

The teacher as a crucial factor in curriculum innovation

the case of Utrecht University

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Summary

What strategies are feasible to enhance the competencies and motivation of teachers in university education on a large scale (empowerment)? This enhancement will be of decisive importance for the realisation and the quality of curriculum innovations. For this reason we analysed the process of innovation in Utrecht University (The Netherlands) in the past ten years: to what extent has the vision to enhance the competencies and the motivation of teachers indeed resulted in the realisation of this vision, in an actual enhancement of the competencies and motivation of the teachers and in successful innovations of curricula? Based on quality assessments by visitation and accreditation panels, and on evaluation data of student questionnaires through the years we analyse whether there is substantial evidence for an answer to this question.

In this paper three strategies and six clusters of measures are described that were found in our analysis and directly aimed at the enhancement of the competencies and motivation of the teachers. These measures arose from and were consistent with the educational vision and policy on the position of the teachers. Analysis of the activities and the results thereof show that this vision has resulted substantially in the intended effects.

From the context of this theoretical framework three strategies are distinguished and used as frameworks for the analysis and interpretation of the results of the elaboration and execution of these strategies:

1. The quality of the teachers as starting point for the educational policy
2. The teachers as designer and developer of education
3. The teachers as professional experts in the practice of the activities that are characteristic in their discipline and profession

Six clusters of measures were distinguished in the analysis:

- A. Qualifications on Teaching in Higher Education and training programs
- B. Quality assurance
- C. Excellence in University Teaching
- D. Changing the perspective of the teachers into designers and developers of education
- E. Fostering excellence in learning and teaching
- F. Changing the role of teachers in authentic practices

In the presentation we will describe this changing role of the teachers more in detail, specifically related to the character of this *research based university*: the authentic practice of doing research. Early in the nineties a development started that has led to a different vision of higher education, a different selection of content, and a different choice of educational methods, assessment and a different role of the teacher. Distinguishing in this vision is that the practice of the domain was combined with the programme by giving the characteristic tasks, problems and cases a key position in the curriculum. With the concept 'practice' we refer to the characteristic activities and expertise in a community of practice. Of course the authentic tasks and problems are adapted to the educational situation, and the teacher keeps next to the role of project manager from the practice also the role of teacher. Some examples: in Mechanical Engineering (at the University of Twente) a project was implemented to design a can crusher, in Computer Science (at Utrecht University) a project to develop a software product and a business case; in Chemistry (Utrecht University) a research project.

The *role of the teachers* in these instructional projects is that of the expert from the discipline. Their knowledge has to be up-to-date to support and assess the students in new, authentic tasks, that nearly always are related to a real external client or assessor. The teachers are and remain in this way in their own activities (and in their learning process) much more involved in the dynamics of the practice of their own domain of competence. Their expertise and authority remain related to this field. They are the leaders of the projects and have and keep the relation with the external community of practice that the students want to belong to. They are their coach and at the same time the manager of the project who give them tasks and assesses their results before they show these externally. The relation is rather that of a junior to a senior, than that of a student to a teacher. The teachers are not the ones who know everything, but they are the guide on the way to issue knowledge, they do not assess multiple choice questions, but organise peer-assessment; sometimes presenting some of their expertise, but primarily coaching in a balance between controlling learning processes and co-operating on project results. They show the route to the criteria that external assessors will use, instead of presenting a list of educational objectives.

This development to a new role of the teacher started in UU in 1998, first in a cautious way in some departments (Chemistry projects), sometimes through Honours programmes as laboratories for innovation, in recent years also in other departments (Physics), Pharmacy, Veterinary Science, Social Sciences, Computer Sciences etc. This development is until now certainly not at a large scale, but from the perspective of an innovation process this would not be realistic, as the size of the innovation is large for teachers, students and management. However, it is striking that this development is steadily going on, cautious and moderate, but irreversible: nearly all of these risky innovations were successful without signs of failure and relapsing into the old situation. It seems that the teachers involved are conscious of the trend, but also understand how far-reaching the consequences are for the vision on education, for the role and task of the teachers and for the infrastructure.

Introduction

If the quality of personnel is the capital of the organisation, this should be true in university education. But is it true, can it be the focus? What should be the policy, the strategies and the actions? And what are good indicators, to show that you are on the right track?

The research question that is the basis for this paper is: What strategies are feasible to enhance the competencies and motivation of teachers in university education on a large scale. Or in other words: how to enhance the empowerment of teachers for teaching and innovation of teaching? According to Short & Johnson (1994) teacher empowerment is related to the following dimensions, regarding the new tasks and roles of teachers in teacher-based curriculum innovation:

- Involvement in decision-making,
- Teacher impact,
- Teacher status,
- Autonomy,
- Professional growth, and
- Self-efficacy.

This enhancement will be of decisive importance for the realisation and the quality of curriculum innovations. For this reason we analysed which indications can be found that in the case for this study, the process of innovation in Utrecht University (UU) in the past ten years: to what extent has the vision to enhance the competencies and the motivation of UU-teachers, indeed resulted in the realisation of this vision, in an actual enhancement of the competencies and motivation of the UU-teachers and in successful innovations of UU-curricula. Based on quality assessments by visitation and accreditation panels, and on evaluation data of student questionnaires through the years we analyse whether there is substantial evidence for an answer to this question.

