**Project Proposal: Post-marking Analyses using Automated Guttman Charts**

**Motivation**

Post-marking analyses can empower educators with key insight into learners’ progress and facilitate subsequent intervention designs. The implementation of assessment rubrics (see Appendix A) has been gaining wider acceptance in recent years, where learners develop meta-cognition through modelling “things my teacher looks for in a good essay” and how each marking criterion can be achieved at various success levels (final column in Appendix A). Evidence-based grading can then be carried out with transparency and accessibility to learners, parents, and school leaders.

In addition to computing sum scores, rubrics-based marking leaves behind a rich collection of learner data. A Guttman analysis takes in every learner-by-competency observation and visualise class-level performance patterns into a useful map (Guttman chart, Appendix B). The zone of proximal development (ZPD) can then be identified as the transitional region from “grass land” (zone of actual development, ZAD) to “desert”. By grouping students with similar learning needs (blue, orange, and green boxes in Appendix B), interventions can be carried out with high precision and efficiency.

Even more, systematic difference in visual patterns may reveal latent issues beyond the current assessment. Separate Guttman charts can be generated by sex (“Do girls do better in this psychology essay than boys, at which competencies, hence how do I adapt my teaching next to ensure success for all?”), by classrooms (“Class D’s history classes are all scheduled in the final period. Does this timetabling issue translate to poorer learning outcome?”), or by cultural/aboriginal identity (“This competency demand appeared to be particularly difficult for certain subgroups. Should we consider fairness issues in the next round of assessment design?”). Underutilising post-marking analyses leaves too many improvement opportunities unexplored.

**Problem Statement**

Guttman charts, unfortunately, are rarely produced by front-line teachers. A manual compilation of a Guttman chart routinely takes half a day—a prohibitively costly exercise in terms of teachers’ time. Machine time, on the other hand, is well suited for post-marking analyses because the steps are highly procedural, predictable and programmable. This project proposes a digital learning management system (LMS) solution that turns post-marking analyses from hour-long “nice to have” to a click-a-button “must have”—shorthand “AutoGuttman” from now on.

**Product Description**

By incorporating itself to the existing LMS, AutoGuttman can take over post-marking analyses by reading in each learner’s rubrics marks into a two-dimension array (row = learner, column = assessment competency/task). Next, a sorting dictionary will rearrange rows and columns in descending order by row-sums and column-sums. Colour schemes will then be applied to the Guttman chart to mark can-do from cannot-do (see Appendix B for visual effect). Using Java Script and CSS, these tasks can be completed in seconds for an average-size classroom in Norwegian high schools (Year 8—10 grunnskole, and VG). If desired, teachers, year leaders, and school principals can request differential analyses by sex, classroom, or other demographic attributes as illustrated in this prototype: <https://engagelab.uio.no/AutoGuttman/#/> (Due to an expired API key, the graphical front-end has lost connection with the back-end nettskjema where the mock data were stored. This website could be quickly restored once funding resumes.)

As a future development goal, AutoGuttman can take advantage of the proliferation effect to further reduce implementation costs. Since rubrics and Guttman charts are stored as database files, teachers can download existing rubrics, drag-and-drop/type-over, and re-publish their designs at near-zero cost. A GitHub-like community may soon emerge as the central repository, paving the way for featured assessment designs and the associated post-analyses. Practices and data from this community could enable further educational research on atomic-level competency development, and inform the curriculum authority about how the national learning strategies are implemented at the grass-root level.

**Budget**

Engagelab charges internal projects at Lønnstrinn 69 (approximately 600 to 700 NOK per hour). A functioning AutoGuttman beta release requires front-end graphic designers (student-facing and teacher-facing pages, with the latter having design mode and marking mode) and back-end database manager (data capturing, efficient sorting dictionary, Feide access security, data protection (especially important since we process data from young learners under 18), data backup and access log maintenance). I am too inexperienced to estimate the total developer-hours required so I defer this judgement to the Faculty in consultation with EngageLab.

**Planned Partners**

In addition to UV’s EngageLab, legal expertise shall be sought for the purpose of drafting end-user agreements, as well as compliance audits with GDPR and Norwegian privacy laws. Data custody must be agreed upon before beta release, including legacy protocol should this project cease functioning. Similarly, I refer cost estimation to the expert.