A COMPARATIVE STUDY ON THE INFLUENCE OF DYNAMIC GEOMETRY SOFTWARE ON THE ACQUISITION OF BASIC GEOMETRIC NOTIONS

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Background Dynamic Geometry (DGS) increasingly makes its way to the classroom. It is widely believed that its capabilities help learners to gain insights and develop heuristics. But one must also account for a *computational transposition*[1] – for instance, Hölzl[2] reports epistemological shiftings and increased cognitive demands as side effects of DGS usage. But his case studies have been criticized for being too demanding and not representative. Therefore it seems appropriate to investigate on a broader basis the impact of a more retentive DGS application on students' achievements in regular classroom situations.

Method At 3 senior high schools (one being a private school for girls), 12 lessons were taught in grade 7, developing basic notions like perpendicular or angular bisector from "real life" problem contexts. This was done either based on paper (P classes) or, by the same teacher, exploring "electronic worksheets" with DGS (C classes). In the control classes (V), ordinary lessons were given by the regular teacher.

Results Mean posttest achievements (adjusted by pretest) were about equal in P and C (and considerably higher than in V)[3], but we found some distinctive features:

- in C*, higher achievers* profited more than lower achievers – vice versa in P,
- P was (significantly) superior to C *for girls at the private school*,
- C was somewhat more effective than P *for girls at public schools,* but considerably less effective for lower achieving boys, so C lay slightly behind in totals.

Also, differences in achievements and strategies between P and C occurred with "dynamic" problems, but surprisingly also with some "static" ones.

Discussion It seems that when dealing with standard examples, the benefits of dynamic exploration can easily be outweighed by the extra costs of DGS, so we confirm that *dynamics is not a didactical advantage per se* (Hölzl). The use of DGS should therefore be preceded by thorough consideration – it will be most favorable when an objective requirement for the tool meets an advanced mathematical experience.
The interplay of environment and gender with the effect of DGS seems new and deserves further attention. In coeducative classes, girls can profit from DGS treatment,

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[1] in the sense of Balacheff, N. (1993): Artificial Intelligence and Real Teaching. In: Keitel, C.; Ruthven, K. (eds.): Learning from Computers: Mathematics Education and Technology. Springer.
[2] See e.g. Hölzl, R. (1996): How does 'dragging' affect the learning of geometry? Int. J. Computers for Math. Learning, vol. 1(2), p. 169-187.
[3] This could have been expected, if one considers DGS just as media, as treatment is commonly believed to matter more than media, see e.g. Clark, R. (1983): Reconsidering research on learning from media. Rev. Educ. Res., vol. 53, p. 445–459.

but special care should be taken of lower achieving boys, especially to prevent them from using DGS just as a plaything.