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Use of CrystalWalk interactive program to teach crystal structures to Brazilian students in engineering courses.

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Understanding how atoms of chemical elements form crystals is not a simple task, especially for students that are learning about the properties of materials. This task is even more arduous when the course workload does not match the content and traditional teaching methods do not stimulate students. Recently, the teaching methodology of Materials Science discipline has been completely modified aiming at the improvement of student learning. The new procedure is based on project execution, team-based learning, flipped classroom, use of the CrystalWalk interactive program and additive manufacturing, with 3D printing of crystal structure models. CrystalWalk is free didactic-interactive software for synthesis and visualization of crystalline structures, developed by the Nuclear and Energy Research Institute (Ipen, Brazil), which can be used online and in devices such as computers, tablets, and smartphones. With the software it is possible to construct the crystals step by step, choosing the basic structures and the atoms that will enter its composition. In the first step, questions were presented using the Plickers application to check student's prior knowledge before approaching the topic and then a video-lesson with key points about crystalline structures was visualized in the flipped classroom model. After that, groups were created to construct the different structures using the CrystalWalk software, and the 3D impression of the structures of each group was built. Finally, new questions about crystalline structure were presented using the Peer instruction methodology to evaluate if 70% of the class absorbed the presented content. As a result, it was observed that the use of this new learning model increased the student's engagement and, consequently, their final grades.