In this paper three strategies and six clusters of measures are described that were found in our analysis and directly aimed at the enhancement of the competencies and motivation of the UU-teachers. These measures arose from and were consistent with the educational vision and policy on the position of the teachers. Analysis of the activities and the results thereof show that this vision has resulted substantially in the intended effects.

Teachers as key actors in curriculum innovations

It is widely acknowledged that teachers are key actors in curriculum innovations. Curriculum innovations usually require a change in teacher practice (Fullan, 2001; Havelock, & Huberman, 1977). However, experienced teachers do not tend to change their current practice easily because it is rooted in their beliefs, and in the practical knowledge they have accumulated during their years of teaching (Fullan, 2001; Van Driel, Beijaard & Verloop, 2001). If teachers don't have the right competencies to fulfil their new roles or if they are not convinced about the usefulness of an innovation, it provides an important pitfall for innovative projects in higher education. Competencies and motivation of the teachers in universities are of crucial importance to the quality of the educational innovations, as we can delineate from the tasks of the teachers, the high rate of dynamics in the disciplines and professions, and in the permanent changes in the demands that are made on the quality of university education by agencies for quality assurance and accreditation (e.g. the ABET 2000 criteria of the Accreditation Board on Engineering and Technology) and through ranking activities.

How can we involve university teachers in such a way that they can actually and permanently cope with innovation of content, innovation of curriculum structures and innovative learning arrangements? In other words that they are empowered to do so (Short & Johnson, 1992)? The implications of the dynamic changes in universities are that we should focus on the learning processes of the teacher in a learning organisation. It is not enough to focus on the competencies of the teacher at a certain moment and leave it to that in a static view. Teachers in higher education primarily are content specific experts, proud on their discipline, appointed and promoted because of their knowledge of their subject area or profession. Next to this, they are teacher, but their quality as teacher is considered by the institution most of the time as a second criterion for authority, power and status (Pilot & Ruijter, 1993). To accomplish changes in teacher practice, teachers should not only implement innovations, but they should also become actively involved in the development of innovations. In general, it is assumed that teachers develop co-ownership of a new curriculum when they are actively involved in its development (Fullan, 2001).

In the nineties Utrecht University decided to consider the quality of education as a key issue in the vision on the future of the university, that educational innovation was necessary and should be a permanent part of its educational policy, and that enhancement of the quality and status of education as 'core business' of Utrecht University needed concentrating on the competencies and motivation of teachers (Keesen & Vermeulen, 2000; Keesen et al, 1996). The case of this innovation process is analysed in the perspective of the recent major innovation processes, introducing the Bachelor Master framework in the Netherlands (and all over Europe), combined with a strengthening of the academic goals in the domain of higher order learning (Vermeulen & Van Kammen, 2002a, 2002b). This case will be analysed using a theoretical framework on factors that influence the process of innovation and data from different sources about the period of many years that these innovations took place.

Innovation processes

Bottlenecks in educational innovations in universities

Eraut (1975) summarised five bottlenecks in educational innovations in universities:

- a) No need to innovate: there is no real dissatisfaction with the existing course of affairs.
- b) Learning and teaching have a low priority.
- c) The costs of educational innovation and the time needed for results are much higher than expected at the start.
- d) Shortage of expertise that can assist in the innovation processes.
- e) Participants do not know alternative, innovative options (don't know that it can be done differently and in a better way).

Characteristics of innovation projects

Havelock en Huberman (1977) characterised a large number of innovation projects, their results, and success and fail factors. They formulated conditions that should be taken into account in the planning of innovation projects in higher education. Their most important conclusion is that the original aims are rarely reached in large scale innovation projects in higher education. Their explanation of the limited successes of these large scale projects is the following:

- I In a large scale project a very complex transition state arises; controlling this situation is not easy or even nearly impossible.
- II Participants have no or little experience with planning and executing large projects in education.

III A large scale change evokes all kinds of counter forces. Because nearly always parts of the innovation will be not successful, these counter forces will get stronger.

An innovation project in university education can only be successful in their analysis when the 'IAC-conditions' are from the start fulfilled to a large extent. The IAC-conditions are: *Infrastructure, Authority and Consensus*.

A good *Infrastructure (i+)* has the following implications:

- a. a correct determination of the needs on all levels;
- b. a correct analysis of the problem (in the factors that explain the problem);
- c. the availability of a feasible solution on the level on which the intervention is done;
- d. a solution that can be implemented in a fast and reliable way.

The concept infrastructure in this sense is related to the context of the educational process, the connection between the problems established and the alternatives for solutions. Also *Resources* are considered to be part of the infrastructure. This condition includes the extent to which trained personnel is available (Havelock & Huberman, 1977), the communication can be secured and the budget is available to finance the changes.

A high *Authority (a+)* means that there are persons available and willing to take care of measures to ensure that the problems are analysed, a solution is implemented and is institutionalised.

