



HyperValu@tor, a tool for the multidisciplinary assessment of didactic hypermedia

Paola Plantamura, Teresa Roselli and Veronica Rossano

Department of Computer Science – University of Bari – Italy

{pplantamura, roselli, rossano}@di.uniba.it

Abstract

The rapid spread of hypermedia has led to a proliferation of didactic software available on the market, but it is getting more and more difficult to choose the right product. To meet the teacher's need to acquire methodologies and tools supporting her/his new function of critical evaluator of didactic SW, we have created HyperValu@tor, a tool for the multidisciplinary assessment of didactic hypermedia.

HyperValu@tor takes into account the main quality indicators guaranteeing overall teaching efficacy (content, multimediality, interactivity, navigability, style). Using the questionnaire supplied, the teacher/evaluator assigns a score (from 0 to 2) to a series of questions probing these quality indicators. All the indicators need to be considered in order to achieve an overall assessment, but if only some aspects of a hypermedia need to be judged, the single indicators can be assessed separately with HyperValu@tor.

This dynamic navigation, offering the possibility to choose which indicators to evaluate, is one of the strong points of HyperValu@tor. But its most salient feature is that it allows teachers/evaluators to set up collaborative activities through the Web. Unlike other tools in the field, with HyperValu@tor it is possible to make a public evaluation, whereby several users can collaborate to achieve an assessment of the same product.

1. The assessment of didactic software

As always happens when a new frontier is opened to research and business activities, the market for didactic software has been rapidly invaded by a heterogeneous multitude of products, that include not only many works with a coherent design but also some haphazardly made up products and even recycled ones.

Moreover, the ever more frequent and widespread navigation of the Web has generated in many users a certain familiarity with hypermedia.

In some cases, this is more apparent than real, being confined only to the multimedial or interactive aspects of hypermedia rather than to the entire product. In the case of didactic hypermedia, this apparent familiarity can weaken users' critical sense, inducing them to adopt hypermedia that, although they appear excellent at first sight, are in fact lacking in those features that determine their teaching efficacy.

These considerations have led us to pose two questions:

- how can users best be guided through the manifold, complex world of didactic software?
- How can teachers make efficacious technological choices on the basis of their own disciplinary and pedagogical skills?

These are essential, urgent questions that have implications on the entire educational world but above all on the responsibility of those whose mission it is to transmit knowledge.

The centrality of teachers to the educational process must be acknowledged and re-affirmed, even in the era of the personal computer and on-line education. It is clear that teachers are able to evaluate a manual, and to choose the traditional text book best suited to their specific needs. It cannot be taken equally for granted that they will be able to judge didactic software in absence of a well-founded, consolidated knowledge and experience of these media.

The aspects that differentiate traditional teaching from electronic teaching are the digital format, the multimedial and interactive features, all elements that change the form of expression, the organization and the editorial structure of the product. Instead, the relevance of the user context remains valid in both cases, because the quality of a didactic software, cannot be divorced from the peculiar needs and context in which the teaching process operates (Ligorio, 2001)

It is therefore necessary for teachers to develop a proper evaluation covering many different aspects, in order to be able to distinguish and select the most suitable working environment for their purpose (Trentin, 2001). Thus, besides the definition of requirements and quality standards (Cir. Min. n. 282/97), research must also be carried out aiming at providing teachers with methodologies and tools supporting this specific — and new — function of critical evaluator of didactic software.

2. Evaluation methods

Various institutions have taken on the task of supplying concrete answers to the demand for guidance in the complex field of the new technologies, made by members of the educational world.

In Italy, the first works in this sector date back to the 1970-'80s, when a lively debate developed around the issue of the «evaluation of medial teaching communication», in which L. Galliani analyzed the relationship between linguistic-medial elements and learning (Costa, 2002).

Pellerey (1984) also focused on the criteria of effectiveness and efficaciousness as significant parameters for judging quality aspects. An evaluation scheme was drawn up, based on the «description of the software» (title, author, producer...) and a «summary evaluation» (aims, prerequisites, content development...).

