the University of Ghent (particularly the work of Valère Meus, former director of the Centre) during the Lingua-funded Welcome project (http://www.taalnet.rug.ac.be/Description_of_Welcome.pdf). Since our aim was not to achieve full interoperability or exchange of materials with other systems (at least not at this stage), we decided on using a subset of the descriptors available in LRMS 1.2.1 to identify exercises and content pages for the two main uses required:

1. a description that would allow users to retrieve exercises and content pages from the online database for re-use in other learning contexts;
2. an adaptive system which would allow *Ellips* to offer new exercises on areas not yet mastered by the student.

Apart from the obvious fields such as "identifier", "title", "language", "status", "date", "role" (= author by default) and "entity" (= the author's name by default), we make use of the "taxonpath" descriptor to establish the link with the CEF. Following the division originally proposed by the University of Ghent, we distinguish between three different taxonomies for each of the relevant CEF descriptors, Activity, Competences and Topics. The top level attributes of each of the descriptors are presented in Table 1.

Each exercise and content page from *Ellips* can include metadata from any of the sets from Table 1. Each exercise or content page can thus be marked for the language learning activity involved (basically the skill taught or acquired), the competences that come into play (this includes the traditional areas of grammar and vocabulary) and the topic dealt with. Exercises or content pages can be zero, one, or more than one entries in each category (although for the system to work no metadata or too much metadata will obviously be counterproductive). It should be noted that the actual range of choices is more extensive than shown here. Moreover, teachers may add specific keywords, not included in the CEF descriptors. The metadata are added using a metadata-editor which provides collapsible indexes for each of the taxonomies defined, allowing the teacher to add metadata as required.

Coding all exercises with metadata is very time consuming and teachers are more willing to invest time in producing exercises and developing context-sensitive feedback than in inserting metadata. To reduce the coding activities to a minimum, within *Ellips* it is possible to copy exercises with their metadata. Since teachers usually create more exercises about the same topic, so that enough alternative materials can be offered to the students by the semi-adaptive system, this feature also speeds up the material development.

The semi-adaptivity mechanism builds on these metadata as follows. A separate tab in the authoring interface allows the teacher to define "keys". These are effectively queries from the exercise database which can be composed using the metadata-editor mentioned above. If the database contains an exercise using the following taxonomies to describe that it is a listening exercise, dealing with specific vocabulary on traffic and transport:

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Table 1. *Metadata taxonomy*

1. Activity	2. Competences	3. Topics
1.1. Production	2.1. General competences	3.1. Arts
1.1.1. Speaking	2.1.1. Knowledge	3.2. Business & Economy
1.1.1.1. Spoken Production	2.1.1.1. Background Knowledge	3.3. Computers & Internet
1.1.1.2. Spoken Interaction	2.1.1.2 Socio-cultural knowledge	3.4. Education
1.1.2. Writing	2.1.1.3. Intercultural awareness	3.5. Politics & Government
1.2. Reception	2.1.2. Know-how	3.6. Health
1.2.1. Listening	2.1.2.1. Intercultural skills	3.7. Law and Justice
1.2.2. Reading	2.1.3. Existential competence	3.8. News and Media
1.2.3. Audio-visual Reception	2.1.4. Ability to learn	3.9. Recreation and Sports
1.3. Mediation	2.1.4.1. Study Skills	3.10. Regional
1.3.1. Oral Mediation	2.1.4.2. Strategies	3.11. Sciences
1.3.2. Written Mediation	2.1.4.2.1. Communication Strat	3.12. Society
	2.1.4.2.2. Cognitive Strategies	3.13. Nature and Environment
	2.2. Communicative competences	
	2.2.1. Linguistic competence	
	2.2.1.1. Vocabulary	
	2.2.1.2. Grammar	
	2.2.1.3. Semantics	
	2.2.1.4. Phonology	
	2.2.1.5. Spelling	
	2.2.2. Sociolinguistic competence	
	2.2.2.1. Register	
	2.2.2.2. Variants of the standard lang	
	2.2.2.3. Politeness conventions	
	2.2.3. Pragmatic competence	
	2.2.3.1. Discourse competence	
	2.2.3.2. Micro Functions	
	2.2.3.3. Macro Functions	

```
taxonpath - Activities - Reception - Listening - Announcements
taxonpath - Communicative language competences - Linguistic competences
- Vocabulary - Words - Topics - Traffic and transport
taxonpath - Topic - Business & Economy
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it will be retrieved by a key such as the following:

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taxonpath - Activities – Reception
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or

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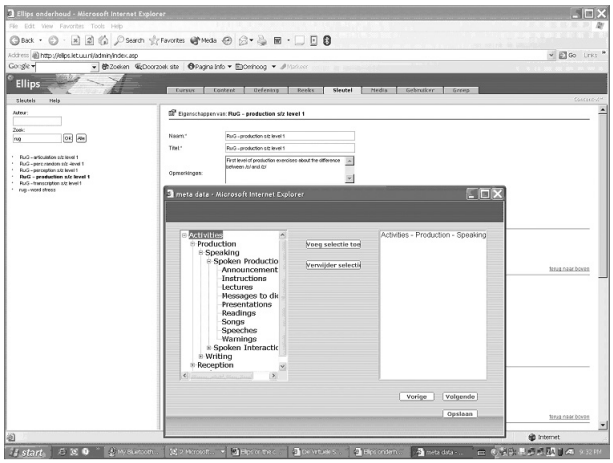


Fig. 3. The *Ellips* authoring environment showing the metadata-editor.