Authority (power, control and leadership) is expressing to what extent the process of change can be directed and stimulated.

A high rate of *consensus* is expressing that (i) most people involved (ii) agree about (iii) the aims of the project and (iv) the way the aims should be reached. At the start of a project consensus rarely is available. There will be different, competing or even conflicting interests, and the opinions about what is needed or intended deviate from what is really meant. Those who are responsible for the decisions too often assume that consensus is reached (they see it as an obvious problem) and they start implementing the innovations too early.

The combination a+ and c+ rarely occurs, only in small units the authority can enforce consensus to a certain extent.

The three conditions *infrastructure, authority and consensus* are not to the same extent important for every innovation. Their importance is related with two dimensions of the changes involved (Pilot & Ruijter, 1993):

- a) *the character of the change*, ranging from simple to complex: the more the situation and the participants have to change, the more important the IAC-conditions will be;
- b) *the size of the change*, ranging from small scale to large scale (or from a fragment to integral): the larger the scale of the change, the more these conditions will be crucial.

The relation between the IAC-conditions and the two dimensions are shown in figure 1.

way have to be the owners of the educational constructs and the educational problems. They should not be just performers of educational activities that were developed or decided on elsewhere by others, unless they explicitly decide to make that choice.

3. The teachers as professional experts in the practice of the activities that are characteristic in their discipline and profession

Relate the position of the teacher with that of the professional expert, take his role in the community of practice in his domain and profession seriously, give it even a central position in his roles and tasks. That makes the teacher authentic, stimulates the dynamic input from his community of practice and brings realistic, not-scholastic assessment criteria into education (important for the control of the innovations and the realisation of education).

Other factors will have had influence on the curriculum innovations and the outcomes, like the policy to conceive the students as key clients in the university education (and the role and activities of the teachers!), educational budgets (decreasing in the Netherlands each year 2-3%), changes in pre-university education, and quality assurance policies. In this case study we will focus on the teacher in this process and the activities and results directly related to the teacher.

Method

In Utrecht University these strategies have been applied in the last ten years systematically in curriculum innovations in the educational programmes of the UU. Through analyses of the policy documents it can be determined on the level of the visionary curriculum (Goodlad, 1979; Van den Akker, 1998) what the points of departure have been. By analyzing what actions have been taken it can be determined to what extent this policy has resulted in actual activities. By determining the output and results of these actions in the evaluation data it can be decided to what extent these actions have led to the results that were aimed at in the vision and the educational policy. We will then analyse to what extent these data can be related to the overall processes of curriculum innovation, leading to conclusions about the relevance and feasibility of the three strategies.

Elaboration of the innovation and results

Point of departure, the situation in 1990.

Around 1990, Utrecht University was facing a number of problems, related to the quality of education issue. There were different views on these problems. Solving these problems in a way that was acceptable to all parties seemed to be impossible (Keesen and Vermeulen, 2000).

Faculty staff members had a strong tradition of professional autonomy. They recognised that expertise in the subject discipline determined their position in the faculty organisation. Therefore expertise was the final justification of all professional behaviour. Pedagogical qualities were hardly an issue among faculty members. The attitude towards research was completely different. Research quality was an important issue for them because careers were based on achievements in research. In the period of 1980-1990 university policy had given priority to this issue. However the combination of competition in research, the growing numbers of students and decreasing funds had caused increasing teaching workload and opportunities to distinguish in research were few.

As a result, individual staff members had become highly "change-resistant" knowing that any educational innovation required effort and many of them, especially those who felt treated unfairly by their employer, were organised in labour unions. These unions had considerably

influence on personnel policies, which were based on governmental regulations. Students expected their teachers to be pedagogically qualified, to take their teaching tasks serious and to care about individual students.

In its policy, Utrecht University refused to accept the idea that a choice had to be made between quality and quantity. As student-staff ratios had not dramatically changed during the decades in which mass education arose, these problems were considered organisational problems rather than structural quality problems. In fact, Utrecht University was hardly able to choose an other policy, as the quality-quantity issue draws a dividing line right through Utrecht University itself. Mass education had taken place almost exclusively in the Arts and Humanities: the question in these departments was how to guarantee a quality level for large numbers of students. Such large amounts of students never entered the Science faculties. Here the combination of teaching and research was no problem.

Altogether, university policy was to find ways to enable the departments to deal with the problems of mass education, without reallocation of resources from science faculties to arts and humanity faculties.

Elaboration of the strategies: six clusters of measures

In the concrete elaboration of strategy 1, the quality of the teacher as starting point for the educational policy, three measures (A, B and C) can be distinguished.

A. Qualifications on Teaching in Higher Education and training programs: the FLOW-program.

The development and implementation of a new human relations policy in job specialisation and career building, combined with qualifications on Teaching in Higher Education (THE) and training programs leading to these qualifications (the FLOW-program).

It was decided in a long decision making process with many stakeholders that all teachers in Utrecht University had to comply with the demands of the basic THE-qualification (Figure 2), and that assistant and full professors had to comply with the demands of the senior THE-qualification (Keesen et al., 1996; Keesen & Vermeulen, 2000). Appointments and promotions were dependent of this compliance. The implementation started in 1996 for all appointed personnel through a make up process with assessment committees and learning activities for teachers (courses, conferences, training programs on an individual basis).