In the '90s, the problem has been faced more explicitly, with the intervention by government institutions regulating the Italian school system. Ministerial decrees were issued, based on the research activities carried out in the '80s, such as the C.M. n. 908 of 23 December 1997, addressed to teachers (Cir. Min. n. 908/97). At local level, the initiative undertaken by the Emilia Romagna region should also be mentioned, which instructed the Regional Commission for the Certification of teaching materials and services for Distance Learning — Cerfad — to issue certificates for electronic teaching materials produced in this field. The Commission published a «Guide to the quality criteria for certifying teaching materials for Distance Learning» (1996) and a «Guide to quality services supplying and supporting distance learning» (1999-2000) (Cerfad).

Nowadays, a qualified point of reference for the evaluation of teaching software is the National Institute for the Documentation of Educational Research and Innovation, which has activated a project (INDIRE, 2001) for issuing certificates for didactic software using a grid, developed with the aid of the MIUR (Italian Ministry for Research and University Education) and the collaboration of experts belonging to the Faculty of Educational Science of the Universities of Bologna and Florence. This evaluation probes the practical usability and didactic validity of the software and the motivation aroused in the learner, and terminates with an «overall judgment» justifying the score obtained.

3. The evaluation tool

The scientific activity outlined above was integrated by works carried out by various university research centers aiming at designing specific tools for simplifying and automating teachers' evaluations.

In particular, the Université de Technologie de Compiègne, in France, has created «Cepiah», a web-based system aiming at helping teacher to design hyper-

medial documents and evaluate the resulting prototypes (Trigano & Giacomini, 2004). The system consists of three modules but only the first two deal with evaluation.

The first module, named «aid to evaluation», proposes the examination of six quality indicators: general impressions, technical quality, usability, multimedial documents, scenario, teaching quality. The questionnaire has a hierarchical structure leading the teacher towards an ever more detailed analysis of the product. Supported by dynamic navigation features, this structure allows the user to discard a criterion, with all its associated sub-levels, or any question considered non pertinent. Moreover, the answer to each question is analyzed to see if it could affect other questions or criteria. This yields an evaluation that dynamically adapts to the user's behavior.

The second module acts as a kind of feedback after the evaluation. It provides useful advice for acting on critical elements and thus for improving the application.

Instead, the University of Joensuu (Finland) has set up «eValuator», using open source technology. This web-based tool can be used to support both the evaluation and the development of teaching applications.

For the evaluation, the tool is based on a simple questionnaire connected to a database. The user can examine a new teaching material, evaluate materials already inserted by other users, or search the database. In the first case the tool requires the insertion of identifying data on the material to be evaluated; in the second it proposes a series of options from which to make the evaluation, including the point of view (teacher or learner), thus personalizing the questionnaire.

A maximum of three quality indicators can be examined: pedagogical, technical, and practical usability. At the end of the evaluation, made by means of a multiple choice questionnaire generated according to the indications provided by the user, the system presents the conclusions, showing the strong and weak points of the software together with the results obtained in previous evaluations made by other users.

Another tool for evaluating didactic software is «Arvo», created by the University of Technology Tampere (Finland). This, again, is a web-based system aiming at helping the teacher to control the assessment process and to collect essential information. The quality indicators taken into account are: accessibility, quality of the data, usability, pedagogical usability. Each indicator opens out various criteria, and then specialized sub-criteria for the particular aspect being examined. The questionnaire is generated in a semi-intelligent way, in other words it takes into account of the choices made: for example, if the evaluator indicates the absence of a video or a piece of audio, all the criteria connected with this multimedial element are excluded from the final assessment. At the end of the evaluation, the tool presents a report containing the overall outline of the material, a summary of the strong points and some instructions on how to improve the quality of the product.

A review of the state of the art shows, therefore, that electronic assessment of didactic software is essentially an analytical judgment based on indicators which have been studied for the purposes of scoring different degrees of quality. This type of assessment is useful because it can improve personal evaluations, indicating the quality of the product being analyzed in graphic, and hence intuitive, form.

An overview of the different tools available shows some analogies but also significant differences. On one hand, all the tools described use a questionnaire to follow the user along an analytical evaluation pathway, based on questions concerning the quality indicators featured by the didactic hypermedia.

On the other hand, not all the tools present the questions in a semi-intelligent or dynamic way, discarding evaluation criteria considered to be superfluous on the basis of the preliminary answers supplied by the user.

