Response to ‘Modeling Assessments of Innovative Physics Courses’

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Summary

Fuller c.s. present in there their paper: ‘”Modeling Assessments of Innovative Physics Courses’” results that relate to teachers and students in Tertiary Education.

Naturally, differences exist with teaching conditions in Secondary Education[5]. This contribution first illustrates that nonetheless many of the results reported in the paper are quite analogical to the ones we came across working with teachers and students in Secondary Education, in the Netherlands. Finally, two reasons for explanation of the resemblance are discussed.

Comments to “‘Modeling Assessments of Innovative Physics Courses’”

In the section in the paper of Fuller c.s. :‘Introduction’ it is stated that ‘*It was anticipated that the experimental physics sections would help faculty and students focus on addressing ill-defined problems from the natural world.*’

Former Dutch innovation projects had similar curricular aims. During e.g. the so called ‘PLON’ project (1970-1983) teaching materials were developed and field tested on the basis of the idea that particular ‘realistic themes’ such as “Bridges” and “Traffic and Safety” would be appropriate vehicles to improve students’ motivation to master content elements from the physics school curriculum. In short, evaluation (Wiersma …) at that time illustrated that teaching with PLON materials indeed enhanced students’ interest in the new kind of teaching contexts and classroom activities. Efforts to establish – compared to ‘common physics education at the time’-a considerable improvement in students’ concept development, however, were not too successful (CITO ..).

In the section: ‘Electronic Resources’ it is stated that: *‘While the experimental physics syllabus content objectives were the same as the control sections, the experimental activities were constructed so that students had opportunities to make maximum use of the CD-ROM's research potential and its capacity to aid unique, diverse, and generalizable approaches to problem solving.’*

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5 Main differences between science students and teachers in Tertiary and in Secondary are probably:

Students in Secondary are, generally speaking, far more involved in initial stages of development of science-related attitudes, concepts and skills compared to Science students in Tertiary

Teachers in Tertiary relate far more as academic experts to their students compared to teachers in Secondary who deal with youngsters to whom science related subjects are (only) a (very) limited part of their school curriculum as a whole.

In 'Curriculum Change' it is stated that: '*Lecture time which typically is devoted to the delivery of subject content was deliberately set aside in favor of activities that were designed to facilitate the development of broader professional skills grounded in critical thinking and problem solving.*

Experiences from Dutch efforts to innovate the science curriculum, indicate that our expectations to develop 'meta-skills' such as *generalizable approaches to problem solving* and *critical thinking* in classroom teaching, in addition to content elements included in the traditional curriculum are not necessarily non-realistic but mostly very difficult to realize. E.G. efforts to adapt along similar lines the national physics examination programs, by a national (governmental) curriculum committee (WEN, 1993), resulted unfortunately in a program which students and teachers felt very hard to realize in actual classroom practice. Comparable with the findings of Fuller c.s. these implementation problems were related to problems people had to cope with traditionally defined classroom constraints such as the total number of teaching hours that was available, the kind of didactical resources, the lack of available skills in teaching the new curriculum, and learning outcomes for students.

We find similar observations in this paper, where it is stated in '**Students' Perceptions of the Experimental Process** that:
'Over the semester students in the experimental sections reported experiences and attitudes which represented several recurring themes:
- ✓ *negative impact of time constraints*
- ✓ *confusion in choice-making activities*
- ✓ *problems working with others toward a common goal*
- ✓ *concern about preparation for assessment*

Over the last decades CBL developers - e.g. AMSTEL Institute - as well as more general educational researchers - e.g. at SLO, Utrecht University - in the Netherlands made many efforts to enrich the national science examination syllabi with ICT-related content elements. Currently, we have arrived at the stage of piloting so-called *computer examinations (COMPEX)* in which students' abilities in applying computer skills to lab work kind of situations, are examined during the so-called central written examinations.

- Many of the experiences reported in the paper of Fuller c.s. are comparable to the ones that were observed in the Dutch context, eg. Upper Secondary students' who where exposed to programs such as Word and Excel during 'Informatic classes' already in Lower Secondary nonetheless encountered serious problems when they had to apply particular 'basic computer skills' during the COMPEX-exams. Earlier reports - Inspector's review …. - that also in Dutch schools,

- *'technology as a tool for studying physics added unwanted complexity'*
- some *student support for a practical, inquiry, activity-based, hands-on program declined*

In conclusion

Apparently, quite a few observations of Dutch researchers with High School students are very comparable with the ones reported in the paper by Fuller, c.s.
In our experience this probably results from two basic problems with innovating curricula:

- short vs. long term aspects of innovative effects.
  Our experiences from many decades of curriculum and didactical research indicate that innovative and wanted effects of curriculum innovation are rather easily acknowledged and proofed by respectively well motivated teachers and researchers who were involved themselves in curriculum innovation projects (short term). Innovative and wanted effects of curriculum innovation in the long term are only noticeable with 'common' teachers and students who could benefit from a variety of supportive facilities over a rather long time.

- danger of internal blow up of the curriculum
  Most efforts in the Netherlands to try and innovate the school curriculum and common teaching practice unfortunately, start by issuing new national examination programs. So far, none of the national (governmental) committees in charge of developing these programs escaped from the pitfall to develop a new program by 'simply' adding new content elements to the already overloaded existing collection of concepts, laws and formulas.

However, the recently installed committees[6] unanimously decided to try and avoid these pitfalls by a. not founding their program proposals on the traditional inventory of academic content elements but on a new curricular structure i.e. a small number of *'basic concepts'* together with carefully selected *contexts* (Boersma ….). And, to start their work by defining a well defined set of curriculum goals and objectives before selecting particular content elements during the process of putting together a proposal for new examination programs. And –last but not least- it has been decided that before issuing the new examination programs, their actual merits will be established by field testing teaching materials that are developed on basis of the new proposals by teams which contain both teachers and 'educationalists.'.

[6] This recent development will be explained in more detail at the seminar.