Assessment was done based on portfolios ('show that you comply with the required competencies through self-evaluation, documents, evaluations by students and colleagues'). Assessment committees of high authority were installed, but details were decided on the level of the departments. Implementation was executed by the Board of the university, the deans and committees with high authority, and the certificates of the qualification were presented in public and in festive ceremonies. It was a difficult time, with quite a lot of discussion about the relevance of educational quality and the these certificates, but in 2000 the process was completed for the appointed personnel (which included some thousands of teachers!).

Concerning new personnel the demands were made public in the regular announcements of new positions, in the procedures on appointments, through coaches and by systematic checks in the appointment and promotion decisions. At this moment it is a regular and fully accepted procedure, recently updated in the new human relations and career policy.

Although there exist differences between the departments, in general this FLOW-program is accepted as a relevant educational policy, even as an essential keystone in the educational policy of the university (policy documents on HRM, numbers of qualifications in recent years, observations of portfolios and assessment committees).

The *conclusion* from the analysis of the data is that the intended policy on this issue was realised to a high degree, leading to a substantial enhancement of the quality of the teachers.

Figure 2. Short list of Teacher in Higher Education (THE) qualifications (university standard)

<p>THE Qualifications</p> <p><i>Capabilities regarding contents:</i> The THE possesses a wide and profound knowledge of the concerning discipline and is aware of the place of his/her own teaching in faculty curricula.</p> <p><i>Didactical capabilities:</i> The THE is capable to design teaching programs from the point of view that teaching programs support study programs of students. He/she is capable to perform various teaching activities both for groups of students and individuals and to examine students and evaluate his/her own teaching.</p> <p><i>Organising capabilities:</i> The THE is capable to co-operate with colleagues and give guidance to (PhD) students participating in teaching tasks.</p> <p><i>General capabilities:</i> The THE behaves in a committed, communicative and socially and skilful way dealing with Students and colleagues and is capable of further developing and reflecting on his/her own functioning.</p>

B. Quality assurance (QA).

In 1989 the Netherlands universities and Ministry of Education founded a system of external quality assurance. In this system visitations by external committees, that report in public to the Ministry, play an important role. This system is considered to be a key factor in the development of the educational quality of university programs and in many large scale curriculum innovations. The quality and the competencies of the teachers have been criteria from the start, but the importance of it has grown through the years. In the new 2003 system of accreditation the quality of the teachers was again decided to be an important assessment issue, that is decisive for accreditation. The internal quality assurance system in Utrecht University does comply with this external QA-system, and in that way also the elaboration of the quality assurance concerning the teachers is secured in the educational policy of the educational programmes. The realisation of this FLOW-strategy is in this way secured to a high extent.

The results of internal and external evaluation show a change in the appreciation of the quality. In the national rankings of universities programmes Utrecht University stood in the lower part, until the end of the nineties (Figure 3). These rankings are based on student questionnaires, but also on assessment by the national visitation and accreditation committees for quality assurance. In the last four years the ranking of the UU has gone to the upper part of the rankings, with each year a number of 'First Places' that is above average (Figure 4). Students are satisfied with the pedagogical qualities of the teachers and their motivation for good instruction. They perceive the UU as an institution that gives freedom of choice and custom-made instruction high priority.

The *conclusion* from the analysis of the data is that the intended policy on this issue was realised to a considerable degree, leading to a substantial enhancement of the quality of the teachers and the programmes.

Figure 3: Appreciation of Programmes of Utrecht University in the national rankings of Elsevier; percentage of programmes in the upper and lower part of the rankings in the years 1996-2004.

