

Virtual tools to support the teaching of curricular units in engineering fields

RJC Carbas | EAS Marques | FC Sousa | CSP Borges, TP Duarte | JJM Almacinha | JJM Machado | LFM da Silva

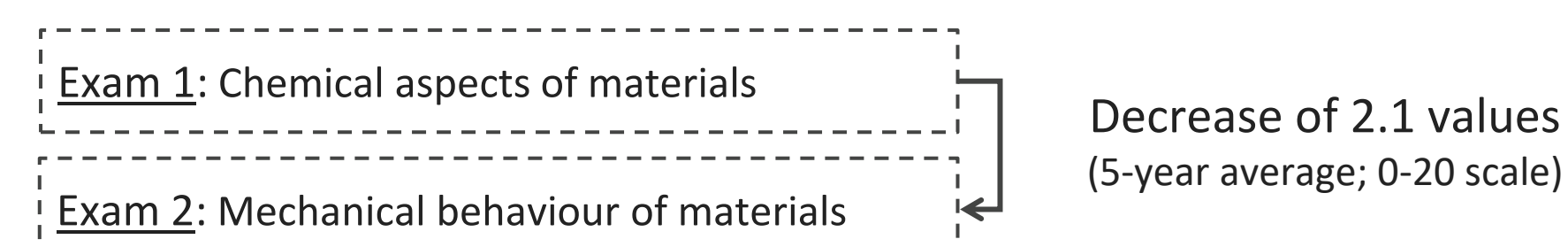
INTRODUCTION

In engineering courses, particularly mechanical engineering, a strong foundation in both "Technical Drawing" and "Material Science" units is crucial. This project developing novel virtual tools, which serve a dual purpose: they can be used as supplementary learning materials during lectures and as independent study resources for students to solidify their understanding outside the classroom. These virtual platforms promote active learning and provide valuable support for students' autonomous studies.

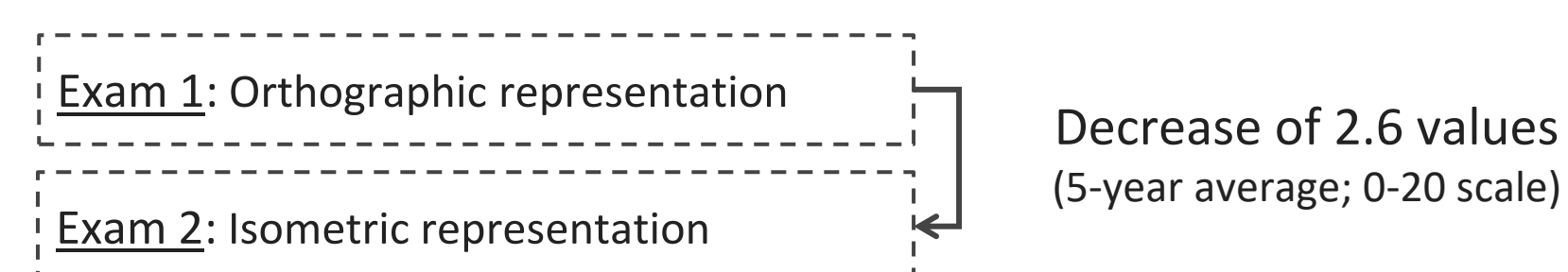
PROBLEM IDENTIFICATION

In the "Technical Drawing" unit the students often as spatial visualization difficulties, specifically the ability to visualize an object based on its two-dimensional projections. This difficulty can negatively impact their performance in the "Material Science" unit, where concepts like crystalline structure, defects, and hardening mechanisms rely heavily on spatial reasoning and abstraction.

