Design Considerations for Semi-Autonomous Robot Assistance in Higher Education

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Abstract: Semi-autonomous robot assistants can support both teaching and administrative activities in higher education, but existing research often examines individual robot applications in isolation. This fragmentation makes it difficult to determine how different robot-assisted functions can be combined, what level of autonomy is appropriate, and which implementation conditions are required for reliable classroom use. This study addresses the problem by synthesizing lessons from previously reported robot-assisted educational scenarios into a preliminary set of design considerations for semi-autonomous robot assistance in higher education. The analysis draws on prior literature and classroom implementations involving attendance checking, question answering and guidance, practical-task pre-evaluation, and immediate feedback collection. The resulting design considerations cover the placement of robot support within the teaching process, the division of responsibilities between the robot and the lecturer, the relationship between robot functions and supporting software services, and implementation factors including usability, reliability, privacy, ethics, and institutional support. Results from the completed classroom studies show generally positive acceptance of robot-assisted support for routine administrative and structured instructional tasks, while also demonstrating that acceptance depends on reliable operation, appropriate interaction modes, lecturer control, and clear practical value. The main contribution is a cross-scenario synthesis of design considerations that moves beyond isolated robot use cases and identifies the elements that should be explicitly addressed when planning semi-autonomous robot assistance in higher education. These considerations provide the basis for a second structured feedback round with researchers and practitioners to assess completeness, clarity, and practical relevance and to guide further refinement.

Keywords: robot assistants, educational technology, human–robot interaction, technology integration, higher education