# Hypotheses

1. **Tier 1 (Foundational)**
2. **Tier 2 (Reality Check)**
3. **Tier 3 (Our Contribution)**

## Foundational Hypotheses

H1.1: Classroom instruction designed for average/typical learners will result in suboptimal outcomes for those operating below or above the assumed level. This is evidenced by: (a) a higher cognitive load and greater frustration for below-level learners; (b) boredom and an insufficient level of challenge for above-level learners; and (c) greater achievement gaps between high and low performers compared to classrooms with matched instruction.

H1.2: Students who receive differentiated instruction, tailored to their individual readiness, learning profile and interests, will demonstrate significantly higher learning outcomes (as measured by post-assessment achievement, retention and transfer) and greater learning gains (as measured by growth from pre- to post-instruction) than students who receive standardised, one-size-fits-all instruction. This is controlled for by taking into account prior achievement and demographics.

H1.3: Students who receive personalised instruction tailored to their learning needs will demonstrate higher levels of intrinsic motivation, engagement (across cognitive, emotional, behavioural and agentic dimensions) and a stronger sense of belonging than students in standard classrooms. Furthermore, the achievement gap between high-performing and low-performing students will be smaller in differentiated classrooms.

## „Implementation-Reality“ Hypotheses

H2.1: Attempting to provide unique lessons for each student imposes significant cognitive, temporal and logistical challenges for teachers, reducing the likelihood of successful implementation and long-term sustainability unless substantial institutional resources or automated systems are in place to support this approach.

H2.2: Using a limited number of learner levels for differentiation (e.g. three or four levels instead of customisation for each individual or a standardised, one-size-fits-all approach) will yield significantly better learning outcomes and engagement, as well as reducing achievement gaps, compared to standardised instruction. This approach requires substantially less teacher preparation time and cognitive load than full individualisation, making it a pragmatic middle ground that is more scalable and sustainable for typical classroom contexts than either extreme.

## Tool-Specific Hypotheses

H3.1: Teachers using the AI-assisted brainstorming tool will develop differentiated activities for three learner levels (Beginner, Intermediate and Advanced) in a similar amount of time to that taken to create a single traditional lesson plan. This will result in significantly greater instructional variety (in terms of activity types, task structures and pedagogical approaches) across the three levels.

H3.2: Activities generated through AI-assisted brainstorming across three learner levels will demonstrate a significantly higher level of task appropriateness (alignment between the cognitive demands of the activity and the capabilities of learners at that level) than activities designed manually by teachers under equivalent time constraints. → Schwierig zum teste, though

H3.3: Teachers who use AI to assist with brainstorming will generate significantly more activity ideas per learner level than unaided teachers. The ratio of usable/adaptable ideas (those requiring minimal revision to implement) will also be higher, enabling teachers to select the most appropriate and varied activities for their specific classroom context.