Guidelines for VP repurposing to different educational scenarios

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Introduction

The CAMPUS system is a vocabulary-based virtual patient shell. Virtual patients are constructed with an easy-to-use authoring system, with the unique and particular feature of displaying one case in two different player types: the CAMPUS Classic Player, a more simulative environment, and the CAMPUS Card Player, which is easier to use, with a more predetermined itinerary. Especially the flexibility to enrich a casuistic with comments, prompts different question types and media at virtually any given point in the case's course, makes it an ideal platform for enhancing already existing cases to support clinical reasoning. The principles used for the repurposing process were adopted from a recent review by Bowen on educational strategies to promote clinical diagnostic reasoning as well as from a focus group study about design principles of virtual patients by our own group. As described by Bowen these include the elements of acquisition and selection of data, the summary of presenting problems, the generation of hypotheses, providing cognitive feedback, asking typical presentations for potential diagnoses, defining and discriminative features. Although Bowen's educational strategies focus more on a face-to-face teaching scenario, these strategies were implemented as questions for the simulation of an interactive dialogue between a student and a clinical teacher in the virtual patients. Whereas our design principles describe several general design features, those factors, which our repurposing for clinical reasoning was focused upon, were mainly interactivity, specific feedback, recapitulation of key learning points and, above all, questions and explanations to enhance clinical reasoning.

Description of original VP and original educational setting

The virtual patient cases used for repurposing in clinical reasoning have been used within the paediatric curriculum for self-study purposes with duration of approximately 45–60 min.

Brief description of VP format

The original VPs were created with the CAMPUS authoring tool as cases for the CAMPUS Classic Player. They all take a linear pathway through the case and provide multiple options (e.g. choosing from a variety of examinations). They include media in the form of pictures and videos.

Methods and Materials

Selection criteria

The VPs were chosen by an e-learning content developer at the University Childrens Hospital in Heidelberg. The cases were selected to cover the content that is part of the paediatric curriculum. Also, VPs that had been revised within the last 2 years were not selected.

What type of repurposing was done

According to eViP definitions the repurposing for clinical reasoning included repurposing to different educational scenarios. After repurposing the cases for clinical reasoning they are planned to be used before teaching sessions (familiarisation fVPs), after lessons (review rVPs) and for self-directed learning (sVPs). In addition, content enrichment was done.

Steps involved in repurposing

A central part of the repurposing for clinical reasoning was the creation of a graph to display the clinical decision-making pathway from beginning to end. On the left of this graph all possible differential diagnoses were displayed, after the initial basic problem was presented at the beginning of the case. In a case's due course more information becomes available to either strengthen or weaken certain differential diagnoses and hypotheses until such time as the final diagnosis can be made, which is then displayed on the right side of the graph. After completing the differential diagnoses, the defining and discriminative features were assigned to either one or a group of diagnoses. The graph was supposed to function as the mind map of the clinical reasoning design, both as a guide through the editing process and also to be displayed at the end of the case.

Before the contents of the case were revised, the intended learning goals of this specific virtual patient case were defined. By comparing the defined learning goals with those of the existing case, a profile of the required changes was generated, which included not only enrichment but also reduction or deletion of those parts deemed unnecessary with regard to the desired learning outcome.

The repurposing work was done mainly by using the CAMPUS Virtual Patient system, Microsoft Word, Excel and Paint. The steps were:

Step
1. Case selection and first check
2. Literature review
3. Development of a repurposing concept
4. Enrichment for fostering clinical reasoning
5. Reduction of cognitive load
6. Final checks including review by expert and completion

How the work was planned

The repurposing process was supervised and coordinated by the senior lead of the Heidelberg eViP team. The repurposing efforts were monitored using the eViP repurposing effort sheets.

Brief outline of skill set required

- Learning technologist and physician in the field of paediatrics to develop a repurposing concept and to apply it to the case
- Senior residents in paediatrics as an expert for content questions and to make the VP realistic

Results

How the content was enriched

With a clear scheme at hand the case was edited within the authoring system, adding open-ended free-text questions, consistent with the mind map, to prompt for all reasonable differential diagnoses, which followed the initial problem presentation. During the case's due course, more and more of the features of the disease become known to the user. To guide towards a proper problem representation the user was prompted to summarise these in abstract terms. Consecutively, further questions were added to the case to prompt for discriminative or defining features of a differential diagnosis, or for the significance of a feature concerning the possible diagnoses. Whenever a question was implemented, the author tried to embed it into the virtual patient scenario, e.g. a senior consultant asking for a case summary or a nurse asking for prescriptions. Wherever the editor deemed it useful to comment on

features or illnesses he implemented expert comments or prompted for important details of the case. This was done with open-ended free-test questions with comments included in the ideal answer to engage the student more actively.