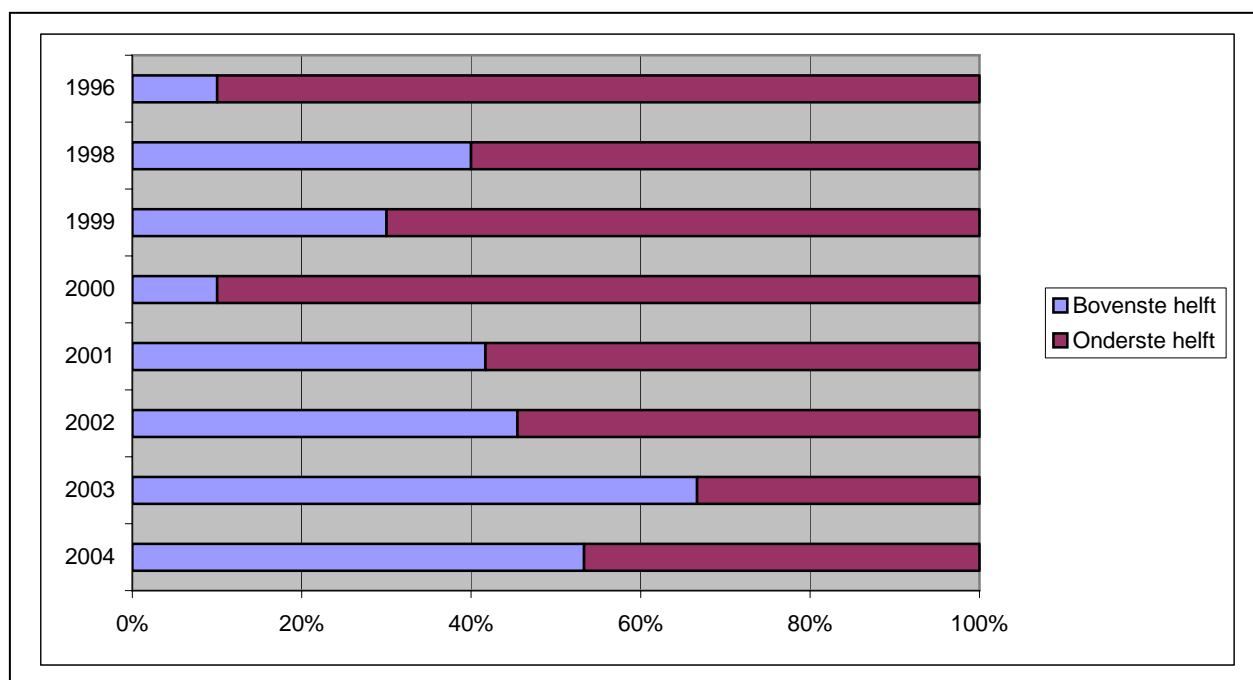


Figure 4: Appreciation of Programmes of Utrecht University in the national rankings of Elsevier; percentage of first places in the rankings in the years 1996-2004.

<i>Year</i>	<i>% 1^e places</i>
1996	0
1998	20
1999	0
2000	0
2001	17
2002	18
2003	40
2004	33

C. Excellence in University Teaching

In order to comply with the demands of permanent educational innovation Utrecht University decided that it needed a group of teachers that are able to manage, or better, to be the leaders in education and in innovation projects. To provide for this need the focus was on high potentials, that were in their disciplinary research and in their education at a high level of qualification: (assistant) professors, that might become directors of educational programs, were able to develop new programmes, and were capable to elaborate large scale innovations. In 2000 a first group of 16 persons were selected by the deans to start a learning programme of 15 months. The programme consisted of a meeting of 1,5 day each month, coached project activities in their departments, study visits to universities in Europe and North-America etc.(Ramaekers, 2002). Workshops of high quality, intervision, teamwork and coaching on specific, individual issues result in a long and intensive programme, that ends in a working conference with the Board of the university and the deans in combination with the presentation of the certificates by the Rector Magnificus (authority!). In 2006 the seventh group will start with this programme. The results can be seen in the positions these trainees now have in the development of new educational programmes, their leadership in existing programmes and in the elaboration of large scale innovations. In most departments these teachers are seen as the key persons in educational leadership. Not all persons are still at UU, not everybody is working in these positions, but to a substantial degree (more than 1/3 of the programme leaders) and many other important management positions in UU-education are taken up by former participants of this programme of Excellence in University Teaching (Quality Assurance Committee of the university, leading in major curriculum innovations in Pharmacy, Medicine, Law).

The *conclusion* from the analysis of the data is that the intended policy on this issue was realised to a high degree, leading to a substantial enhancement of the quality of those teachers, that form the leadership in the academic education.

In the elaboration of strategy 2, the teachers as designer and developer of education, measures D and E are distinguished.

D. Changing the perspective of the teachers into designers and developers of education

The perspective of the teachers as designer and developer of education is in university education a more or less self-evident point of departure, related to the diversity of disciplines and courses. But in the period between 1970 and 1990 a strong tendency has been among educational researchers and educational policy makers to use a more industrial paradigm (model) of innovation, in which teachers were more or less considered to be executing educational constructs that were developed elsewhere by specialists in educational development. In that policy organisational units were set up that had the task to develop education by writing programmed instruction, teaching machines, CAI-programmes, video programmes, sets of test items etc. with specially appointed and trained personnel. However, influenced by many failures in the implementation of this paradigm, by the high dynamics in the disciplinary and professional domains, the changing place of (encyclopaedic) knowledge, and by the development of the concept 'learning organisation' in the theory of innovation, a different paradigm has come to the fore. In that trend teachers are more

considered as learning professionals who to a larger extent (in an organisation of teams) also should be given the responsibility and authority to design and develop educational programmes. In the analysis we found evidence for the position of the teachers changing into a situation in which taking initiative and being responsible for new programmes and innovations in the curriculum are frequent and considered the common position.

That change in paradigm also goes with a different vision on training and competency of teachers (see measures A and C), and a different position and task of the specific expertise of educational researchers and advisers. This shift in paradigm also influenced the position and responsibility of the centre for educational expertise in Utrecht University. IVLOS, the Institute of Education, as educational unit supporting the educational policy of the Board and deans of the university changed her task in the direction of advising, consultant work, support of teachers and programme management that had identified a problem and were seen as problem owners; the production of educational materials was stopped, top-down approaches were transformed in a co-operative responsibility for future educational activities, by thinking in scenarios agreements were developed about concerted investments. In the strategic plan 2006-2010 this is formulated as follows: "Teachers will get more possibilities to develop education in collegial exchange of ideas and from their own professional expertise, and to organise instruction in a small scale set up to well-organised groups of students".