```
taxonpath - Topic - Business & Economy
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or a combination of these. Exercises satisfying the criteria of a particular key are shown at the bottom of the screen, thereby allowing the author to refine or broaden the search as required. After the selection of exercises on the basis of the key definition is complete, keys may be used to define sets of exercises to be offered to students. Alternatively, sets may be composed by selecting each exercise to be offered individually.

4 Unicode

In *Ellips* Arabic language materials needed to be developed in which students could enter both the Arabic characters and their Roman transcriptions; also, students of English were required to learn and use the International Phonetic Alphabet (IPA) alphabet. This was only possible if *Ellips* could offer Unicode support throughout. This feature is missing in most web-based CALL authoring tools currently in use; partially because they were developed before the implementation of Unicode standards and partially because they are usually created primarily for English or for Western languages and only support Roman scripts. The lack of Unicode support makes these applications vulnerable to future developments: some characters may for instance not display properly in more recent browser versions (Henry & Zerwekh, 2002). Thanks to Unicode, which has introduced a generally accepted standard, PCs can now support a variety of languages – provided that the applications installed and the operating system are Unicode-compatible (for instance, Windows 2000 is Unicode-compatible, but not in every detail; Windows XP is fully Unicode-compatible, as is the Mac OS X) and that different Unicode fonts have been installed. Times New Roman, for example, is an excellent font for Arabic, Hebrew or Latin script, but it does not contain all of the necessary transcription symbols. A better solution is Arial Unicode MS, because this font can produce all necessary symbols for Arabic script as well as for IPA and transcriptions.

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To be able to use the potential of a Unicode font to its full extent, an external application, a so-called keyboard-mapper, is needed. In *Ellips*, Tavultesoft Keyman (www.tavultesoft.com, version 6.0) has been chosen for this purpose. Keyman sup-ports Unicode input comprehensively and can combine so-called dead keys with the character required and thus produce letters like ḥ ṣ ṭ ġ ẓ. To allow developers and students to type Arabic characters and Roman transcriptions in *Ellips*, a special keyboard has been developed with Tavultesoft Keyman Developer. Once installed, Keyman puts an icon in the system tray. Left-clicking on the icon brings up a small window where a specific keyboard can be selected. Although students need specific instruction to learn working with Keyman, this system allows them not only to make exercises in *Ellips*, but also to enter transcriptions in Word and other Office applications. In the future we hope to create *Ellips* exercises for other non-Roman languages; in our vision, Unicode compatibility is a key issue in the future development of CALL applications, so that a greater number of languages can be supported.

