# Guidelines for VP repurposing to a different educational level and discipline

**Authors**:
**S. Oberle,** Heidelberg
**S. Huwendiek,** Heidelberg

## Table of Contents

## Introduction

The originally used virtual patients (VPs) were applied at the Heidelberg Medical School in Germany within the regular curriculum in pediatrics.

Only 10 to 15 % of the (preclinical) basic science knowledge, such as biochemistry, physiology and histology, can be transferred by medical students into applied clinical thinking and clinical problem solving. According to Norman (2008), this transfer can be greatly increased by: a) teaching "preclinical basic concepts" with clinical examples; b) teaching these basic concepts within clinical examples – examples in addition to those mentioned during the introduction of the concept; and c) repetition within many clinical examples covering the entire period of study.

Integrating knowledge of basic science concepts into already existing clinical virtual patients, and adapting them for use in the preclinical years seems to be well suited to support the above mentioned strategies to foster the transfer of basic science knowledge.

## Description of original VP and original educational setting

The originally used VPs were applied within the regular curriculum in Pediatrics. They were used by medical students by self-studying in preparation of seminars or as a recapitulation prior to an exam.

## Brief description of VP format

Originally the VPs were created with the CAMPUS Virtual Patient system using the Classic-Player. These cases were meant to be worked through within 60 minutes. Graphics for instance pictures or video content were included but no interactive media content.

## Selection criteria

For this pilot study, a virtual patient originally created and implemented for education and assessment within the regular pediatric curriculum was taken. The selection criteria were chosen to be able to fit in basic science content for use in a preclinical setup.

## What type of repurposing was done

A clinical paediatrics case was taken and repurposed for application to preclinical subjects including anatomy, biochemistry or physiology (educational level, discipline area).

## Steps involved in repurposing

First, a basic science teacher and a clinician chose the existing virtual patient, thereby ensuring suitability for the pilot study in terms of content as well as organisational aspects, such as planning which existing teaching event will receive the virtual patient. The next step was to define detailed preclinical and clinical learning objectives for the virtual patient. To approach this, basic scientists, clinicians and students exchanged materials and literature, and discussed the learning objectives for the planned virtual patient. This virtual patient was then accordingly redesigned and simplified in terms of clinical level of difficulty. As a last step, the case was reviewed amongst senior physicians and basic scientists to assure the accuracy.

The mean effort was to include the preclinical learning objectives out of the basic sciences anatomy, physiology and biochemistry within a clinical case without overcharging with too much clinical content.

## Virtual patient software

CAMPUS is a vocabulary-based virtual patient shell. Its authoring system allows easy development of virtual patients with integration of background knowledge, such as expert comments. The system supports multiple choice or free-text questions, and the use of multimedia, such as pictures, audio and video. In this study the card-player was used (www.campusvirtualpatients.com). This card-player can be used on HTML-basis with every web browser. In the presented study interactive graphics were used for the first time to verify student's knowledge in a new way. On a drawn figure students had to place correct descriptions to tagged structures.

## How the work was planned

This work was coordinated and supervised by the senior lead of the planning commission of medical education at the University of Heidelberg. Together with the coordinating representatives of the preclinical subjects suitable strategies were chosen and the specific learning content was set up.

## Results

### How the repurposed VPs were evaluated

The virtual patient was presented in the context of a cell biology seminar. Students in their second year of medical education attending the seminar were encouraged to test this virtual patient. They could do so at home on a voluntary basis in addition to recapitulation of the seminar's content. Creator's or teacher's opinion was not part of this evaluation.

A student questionnaire was developed and tested for conformance with students. It was integrated as an online questionnaire at the end of the virtual patient. It consists of 10 questions covering 'linkage of preclinical and clinical content', 'handling of the player', 'increase of knowledge', 'difficulty', 'wish to have virtual patients as part of other seminars', 'overall grade'. Answers could be given on a Likert-scale from 1='strongly disagree' to 5='strongly agree'. Furthermore, free text answers could be given concerning 'weaknesses and strengths' of the virtual patient.

Twenty-six students in the second year of their medical studies completed the questionnaire. In the following figure a summary of these results is shown (Fig.1).