Although it is difficult to quantify the results of this cluster of measures, we can draw the *conclusion* from the analysis of the data that the situation is now to a high degree as intended in the strategy, leading to a substantial change in the competencies of the teachers.

E. Fostering excellence in learning and teaching

An important development was the decision to found the Utrecht University College, an Honours College, as a separate unit of the UU, with all instruction in English, residential, international oriented, 600 students. This College is selective (Dutch universities are not selecting their students), has a different educational concept (small scale instruction in groups of 25 students, with academic core courses, a Bachelor programme with major-minor, already some years before the UU as a whole changed into the Bachelor-Master structure).

The most capable (excellent!) teachers of the UU were invited to give the educational programmes in this College, those teachers had real authority amongst their peers and reported about their experiences in this College with authority in the UU- organisation at the time that for the whole of the university the points of departure of the Bachelor-Master structure were decided and implemented: academic competencies, interdisciplinarity, portfolio to be used by all students, instruction in small groups, more commitment in educational activities etc. (Vermeulen & Van Kammen, 2002a, 2002b). Many of these characteristics have been brought into the innovation process by UU-teachers, based on their experiences in Utrecht University College. From their position of authority amongst the teachers they were able to show leadership in the innovation process, and influence discussions in the years of implementing the decisions (Wolfensberger et al., 2004).

The large scale of this innovation process certainly also resulted in a real restriction of the possibilities of the teachers as designers of their own education. Some measures restrict the possibilities in a very strong way (e.g. one time schedule with four half-semester that start at the same day (an radical innovation in this old university), all courses have the same 7,5 ECTS (European Credits), all students use a portfolio). However large differences exist between the programmes, which make it impossible to give a general description of the situation. In some programmes with large numbers of students (e.g. Law) a strong unification arose, in other, small scale programmes this was not so much the case. It is clear that in this situation there is a considerable tension between vision and realisation. However, a striking tendency is that some recent developments go in the direction of small scale organisation of

education in new Colleges, with a specific character within a large programme (e.g. Law), to be founded around teams of teachers, for students that will be selected. And that these developments are considered to be a further elaboration of the original vision. The initiative to this development did come from teachers, and in that initiative the influence of the 'high potentials' (see activity C) was clearly visible.

In recent years also the policy on furthering excellence has led to the founding of Honours Programmes in Utrecht University. The Strategic Plan 2006-2010 will lead to Honours Programmes in all faculties and to an interdisciplinary Honours Minor. The data from the first implemented programmes show a high motivation and quality of the teachers (and the students) involved (Van Eijl et al., 2006).

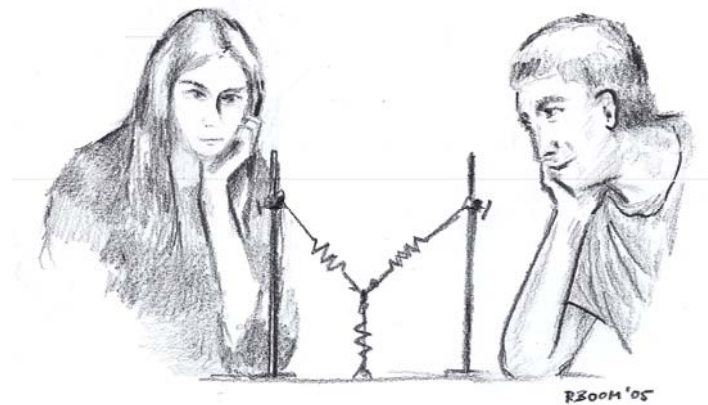
The *conclusion* from the analysis of the data is that the intended policy on this issue was realised to a considerable degree, leading to a substantial enhancement of the quality of the teachers.

In the elaboration of strategy 3, the teacher as professional expert in the practice of the activities that are characteristic in his discipline and his profession measure F is distinguished.

F. Changing the role of teachers in authentic practices

Teachers in Utrecht University are primarily experts in their domain, proud on their discipline, appointed and promoted because of their knowledge and competencies in their field or profession. In the last century the curricula more and more developed in the direction of long routes of training in which basic, foundational knowledge was passed on, skills were learned, fundamental knowledge had a central position, while the situation of the professional practice was kept outside the educational activities until the end or even after the programme (figure 5). The extent to which this happened was different, but for the teacher it meant that that his educational tasks were becoming more and more on a distance from the practice of the domain (in the sense of a distance to the activities in his community of practice). A more scholastic content of the subjects and the educational methods have led to a teacher that no longer could or wanted to show the connection between his expertise and authority in the practice of his discipline and profession, and his role and task as teacher. Important causes for this development were the enormous expansion of the (scientific) knowledge (more and more fundamental knowledge were put into the programmes), and (in the Netherlands) the growing number of students in combination with the reduction of the budget for higher education.

Figure 5: 'story about the teacher not having a proper answer ...'



