

INTERACTIVE VISUAL AIDS FOR TRAINING AND KNOWLEDGE TESTING

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Abstract:

In this paper we have described one plug-in of educational Scriptrunner system, which through visual tool allows learning, training and testing of students, workers and employees over the Internet. Application is wide and verified: from factory halls and driving schools through students in classrooms and various psychological researches. Thanks to a good control (especially in terms of time) of video objects with supporting features (text, audio, video) this tool has been proven to be useful in studying and checking (workers prescreening). Since this plug-in is embedded in our Web collaboration system, it has all of the Scriptrunner's power possibilities. 'Visual aids' plug-in has similar features of commercial Learning Management System, too.

Keywords:

Educational & psychological testing, Employment screening and testing, Training.

1. INTRODUCTION

This research proposes a method of organizing an effective information-transfer system design in a plant-working environment. The developed computer solution is based on a combination of the visual characteristics principles used in the development of safety systems and visual factory advanced training practices. We've developed a new plug-in for our web collaboration system called Scriptrunner [1] that enables editing and running programs in various programming and mathematical languages. When implanted, this Scriptrunner plug-in will reduce the probability of worker's mistakes and it will provide a tool for effectively managing change in an environment of growing demand for information exchange, revision and update.

Dedicated thematic audits in the late 1980s showed that, in order for a business to avoid future disasters, it had to focus on essentials, one of which was the effective transfer of information. Although this sounded obvious, practice showed that it was not. Manuals of operating guidelines existed. However, when these guidelines reached 'the floor', they were too complex and detailed, leaving company personnel in doubt about what was expected of them. This led to a misconception or even ridiculing of the communication's scope. In most businesses today, information availability is no longer a problem, but the internal communication of this information seems to be ineffective, despite the fact that its necessity becomes increasingly demanding in a business environment where changes are becoming more frequent, requiring even more effective internal communications [3], [4]. However, audits are used as a management tool, rarely conveying their information to the floor workers. In addition, it has been reported that 85% of accidents are behavior related [5], [6].

In general, there are three ways for transmitting information throughout the operations with the objective of achieving behavior modification and adoption to continual changes. Training was considered, and still serves as, the primary tool for upgrading the industrial worker's

background and skills. In addition, no identified change must be implemented without prior training for affected personnel; however, while none can doubt the value of training, it seems that, in practice, it often proves ineffective because it is rarely repeated, it is very rarely change-adaptive or change-consistent, it is rarely simple or practical and it is never operations-oriented, thus adding no value to the workers' background while still leaving them room for improvisation, which does not help behavior modification to achieve the required consistency for mistake minimization.

Our visual aids have been introduced to enhance imaging during training. Learning is performed by a display of a series of images, which appear on monitors with the predefined time (from 150 ms, to several seconds). Learning and knowledge testing is held for a group of workers at the computer classroom. Plug-in was not only utilized in the factory but also for psychological learning tests and for the exams checking the knowledge of several Glagolitic script types. (The intention was to show the development of different Glagolitic script types, by the chronological order, which is not an easy task).

The candidates (workers) are expected to display the simplest use of a mouse; they do not receive on their monitors the same assignments at the same time (although in the end everyone receives everything), just to avoid cribbing. Audio information may also be included into learning (in that case, every participant shall be given earphones).

2. PLUG-IN STRUCTURE

The Visual Aids plug-in consists of 4 modules. Each module represents a different interface of the plug-in:

- The Knowledge Base
- Creating and teaching Training sets
- Knowledge checks
- Statistics

Basically, usage of the plug-in is two-fold, i.e. by different user types. *Teachers* have access to all modules with administrative permissions, while *students* (have access only to training and knowledge test modules. Teachers can also create and edit sets that students can use for training, as well sets for testing students' knowledge. Creating learning and testing sets is simplified by using a Knowledge Base from which the set items are taken. This also simplifies set administration and enhances information available in the statistics.

2.1. The Knowledge Base

Visual Aids' Knowledge Base is a database of *visual items*. These are used in all other modules of the plug-in. The database is divided into groups for easier picking in the creation of learning and testing sets.

The visual item is the basic element of all sets. It belongs to a group and consists of a picture, several named features that describe the item and optional video or audio that can define or describe the item in more detail. Each assigned feature is a one-line text item, with multiple features being added simply by adding another line in the Features text box.

For example, the following features can be assigned to the picture of a lightning on Figure 1: danger, high voltage, lightning, electrical engineering. These can later be used for learning or knowledge checks. The purpose of additional audio elements is, for example, useful in language teaching. A user can be given a Chinese glyph or character – a picture – with its

pronunciation – an audio file - and several features that represent translations of the character.