- Technical Drawing unit



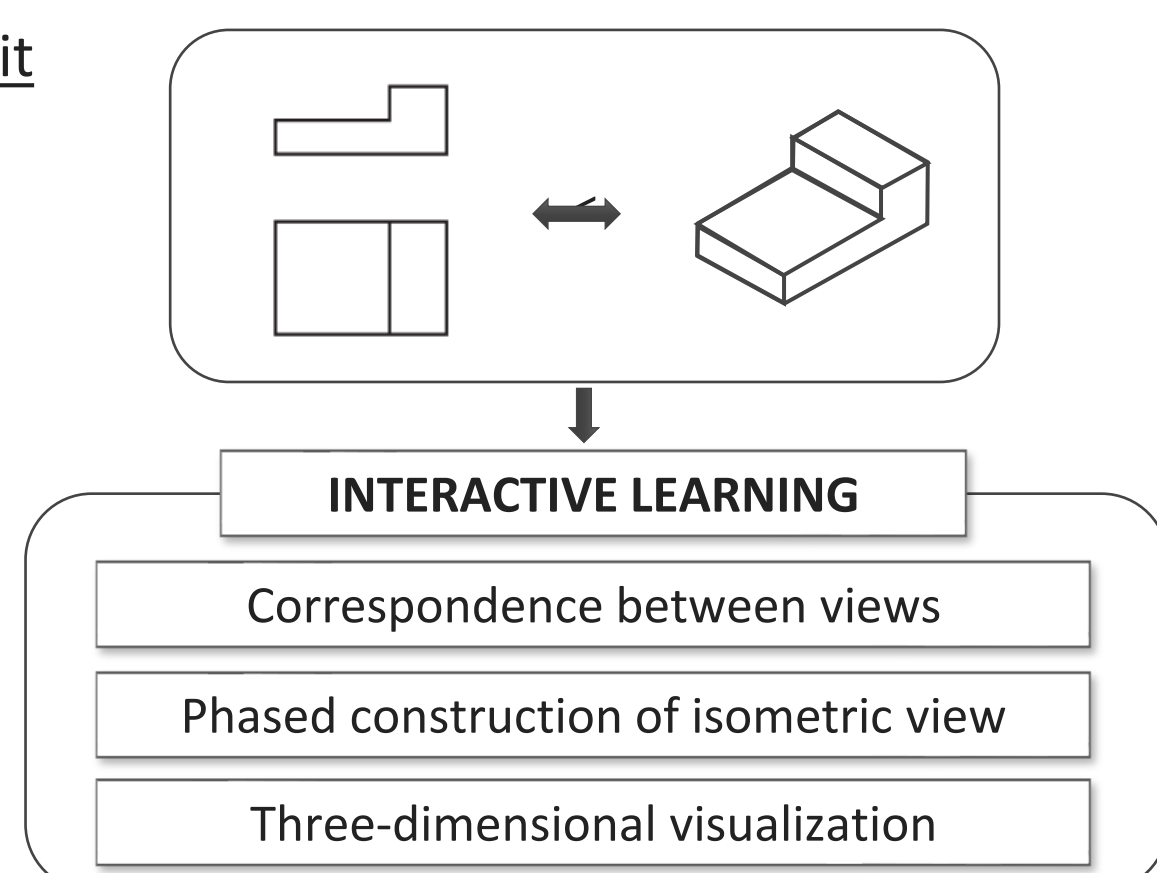
- Material Science unit



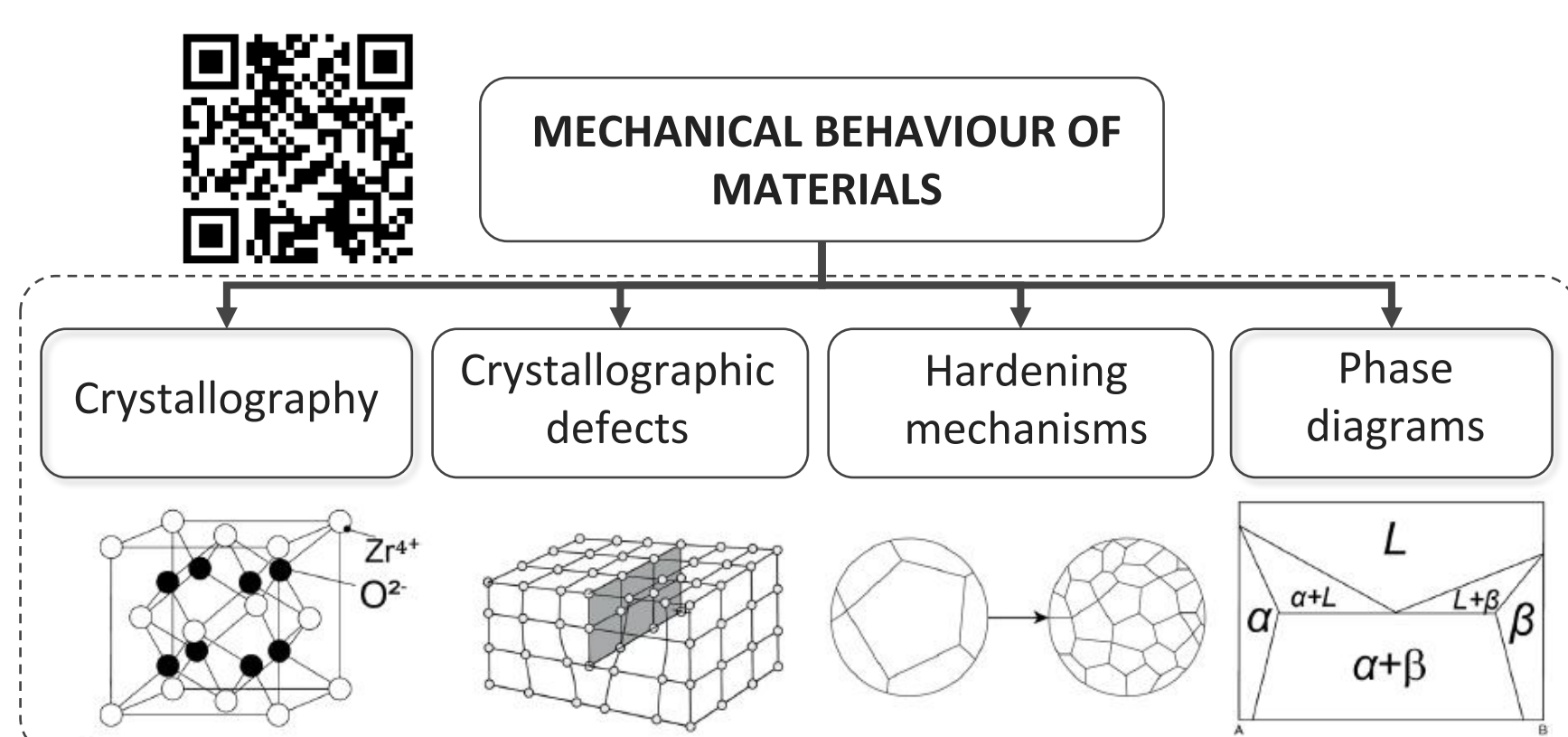
METHODOLOGY

To improve the individual learning with a virtual platform that offers interactive support, enhances lectures, and provides valuable resources for studying and consolidating knowledge.

- Technical Drawing unit

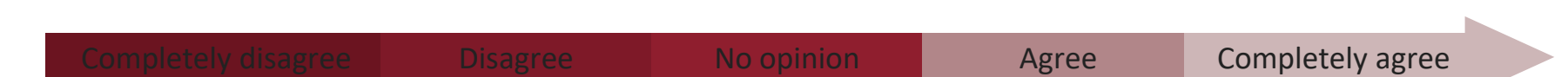


- Material Science unit



FEEDBACK OF FEUP STUDENTS

A survey at 260 students of 1st year of Mechanical Engineering Bachelor at Faculty of Engineering of University of Porto (FEUP), provide a student perspective in the use of "Material Science" platform. Some results of the survey are shown in Figure 1 and 2 using a scale from "completely disagree" up to "completely agree".



- It is easy to understand where to look for each piece of information in the software.