Students: "Miss, why do we have to do this assignment, why should we learn this? I want to become a physician ..."
Teacher: "Euh, yes, no, maybe, euh, ..., yes, no, ..."

Teacher: "In this image the two students do not appreciate the practical assignment I thought was very motivating. Although I had found a way to deal with problem solving skills, the physics class was rather boring. Physics was reduced to making exercises, and I wanted to include some more hands-on activities. So, I designed a more or less open assignment in which the students could verify that in a 'spider web' the sum of the vectors of forces indeed added up to zero. I was excited about this idea; most students, however, did not appreciate it at all."

In secondary education researchers started to focus on: how to integrate problem solving skills within a physics class which in its intrinsic nature makes sense to the students, in which they at every step of their learning process understand why at this point they extend their knowledge in a certain direction. In other words, how a certain assignment, a certain physics problem is part of a larger meaningful context (Lijnse and Klaassen, 2004).

In Higher Education in the nineties a development started that has led to a *different vision of higher education*, a different selection of content, and a different choice of educational methods, assessment and a *different role of the teacher*. Distinguishing in this vision is that the practice of the domain was combined with the programme by giving the characteristic tasks, problems and cases a key position in the curriculum. With the concept 'practice' we refer to the characteristic activities and expertise in a community of practice. Of course the authentic tasks and problems are adapted to the educational situation, and the teacher keeps next to the role of project manager from the practice also the role of teacher. Some examples: in Mechanical Engineering (at the University of Twente in the Netherlands) a project was implemented to design a can crusher, in Computer Science (first in Twente, next at Utrecht University) a project to develop a software product and a business case; in Chemistry (Utrecht University) a research project (Bulte et al, 2005; Bulte et al., 2006; Pilot & Bulte, 2006). The inspiration for this development came from the experiences at Alborg University in Denmark.

The *role of the teachers* in these instructional projects is that of the expert from the discipline. Their knowledge has to be up-to-date to support and assess the students in new, authentic tasks, that nearly always are related to a real external client or assessor. The teachers are and remain in this way in their own activities (and in their learning process) much more involved in the dynamics of the practice of their own domain of competence. Their expertise and authority remain related to this field. They are the leaders of the projects and have and keep the relation with the external community of practice that the students want to belong to.

They are their coach and at the same time the manager of the project who give them tasks and assesses their results before they show these externally. The relation is rather that of a junior to a senior, than that of a student to a teacher. The teachers are not the ones who know everything, but they are the guide on the way to issue knowledge, they do not assess multiple choice questions, but organise peer-assessment; sometimes presenting some of their expertise, but primarily coaching in a balance between controlling learning processes and co-operating on project results. They show the route to the criteria that external assessors will use, instead of presenting a list of educational objectives.

Next I will describe in summary the teaching and learning phases in general terms, to be used as heuristic guidelines for the design of similar examples (see for more details Bulte & Pilot, 2005).

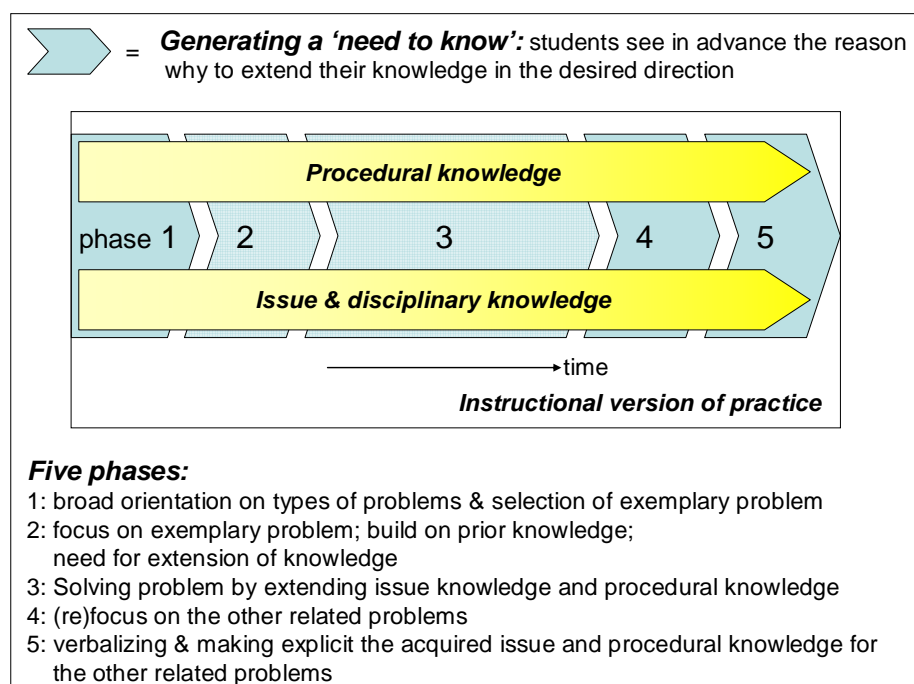


Figure 6: A framework for meaningful science education: the subsequent teaching and learning phases embedded within an instructional version of an authentic practice.

