Supplementary Material (Table S1). Representative Example of the AI-Assisted Diagnostic and Validation Process

Workflow Implemented (Figure 6)	***Step***	***Description***
1. Compilation of Technical Data	*Maintenance Case Data Entered into ChatGPT*	*Students were provided with a standardized maintenance case involving a rotating machine exhibiting abnormal operating conditions. The case included: (i) an increase in overall vibration amplitude with a dominant 1X rotational-frequency component, (ii) a bearing housing temperature of 74 °C measured by infrared thermography, (iii) an equivalent continuous sound pressure level of 82 dB(A), and (iv) IoT-based monitoring data indicating a progressive increase in temperature over a 24 h period. No personal, academic, or student-identifying information was entered into ChatGPT.*
2. Standardized Prompt Submission	*Standardized Prompt*	*The complete prompt is presented in Supplementary Material S1. Students were instructed to enter the technical data obtained from the maintenance case and request: (1) identification of the most probable fault, (2) justification of the diagnosis, (3) proposed maintenance actions, and (4) recommendations for additional inspections or measurements to increase diagnostic confidence.*
3. AI-Assisted Diagnosis	*Illustrative AI-generated response*	*"Based on the available vibration, thermographic, acoustic, and IoT monitoring data, the equipment may present shaft misalignment and/or bearing degradation. It is recommended to inspect shaft alignment, evaluate bearing condition, verify lubrication status, and perform additional vibration measurements to confirm the diagnosis."*
4. Critical Evaluation of AI Output	*Student Validation Process*	*The student reviewed the AI-generated response and compared the proposed diagnoses with the experimental evidence. The vibration spectrum did not exhibit a significant 2X component, which is commonly associated with shaft misalignment. Conversely, the elevated bearing temperature, progressive thermal trend observed through IoT monitoring, and increased acoustic levels suggested a bearing- or lubrication-related condition.*
5. Comparison with Experimental Evidence	*Supporting Experimental Evidence*	*Elevated bearing temperature (74 °C), increasing temperature trend obtained from the IoT platform, increased sound pressure level (82 dB(A)), and vibration behavior consistent with a rotating component operating under abnormal conditions.*
6. Identification of AI Limitations	*Student Correction or Rejection of AI Recommendations*	*The student recognized that the AI response proposed multiple possible faults and rejected the shaft-misalignment hypothesis due to insufficient supporting evidence. However, the recommendation to inspect the bearing and lubrication system was considered appropriate and retained for further analysis.*
7. Final Student Diagnosis	*Final Student Diagnosis*	*Probable bearing degradation associated with insufficient lubrication. The diagnosis was established based on the convergence of thermographic, acoustic, and monitoring data rather than on a single measurement technique.*
8. Communication of Conclusions	*Technical Conclusions and Maintenance Recommendations*	*The student prepared a brief technical justification summarizing the supporting evidence and recommended inspection of the bearing assembly, verification of lubricant condition and quantity, follow-up vibration measurements, and continued IoT monitoring to confirm restoration of normal operating conditions.*

Table S1 presents an illustrative educational example prepared by the authors to demonstrate the AI-assisted diagnostic and validation workflow shown in Figure 6. The example was constructed from representative laboratory activities and does not correspond to the verbatim validation process or technical report of any individual student, nor to a specific industrial failure event. It is included solely to illustrate the educational workflow implemented during the intervention.