Finally, only some of them allow public evaluation, in the sense of an examination of the software by more than one user, thus widening the number of evaluations and hence making the evaluation more objective and reliable.

4. HyperValu@tor: a multidisciplinary evaluation system for teachers

Our tool, HyperValu@tor, belongs to this specific context of tools created to automate the evaluation process of didactic hypermedia. The system is aimed primarily at teachers and at providing an easy-to-use application that can integrate their personal, generic judgments with an automated, analytical and objective assessment.

A formalized questionnaire is used to make the evaluation, guiding the teacher step-by-step towards a detailed examination of the hypermedia. To set up the questionnaire, the main quality indicators reported in the large body of Italian literature in recent years have been taken into account, and particular reference has been made to the studies by V.A. Baldassarre.

According to the literature, great care has been taken to avoid reducing the evaluation to a mere analysis of the descriptive product-centered elements, but rather to ensure that other aspects are considered, widely recognized as especially important, namely the learning methodology and the relational and interaction modes, that are the categories that principally determine the efficacy of the product.

An examination of the didactic software with HyperValu@tor, in terms of its efficacy and efficiency, helps to point out any critical points, gaps or inadequacies that might otherwise be neglected or underestimated.

Moreover, the system allows users to evaluate both hypermedia of their own choice (private projects) and those evaluated by other users (public projects). In the latter case the results of the evaluation become more reliable because the personal judgment is mediated by others.

Thanks to these features, HyperValu@tor can support teachers in their new function as critical evaluators, and enhance their role as producers of valuable input. In fact, on the basis of their teaching experience, teachers can point out the weak points of the hypermedial product, and these can then be dealt with in a subsequent modification or redesigning phase.

One of the strong points of HyperValu@tor is its ease of use, as emerged from the results of a preliminary usability test performed on the tool. This test, implemented using the SUMI (Software Usability Measurement Inventory) questionnaire developed by the Human Factors Research Group of the University of Cork (Ireland), was conducted with a small sample of teachers at the Department of Informatics of the University of Bari.

The questionnaire included 32 questions related to the product efficiency, user's satisfaction, easy-learning, friendly use of the fundamental commands without using the guide. The expressed evaluation has been calculated in terms of: YES (agreement), NO (disagreement), ? (uncertain).

In general, as far as the efficiency and the easiness of the product are concerned, the teachers pointed out an high usability degree. In particular, to the question «Would you recommend this software to your colleagues?» the 80% of the teachers answered «YES», the 20% showed uncertainty, nobody answered «NO».

The most important data are:

- most teachers judged the software easy to be used;
- an execution of the tasks with a low error occurrence has been detected;
- all teachers pointed out a good organization of the menù.

An high degree of usability, then, emerged so HV may be considered as a valid tool to support the teacher in his/her new function of evaluator.

4.1 Quality indicators and criteria

As stated above, the quality indicators and criteria used in HyperValu@tor are based on those drawn up by the research group of the Department of Pedagogical and Didactic Science of the University of Bari (Baldassarre & Arpino, 2004). These indicators have been selected and grouped into five macrocategories, individuated on the basis of a close analysis of those advocated in the literature.

The process of rationalization and simplification was undertaken to highlight the most important aspects contributing to evaluate the learning environment. These — as emerges also in the studies by R. Trincherò — regard the quality of the content in terms of structure (quality of the learning process), of coherence with the learning aims, which may also be explicitly declared (quality of the teaching process), and of the technological set-up (quality of the learning environment) (Benedetto & Trincherò, 2001).

This brings to the forefront the essential features a hypermedia to be used in the educational context must possess, of both informatics and didactic type (Ardito et al., 2004).

The categories adopted in HyperValu@tor are:

- *Multimediality* – assessing the availability and quality of the media and the context they are inserted in.
- *Interactivity* – assessing the interaction modes, as well as the quality and quantity of information supplied (including the relations among nodes exploiting different media).
- *Navigability* – assessing the validity of the tools (buttons, local maps, global maps, zooming) facilitating navigation in the hypermedia.
- *Content* – assessing the quality, complexity, completeness and coherence of the content.
- *Style* – assessing the graphic appearance.

4.2 Components and functions of HyperValu@tor

The HyperValu@tor system has been developed using open-source technology, the PHP language for creating the dynamic pages and the MySQL database for creating the database.