Phase 1: During the broad orientation on the practice, students start to recognise typical problems that are posed in such a practice, and at the same time they discover that a general characteristic procedure of the practice typically leads to solutions to these problems. Because of their appreciation of the purpose served by solving such problems students become motivated for an imitation of the authentic practice, focusing on an exemplary problem.

Phase 2: By a first analysis of the exemplary problem, their pre-knowledge concerning the issue and their common sense (intuitive) notions concerning a characteristic procedure are expressed and used. Students realise that for solving this exemplary problem, their issue knowledge is not sufficient. That is, they realise that they need to learn / have more detailed issue knowledge.

Phase 3: Students proceed through the steps of the procedure working toward a solution of the exemplary problem, whilst extending the relevant knowledge, and when necessary, also

refining steps of the procedure, until a satisfactory procedure is reached, and a solution for the problem can be presented.

Phase 4: Students realise that for solving practice related problems similar to the exemplary problem, they need to express the necessary steps of the procedure.

Phase 5: Students make a project plan for solving other problems characteristic for the practice. By doing this they explicitly use the complete operational procedure.

An important message for the design of separate units is: it would require a thorough analysis what the exact nature of the related authentic practice is about. An inadvertent mixing up of different types of practices within one unit will inevitably confuse the students what their learning is about and what the focus of their learning should be.

This development to a new role of the teacher started in UU in 1998, first in a cautious way in some departments (Chemistry projects), sometimes through Honours programmes as laboratories for innovation (Wolfensberger et al., 2004), in recent years also in other departments (Physics (Wills et al, 2004), Pharmacy, Veterinary Science, Social Sciences, Computer Sciences (Ten Berge et al., 2005; Nab et al., 2006), etc.) This development is until now certainly not at a large scale, but from the perspective of an innovation process this would not be realistic, as the size of the innovation is large for teachers, students and management. However, it is striking that this development is steadily going on, cautious and moderate, but irreversible: nearly all of these risky innovations were successful without signs of failure and relapsing into the old situation. It seems that the teachers involved are conscious of the trend, but also understand how far-reaching the consequences are for the vision on education, for the role and task of the teachers and for the infrastructure.

Discussion and conclusions

The research question that is the basis for this paper is: What strategies are feasible to enhance the competencies and motivation of teachers in university education on a large scale? The framework for this research was the question how the competencies and motivation of the university teachers as a key factor in the quality of educational innovations how could be enhanced. To answer this question we concentrated on one case, the process of innovation in Utrecht University in the last ten years. We analysed the policy documents, evaluation data and activity reports to find data on indicators on the vision on the position of the teachers and on the measures that were taken to enhance the competencies and motivation of the UU-teachers. We analysed to what extent these measures have resulted in intended outcomes of each measure and found that this was to a considerable or high degree was the case. We also found in the data that this has resulted in major innovations in the curricula and the quality of education as perceived by the students and external quality assurance committees.

Three strategies and six clusters of measures were described, all aiming directly at the enhancement of the competencies and motivation of these teachers. These measures appeared to be consistent with the educational vision and policy on the position of the teachers. Analysis of the realised activities and their results show that these measures have resulted to a substantial extent as intended.

The results of the development show that the design of the policy has been realised to a considerable extent. At the same time it cannot be determined in a sharp way to what extent this vision and strategies indeed have influenced the results, because the situation is too complex, too many factors are involved (like budget cuts, changes in appointed personnel, changes in the law on higher education etc.).

However, an analysis of the results shows that on key issues the vision is realised and that indicators show in the current situation that the position of the teachers as developers and designers of education is enhanced in quality and quantity. When we interpret the measures and the results in the theoretical framework it is plausible that the measures taken have led indeed to a certain extent to the enhancement of the competencies and motivation of the teachers. And that this enhancement has made it possible to carry on indeed the large scale innovations that have been implemented.

Methodologically more precise indicators are needed for securing this research through the characteristics of the curriculum, the activities of the teachers and their observations of the situation. Also a comparison with other institutions of higher education in a multi-case approach would be worthwhile for a better understanding of the influence of different measures. We expect that this can be done in co-operation with the Oxford Network for Enhancing Teaching and Learning in Research Intensive Environments of which Utrecht University is a member (Gibbs, 2005). This network of universities consists of a selected group of universities that lead the way in quality assurance policies for the educational tasks in a research environment. This is a challenge for future research activities.

At the same time we can indicate a number of problems that are a challenge for the innovation process in the future. What will be the direction for the future developments in higher education, what are the key factors to deal with in the continuing innovation processes, what policy will contribute to these processes and what measures are decisive for the progress and the results? Based on the results of this research and the expectation that higher education will be characterised by a changing position of knowledge in the initial academic education, a new relation between teaching and research (cf. Brew, 2006; Jenkins & Healey, 2005), a high level of dynamics in disciplinary content and educational policy, it is plausible that the learning processes of teachers in their professional roles and tasks should have a central position within a framework of a learning organisation. The policy concerning the facilities, infrastructure, responsibilities and authority of teachers has to be focused on this. The three strategies that were described have supported substantially the realisation of the development in the past years, and it is plausible that also in the near future these strategies can support the realisation of this policy.

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