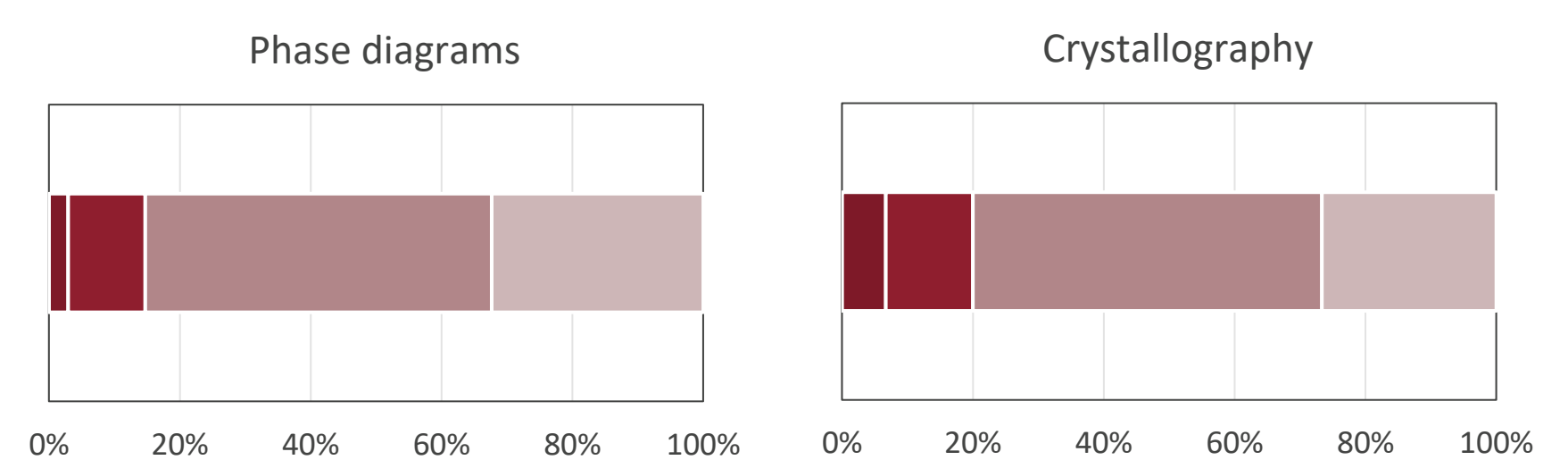


FIGURE 1. The results of information in the software in the perspective of the student user.

- The software has helped improve my understanding of phase diagrams and crystallography.

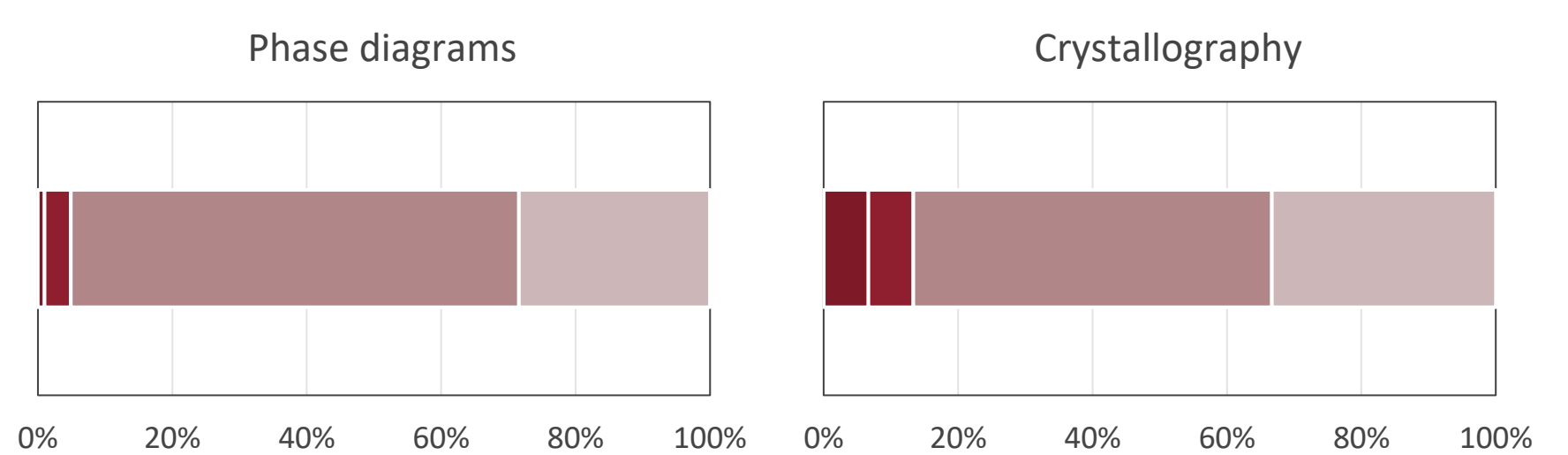


FIGURE 2. The results of understanding improvement in the perspective of the student user.

- Additional students' comments

- "It helped me a lot in understanding the crystalline structures part and not only. It is a very useful tool."
- "I am a supporter of this type of complement to the teaching method, as it allows a clearer and more dynamic visualization of concepts. This one in particular was very well done."

CONCLUSION

- Students believe the platform had a positive impact on their learning process;
- Professors find the platform visual learning of the students.

ACKNOWLEDGEMENTS

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