This makes the application easily usable through the Internet. The system is structured in the form of three macrocomponents:

- *user interface* – for communication between the tool and the user;
- *data collection* – responsible for collecting the data inserted with the user interface and storing them in the database;
- *data processing and presentation* – after processing the evaluation data inserted, the results on the quality of the material examined are visualized as a graph.

The tool allows registered users to assess a hypermedia from various different points of view, individuating its strong and weak points. The questions probe the quality of the material in terms of its efficacy and efficiency.

The functions available to the user are:

- *Creation of a new account* – a new account has to be created in order to access the system.
- *Creation of a new project* – this allows the insertion of the data on a hypermedia/project to be subjected to private or public analysis.
- *Choosing a public project* – used to select for analysis a project created by other users.
- *Evaluation of a project* – allows assessment of an indicator regarding the project (public or private) being analyzed. At the end of the assessment, the mean score obtained in the evaluation of the selected criteria is displayed.

- *Administration of projects* – this enables management of all the aspects related to the projects and evaluations, such as evaluation of the indicators that have not yet been considered, modification of previous evaluations of an indicator or elimination of a project.
- *Administration of evaluations* – this displays the state of the assessments made up to that moment, giving an overall picture. The data can then be modified, both during the course of an assessment and at the end.

4.3 Interacting with HyperValu@tor

To access HyperValu@tor the user must firstly register, creating a personal account. Only then can s/he login, inserting her/his e-mail address and password, as requested by the user interface (Fig. 1).

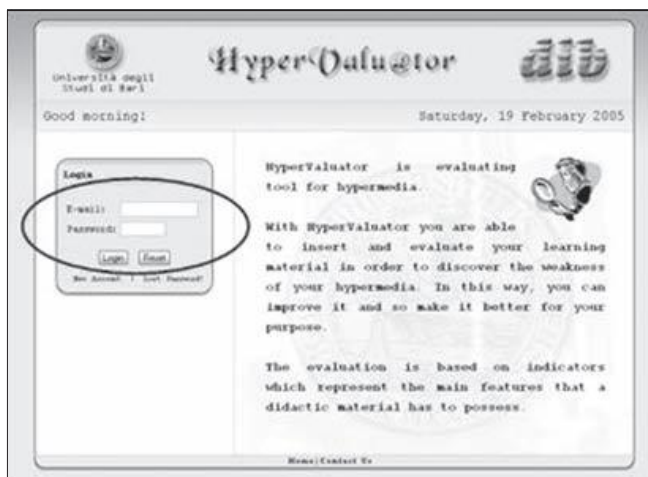


Figure 1 The opening HyperValu@tor display and the user login form.

After authenticating the above data, the system provides access to the personal page, from which the user can choose the various functions available.

The user can create a personal project to be evaluated by choosing from the menu the item «Insert a new project for evaluation». The system will request the data on the project and enquire whether it is a public project, and can therefore be evaluated by other users, too. Then the system can immediately proceed to the evaluation, when the user clicks on the button «Evaluate». Otherwise, the system re-presents the first page, deferring evaluation until later.

If the item on the menu «Evaluate a public project» is selected, the page listing the public projects inserted by all the system users will be displayed. After specifying the project to be analyzed, the evaluation phase can begin.

The tool can manage all the aspects concerning each project and evaluation. To activate the procedure, the user must select the item «Your evaluations» from the main menu. This allows the evaluation of indicators that have not yet been taken into account or modification of previous indicators, or elimination of the project.

After selecting the project to be evaluated (private or public) the evaluation phase begins. The indicator to be considered must first be selected (Fig. 2). Clearly, during the process, the system shows only those indicators that have still to be assessed.



Figure 2 The indicator to be evaluated is chosen through the pop-down menu.

After clicking the button «Evaluate» the assessment will begin, during which the system offers the user a series of criteria to be appropriately scored:

- score 0: the condition indicated in the question is not present;
- score 1: the condition is present but not scientifically adequate;
- score 2: the condition is present and scientifically adequate;
- score N: the question is not considered in the evaluation.

Each time the «Next» button is pressed the system will save the assessment made up to that moment, which can later be modified or started up again in a later work session; this prevents loss of the work carried out up to the moment of interruption.