The screenshot shows a web form titled "Add picture/audio/video". It contains the following elements:

- Group:** A dropdown menu with "--" selected.
- Picture:** A text input field followed by a "Browse..." button.
- Audio:** A text input field followed by a "Browse..." button.
- Video:** A text input field followed by a "Browse..." button.
- Features:** A large empty text area.
- submit:** An orange button at the bottom.

To the right of the form is a preview window showing a video player. The video player has a blue gear icon in the center and a logo in the top right corner that reads "OPASNOST VISOKI NAPON". The video player interface includes standard controls like play, stop, and volume.

Figure 1: Adding an item into the Knowledge Base

2.2. Creating and learning Training sets

We can define a training set as a set of visual items to be used for training or learning purposes. Teachers create and edit these sets, while different sets are displayed to students.

2.2.1. Training set creation

Creating a training set consists of several steps:

1. Specify the sets' ID number
2. Write a text to appear above the items.
3. Select a visual item from the Knowledge Base. They are divided into groups, with a tree view to simplify finding the wanted item. Selected items are put in the set.
4. Choose how many features to show with the items – *one* or *all* features
5. Choose order of appearance of set items – *random* or *sequential*. In the case of sequential order of appearance, the sequence can be specified manually.
6. Choose whether to show the picture, video or audio of the item.
7. Set the duration of item visibility. This parameter is ignored if the items' audio or video are shown. Since they can have varying duration, they are shown during their playback.

We can see the training set structure from this list. Usually, multiple varying sets are created. The teacher can then specify in what order the sets will appear to students. By varying training sets, better learning results can be achieved.

2.2.2. Set training

Students can view a training set. Training usually consists of multiple sessions. When starting a training session, the next training set in the teacher-specified sequence is trained.

While training a set, visual items from the set are displayed for a brief period of time and then hidden, either randomly or in sequence. Depending on the training set options, one or all features are shown with the item's visual or aural element (picture, video or audio). The goal is to connect the visual element with the displayed features. Research has shown that learning is much more efficient this way, because it stimulates the students' attention more intensively. By anticipating a brief view of the item to be taught, students focus more and memorize the features better.

2.3. Knowledge Tests

Creating and managing knowledge tests is equivalent to that of training sets, with the difference that a test type and questions must also be specified.

Figure 2: Interface for creating a Knowledge test

Knowledge tests are organized similar to training sets. Multiple tests can be created, each consisting of a test set. Display of an item from the test set is similar to the training set display, with additional interface elements depending on the test type. There are several types of knowledge tests, differing in complexity.

2.3.1. True – False

The additional are two buttons, with values 'True' and 'False'. The item display is equivalent to the training display, but different visibility duration can be specified. In this test, in addition to the student being correct or wrong, his/her response time is measured.

2.3.2. Feature selection

Multiple features with checkboxes are displayed below the visual item. The knowledge test consists of selecting one or more features as answer to the question.

2.3.3. Multiple choice

In this type of test, multiple items are ordered into a matrix (e.g. 1x2, 1x3, 2x2, 2x3, 3x3...). The student is then given the option to select one or more items using checkboxes as answer to the question. Typical tests of this type include selecting items that do not belong in the set (or the opposite).

2.4. Statistics

Standard statistics can be obtained for student groups, sets and visual items.

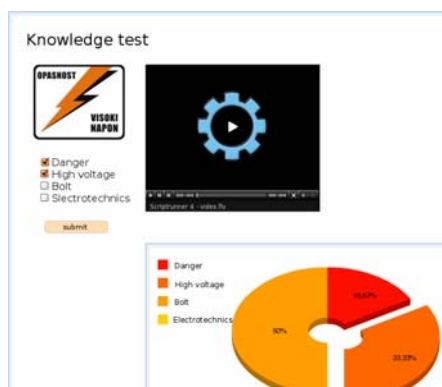


Figure 3: Statistics view

3. CONCLUSION

Our plug-in 'Visual aids' is one kind of Learning Management System for online training. It's a good and easy way to optimize various teaching (training and testing) process. It provides complete internet based training program management for administrator, instructor and consumer, like commercial programs "AVELife TestGold Studio Description" or "Practice Labs Online Skill Assessment and Screening Software"[6].

Rather expensive educational and/or psychological tests for individual, local work have been replaced by the web application for any number of candidates. Problem solving and additional requirements statistics for each and every candidate is well developed. The combination of visual and audio signals brings the best results in the sense that information conveyed is better digested and impressed on the audience's mind. Thus, this plug-in inside Scriptrunner system provides a positive thrust in business continuous improvement. This computer program can serve as an inter-functional tool facilitating the job of the floor workers as well as the plant's middle and top educational managers. [7]

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