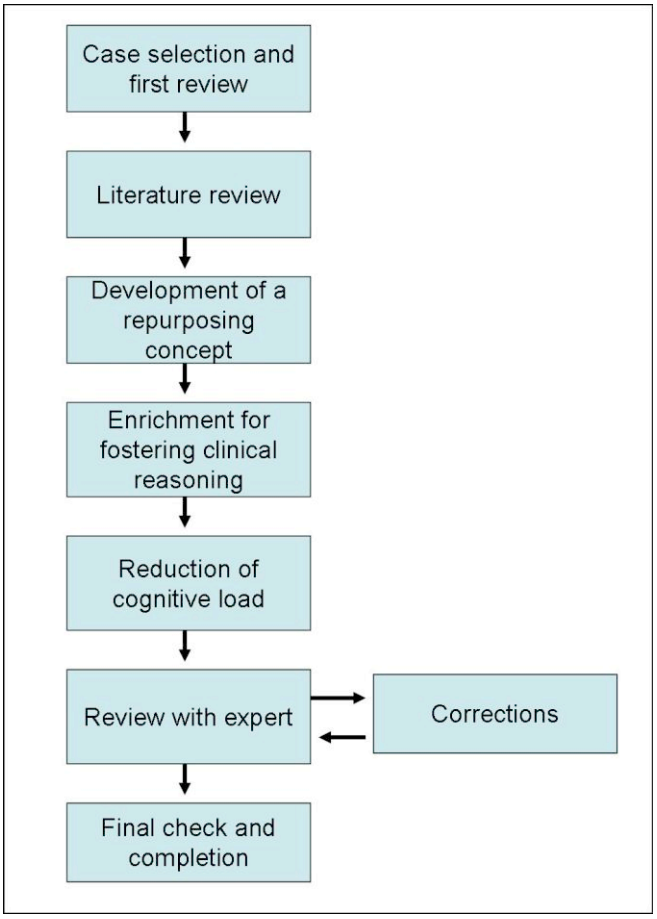
As the case progressed, important aspects of the learning goals were commented on and repeatedly asked about. The goal was to focus the student on these case features and to increase the chances that each student would be able to identify these after the completion of the case. A final summary was composed and added at the case's end, together with a recapitulation of the most important features as a take-home message. In addition, the clinical reasoning graph was embedded at the end of the case.

Another kind of enrichment was reducing the cognitive load of the cases. Although this is a reduction of content, we consider it as an enrichment to the case as it is an improvement in order to contain only the very content necessary.

How long it took per step and in total

Step	*hours*
1. Case selection and first check	2
2. Literature review	4
3. Development of a repurposing concept	4
4. Enrichment for fostering clinical reasoning	11
5. Reduction of cognitive load	5
6. Final checks including review by expert and completion	7
Total	33

The repurposing workflow



How the repurposed VPs were evaluated

Due to the winter break in the students' year to date an evaluation of the cases has not been possible yet. Quantitative controlled trials will be conducted to find out whether students perform better in assessment situations after they have been exposed to virtual patients designed to foster clinical reasoning.

Discussion and conclusions

Repurposing an existing virtual patient case to new design criteria proved to be more time-consuming and costly than initially expected. One factor may be that the cases used were rather elaborate, as efforts are dependent on the intended level of complexity and the length of the case. Consulting an expert earlier in the process might have speeded up the repurposing process and reduced the risk of altering the case towards an unintended goal, although the latter did not occur. Consulting an expert more often, or even have an expert conduct all of the repurposing themselves, would help to minimise the time accounted for in the literature review. However, the

greater the expertise of a clinician the higher is their cost. In addition, it should be borne in mind that an expert on content is not automatically an expert on instructional design. It also has to be taken into account that an expert is not always available and is quite a limited resource. This is why our repurposing was done mainly by a resident with a focus on virtual patient design, estimating it as a more cost-effective way to do the repurposing.

With regard to the efforts generated by repurposing it is questionable whether creating a virtual patient case from scratch might not be more efficient. A new virtual patient can incorporate all the necessary design features without the need to invest time in tampering with an existing case. However, we consider that having an already existing elaborated virtual patient case at hand is a very valuable resource. Repurposing saves all the efforts required for the basic layout, such as patient history, physical and other examinations, all the valuable media and is, in total, more time-saving than time-consuming.

Since our repurposing was done within the same content system, no efforts were generated by the occurrence of technical mismatches. From the technical point of view not crossing between platforms is certainly a less complex way to repurpose. Two major benefits are that the author can avoid almost all technical difficulties and can focus on the content and the target educational scenario. Quantitative controlled trials will be conducted to find out whether students perform better in assessment situations after they have been exposed to virtual patients designed to foster clinical reasoning.