At the end of the evaluation the tool displays the result, showing the quality of the indicator calculated according to the answers supplied by the teacher (Fig. 3). By clicking a link at the bottom of the page, the overall data available and the results of any public evaluations of the same project will be shown.

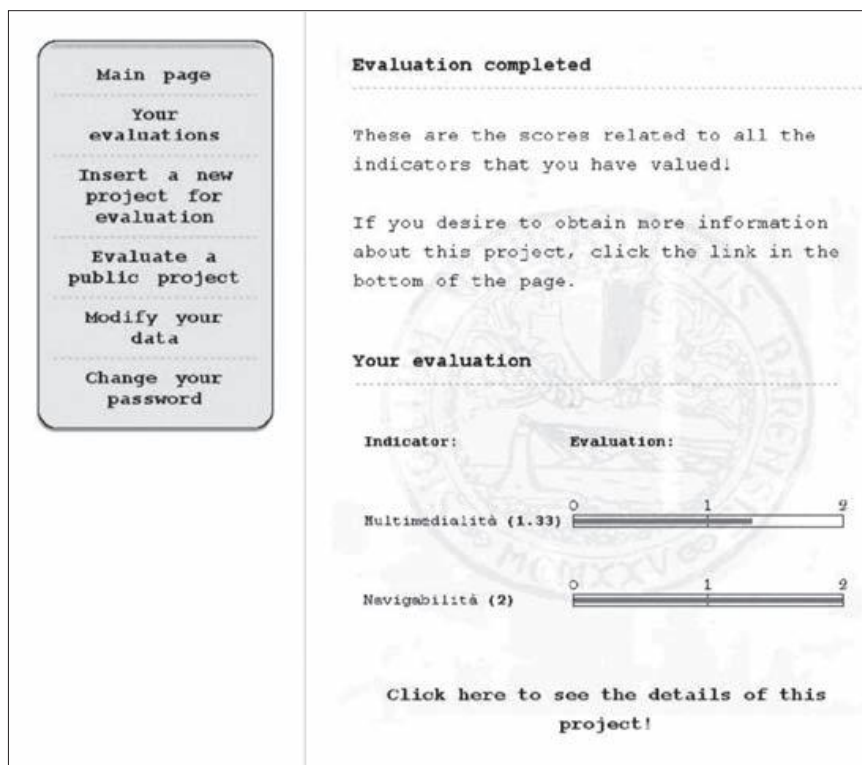


Figure 3 HyperValu@tor illustrates the results of the evaluation in graphic form.

If «Your Evaluations» is chosen, HyperValu@tor allows the user to modify an uncompleted assessment or even a completed one. To activate this option, the section must be accessed, and the project to be examined. The next screen will show the current state of the evaluation, providing an overall view before the modification is made. The indicator to be modified is then chosen and the system proceeds with the evaluation as normal.

5. Conclusions

Conceived for large scale use in many different domains, HyperValu@tor is a valid support for teachers, guiding them in the labyrinth of didactic software offers. Its efficacy lies especially in the possibilities of dynamic assessment and public evaluation of projects, the tool's two strong points.

In fact, thanks to the dynamic evaluation facility, the HyperValu@tor system does not oblige the user to judge all the quality indicators made available. The teacher can choose how many categories, and which ones, to analyze without needing to answer all the questions posed. S/he can discard one or more questions not considered pertinent to the particular hypermedia being examined, gaining a product-centered evaluation. This not only recognizes the intrinsic complexity

of educational software, but also respects and encourages the critical autonomy of the teacher/evaluator.

In this way, the possibility of subjecting a didactic software product to evaluations by several users (public evaluation) confers greater objectivity and reliability to projects analyzed with HyperValu@tor. By increasing the number of examiners, the evaluation takes into account different points of view, approaches, sensitivity and professional experience, as well as different backgrounds.

HyperValu@tor is easy to use, as shown by the usability evaluation carried out. In fact, the tool responds well to the usability criteria, especially as regards product efficiency, user satisfaction, and ease of use. The speed of execution of the tasks and low number of interaction errors were also much appreciated, as were the organization of the menu and the simplicity of use.

Thanks to these special characteristics, HyperValu@tor can respond efficaciously to teachers' needs to rely on automated tools to analyze and select suitable supporting didactic software.

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