From these results, 92.3% declared a successful linkage of preclinical and clinical content and 84.6% attested to having learned something useful. 92.3% wished to have virtual patients as a part of other seminars in the future. 88.5% had no problems handling the program (3.4% gave no answer, 3.4% had problems, the rest had no opinion). 69.2% attested an adequate level of difficulty, whereas 11.5% thought the difficulty was too high (the rest had no opinion). The overall grade in a scale from 6='very good' to 1='very bad' was given with an average of 5.7.
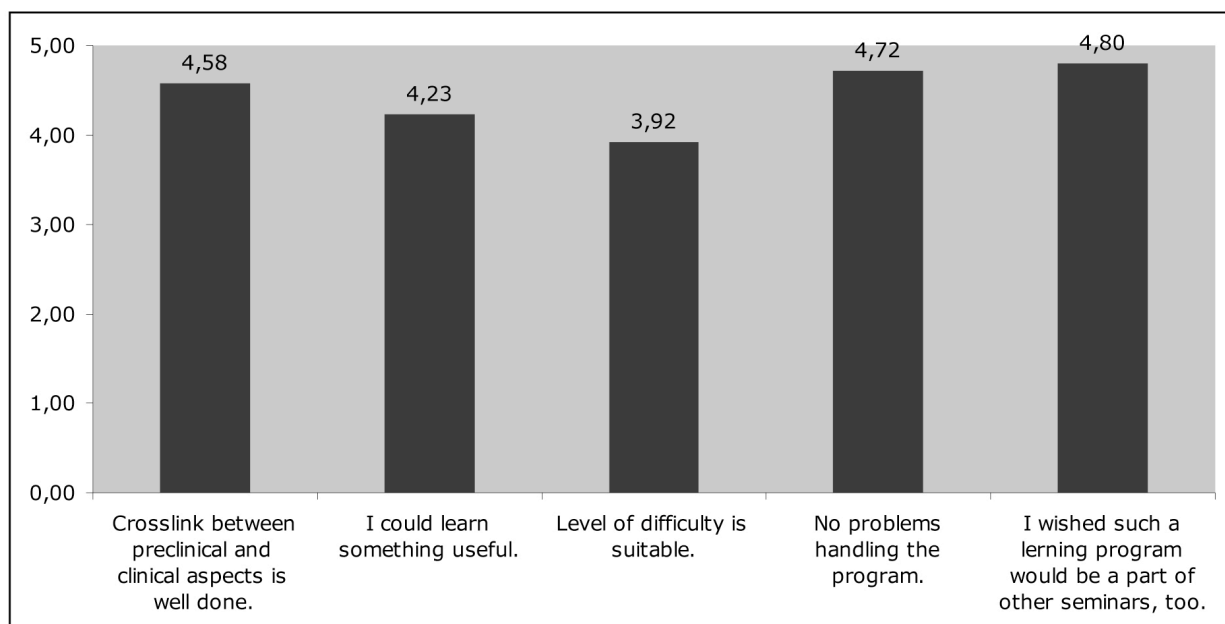


Fig.1: Acceptance and relevance of the project. Values are given as mean on a Likert-scale from 1='strongly disagree' to 5='strongly agree'.

### How long it took per step and in total

The effort to repurpose this virtual patient consumed 85 hours. A summary of the repurposing steps is displayed in Table 1.

| Activity | hours |
|---|---|
| 1. Case selection | 1 |
| 2. Setup and definition of preclinical & clinical objectives | 12 |
| 3. Literature review | 20 |
| 4. Setup of questions and expert comments | 15 |
| 5. Simplifying of clinical content | 10 |
| 6. Development of interactive graphics | 10 |
| 7. Final checks incl. review by experts and completion | 7 |
| Total | 85 |

Table 1: Efforts

About one hour was needed for carefully selecting the case suitable for preclinical content, 12 hours for defining preclinical and clinical objectives, 20 hours for literature review with respect especially to the preclinical content, 15 hours for setting up questions and creating of expert comments within the virtual patient, 10 hours for simplifying the clinical content for preclinical students, 10 hours for development, setup and testing of interactive graphics, and about seven hours for final checkup including review by experts and final completion.

## Discussion and conclusions

In this pilot study we repurposed a clinical virtual patient to suit the preclinical years. The results indicate a high acceptance rate and attest to a successful combination of clinical and preclinical content. Students wish to have more virtual patients like the one presented in other preclinical subjects.

Porting or repurposing a VP within the same virtual shell - in our case CAMPUS - is by far less complicated than porting from one system into a different one. Therefore we had no technical problems using already existing VPs. More time consuming than previously thought was the definition of preclinical learning objectives and the literature review addressing this issue. A lot of effort is needed to sit together with basic scientist defining proper and realisable learning objectives. Another big point is the simplification of the originally solely clinical VP to a VP suitable for preclinical use. According to the first evaluations preclinical students had more problems than thought to get along the clinical case. This was mostly due to the fact, that many clinical terms even basic ones were still unknown. So simplifying means also summarising anamnesis and physical examination and restriction to very basic examinations and laboratory values.

We are convinced that virtual patients are a powerful vehicle to foster the transfer of basic science knowledge into the clinical part of medical education. We are in the process of integrating further virtual patients into the preclinical years. The overall goal is to integrate virtual patients at Heidelberg Medical School into each preclinical and clinical discipline, in order to foster the transfer of basic science concepts to clinical reasoning through a longitudinal virtual patient project.