Criteria to Assess the Quality of Virtual Patients

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Abstract. Quality assessment of virtual patients (VP) is important but still insufficiently standardized. We developed categories and criteria to assess the quality of virtual patients. These categories reflect the life cycle of a VP from the planning to the development, implementation and evaluation. Such elaborated criteria will help authors to create VPs and curriculum planers to assess the quality of implemented VPs and choose high quality VPs from repositories.

Keywords. Virtual Patient, Quality assessment

Introduction

Virtual patients (VPs) are E-learning applications which can be defined as "interactive computer simulations of real-life clinical scenarios for the purpose of medical training, education, or assessment"[1]. VPs are an important component of medical curricula and several recent projects, such as Electronic Virtual Patients (eViP) [2] have focused on the exchangeability of virtual patients. Repositories and referatories, such as MedEdPortal [3] allow faculty to download VPs for use. To foster the exchange of VPs the MedBiquitous standard has been developed and implemented during recent years [4]. However, criteria on how to manage the quality of VPs still remains to be developed.

The ISO/IEC 19796-1 standard provides a framework to describe quality properties and metrics of E-learning resources in general [5]. However, these criteria are quite complex to apply and not particularly designed for VPs.

1. Methods

We performed a review of the quality aspects of described standards such as ISO/IEC 19796-1, questionnaires and criteria catalogues serving as basis for E-learning awards and evaluation of E-learning software [6]. These aspects were then categorized based on the ISO/IEC 19796-1 and adapted to VPs. A Delphi driven process among the co-authors led to a proposed model composed of main categories embodying sets of criteria.

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2. Results

With the following categories and criteria, the relevant aspects of a VP can be assessed.

2.1. VP planning

Integration strategy: As shown in various studies [7, 8] the integration of VPs into a curriculum is an important aspect for a successful and effective use by learners. This aspect influences indirectly the quality of the VP since the VP design needs to be based on and adapted to the integration scenario and context it is used in. **Learning Objectives** should be defined before creating a VP and it has to be ensured that the VP is the optimal method to deliver these intended objectives. A model, such as defined by Mager [9] is recommended for the definition of learning objectives models and guidelines.

2.2. Development and Implementation

Metadata are already available in most VP systems and described in standards, such as Healthcare LOM [10]. In addition to the data defined there, more information about authors and reviewers, such as didactical training, should also be captured.

    Technical, formal and legal aspects: One of the basic dimensions of the VP is the technical aspect including availability, usability, accessibility, standard conformance and user support [11]. This usually depends on the VP system, so a close look at the soft- and hardware is necessary to assess these criteria. The quality of media files should also be assessed technically. Other aspects to be considered in this category are language and grammar, whether special needs are considered, and that copyright and data protection issues are cleared and documented.

    Features of the VP: Because the definition of a Virtual Patient is very broad it is important to take a deeper look at the features of a VP, when assessing the quality. Cook et al provide a list of feature variations in VPs which can serve as a basis [12]. This list includes aspects such as interactivity, progression through the VP, feedback and instruction, learner collaboration, media and adaptability. Depending on learning objectives and target group, certain features will enhance the learning effect of the VP. The feature variability of the VP is limited by the features provided by the system it is, or will be running on. So this analysis will include an evaluation of the VP system (e.g. according to the design guidelines given by Grunwald et al [13] or the VP typology developed by Huwendiek et al [14]).

    Quality of assessment items included in a VP: Not only when implementing VPs as a formative or summative exam, but also when using VPs for learning, the quality of the assessment items, e.g. multiple-choice questions, is crucial for the overall quality of the VP. These questions should be designed to assess the learning objectives of the VP and to actively engage the learner. For the quality of assessment items in written tests, criteria have been developed [15] that can be transferred to assessment items in VPs. Each item is investigated to assess format, structure, relevance regarding the learning objectives, validity and reliability.

    Timeliness, validity and quality of content: Especially in medicine data can become outdated rapidly, so it is important to consider the life cycle of a VP when assessing the quality. An important aspect is the process of the VP creation. Who were the authors and did the VP undergo a peer-review process and if so who were the

reviewers? The life cycle of the VP is included in Healthcare LOM to some extent. A regular review and update workflow can be supported and standardized by using questionnaires such as the eViP questionnaires [16]. If the VP has not been reviewed and updated recently, this has to be done to assess its quality.

Didactical quality: To assess the didactical aspects, a didactical review of the VP is necessary. A pedagogical questionnaire developed within the Caseport project [17] could be taken as a basis and further adapted. The kind and intensity of the didactical training the author and reviewer underwent should also be assessed.

2.3. Evaluation/Optimization

The evaluation of the VP using questionnaires or focus groups gives important feedback from the learner and the experts about their point of view regarding the quality of the VP. Within the eViP projects, a detailed questionnaire has been developed by Huwendiek et al[18] which aims to standardize the evaluation of VPs. The questionnaire includes questions about authenticity, professional approach, coaching and the learning effect of the VP. User acceptance as an important aspect in thi category will be assessed using evaluation questionnaires and examining the use of the VPs, e.g. by analysing the log files.

3. Discussion & Conclusion

The elaboration of these criteria will provide a base for a model to assess the quality of virtual patients. It is necessary to define and elaborate each criterion in a detailed manner, including ratings and tools required to assess it. Even when such standards and tools are already available, these will have to be scrutinized. To validate the elaborated criteria they will be evaluated by an expert consortium in a Delphi driven process. All criteria will then be combined in one matrix and assigned with a weighting schema. As far as possible an automatic or semi-automatic assessment is desirable. Accordingly we plan the implementation of a database schema and a tool to support the matrix creation and weighting and which includes existing tools such as the standard conformance testing tool [4].

This model supports both authors who create VPs and VP reviewers. Another approach investigated is to embed the quality assessment process in VP repositories. This could assist teachers and curriculum planers in finding and selecting high quality VPs. Another use is the quality assessment of already implemented VPs. A major challenge that will be addressed is how to apply it in a time-efficient way and to define and weigh all relevant aspects in close cooperation with experts.

After having assessed and documented the criteria and metadata of a relevant number of VPs, the next step will be to analyse these data and identify influencing factors for the quality of the VPs.

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