5 Audio and video

Although audio and video applications, including streaming audio and video, abound on the Internet, actually getting audio and video to work in the project turned out to be more difficult than anticipated. For the provision of high-quality streaming audio and video we resorted to SURFNet, the HE network services provider for the Netherlands. This would allow us to make use of their ultrafast backbone, as well as SURFNet Video Portal, a dedicated service for streaming audio and video (http://video.surfnet.nl). SVP supports MPEG-1, MPEG-2 and MPEG-4 formats and uses Dublin Core metadata for audio and video assets. An online transcoding service is available for conversion of audio and video to the desired output formats. Assets can be assigned to collections for particular user or interest groups. Finally, a search engine allows users to track down assets that might be of particular interest to them.

One SVP component, the "Virtual Cutter", is particularly relevant for our purposes. The Virtual Cutter can be used to make an excerpt of any audio and video file from the SVP repository (or any other streaming file in one of the file formats supported) and generates the HTML code needed to play that excerpt on a webpage, either as an embedded player or as URL. This makes the Virtual Cutter excellently suited for incorporating shorter sections of a larger audio or video file in feedback texts or other contexts where a recap of some of the information is essential.

Apart from having to deal with some of the teething troubles of this newly released service, the main challenge of using the system is in deciding on an output format that works best with the different technological infrastructures in each of the participating institutions and with students at home, although the latter has had low priority in our project so far. For playing streaming MPEG-1 and MPEG-2 audio and video, the Kasenna media player is required, a player which is not as widely used as Microsoft Media Player, RealOne Player or Quicktime. The player is slightly more particular about firewall settings and streaming protocols than the other players and expert staff were needed to get it to work in the participating institutions.

Another challenge was the integration of a virtual language lab recorder in *Ellips*. We needed a device for recording speech, particularly pronunciation, in such a way that the

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recordings could be reviewed by teachers or peers. At the start of the project, it was decided that rather than programming such a device from scratch, we would try to integrate existing applications. We turned to two major vendors of such programs, Artec in Belgium and Divace in Finland for advice. They kindly offered advice on how to best move forward in implementing the application, but we have not been entirely successful in adapting the recorders to our particular needs. Our list of functional specifications included the following requirements:

- To allow students to save their recordings on our webserver.
- To allow the virtual recorder to be embedded in our main application *Ellips*.
- To use the streaming file formats available on SVP.

Each of these turned out to be beyond the current state-of-the art of the main players in the field. So in the end we decided on a less ambitious implementation: we have now integrated an off-the-shelf recorder (Divace Solo, but it could be any recorder provided it can play files from the web) as follows: exercises in which students are required to speak are based on a specific template. When designing the exercise, a teacher can indicate whether the recording should be saved online. If the recording is stored online it is saved to the student portfolio, where the teacher has access to it; if it is not saved online, students can listen to a model as in many traditional speak-and-repeat exercises. The actual method of storing the file is a two-step process: students first save the file locally and then use an upload button to put it on the server.

6 Conclusion

Designing a language learning program is one thing, making sure that the program continues to be used and is maintained after the project finishes is another. The participants in Digitalenklas were keenly aware of this problem when they started the project and decided to establish a Consortium to consolidate, expand and disseminate the project results upon completion of the project. After paying an annual fee, Dutch HE institutions get access to the *Ellips* server. This allows them to use any of the materials developed previously (including materials originally designed for *Hologram*), adapt them to their own needs if necessary and develop new materials that other institutions can also use. At this stage it is impossible to predict the extent and pace with which the exchange of materials will develop but building on our experience with the former *Hologram* project where a similar exchange was arranged by means of regular distribution of materials on CD-ROM, we are hopeful that the system will catch on among HE institutions in the Netherlands. Needless to say that the CEF-based metadata will become increasingly important as the amount of materials increases.

Of course, there is no need to restrict the use of *Ellips* to Dutch HE if institutions outside the Netherlands want to use it. Although this requires a number of modifications to the program (most notably in the interface of the authoring module, which is now in Dutch), *Ellips* would be perfectly suited for use in transnational projects founded on a similar rationale. Provided suitable funding could be found, this would open up new opportunities for collaboration between institutions across Europe and allow for additional functionality to be added to the program. Although perhaps slightly less ambitious

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than similar projects proposed in the past (Delcloque, 2001), it might herald a new era in which many institutions would be developing language learning materials together instead of re-inventing the wheel time and time again.

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