The teacher as designer:
experimental web based training of teachers in an
Instructional Systems Design approach.
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Introduction

Higher education is confronted with a new trend, in which the transmission of knowledge is becoming a less central teaching activity than supporting students’ learning processes. More and more, the design of learning tasks will become an important part of the role and tasks of polytechnics’ teachers. This trend is sometimes referred to as: ‘new learning’ or ‘learning process oriented teaching’ (Simons, van der Linden & Duffy, 2000; respectively Verloop & Vermunt, 1999). New learning means that learning tasks are job-realistic, the student is responsible for the proper solution of problems, and students have to use of professional methods and tools to solve the problems in their tasks. This calls for new roles of the teacher, such as coach and monitor of students, and as designer of study tasks that promote ‘new learning’. The design and construction of series of these complex learning tasks is a completely new perspective for teachers. The knowledge-transmission perspective since long is a widespread and well-known teaching concept (Pratt, 1998). Now higher education teachers, especially in polytechnics, are supposed to master also the role of task designer. This transition from transmitter to task designer often leads to problems, as stated in visitation reports of Dutch institutes for higher education (HBO-Raad, 1996).

In the research-project “The teacher as designer”, we conduct experiments with groups of polytechnics’ teachers, to examine the influence of training in an Instructional Systems Design (ISD) approach on their attitude to re-use this approach and on their performance with this design approach. Though ISD approaches are not frequently used by teachers (Klauer, 1997; Moallem & Earle, 1998), we suppose that they may help the teachers to solve their design problems because of its systemic character. The ISD approach treats problems of design of study units as part of the curriculum ‘as a system’ (Reigeluth & Avers, 1997). An exploratory study into the teachers’ actual approach of design of study units preceded the experiments. In this paper, we describe this exploration as well as a web-based experiment with 36 instructor-teachers of 16 teacher-training colleges. For detailed reports, we refer to Hoogveld, Paas, Jochems and van Merriënboer (2001a, b).

Exploratory study.

In two Dutch Teacher Training Colleges (“Pabo’s” in Dutch), we explored the design approaches of ten instructor-teachers. The two colleges were working at the innovation of their curriculum. The instructor-teachers had to design or redesign study units and experienced problems in that. A first method to collect data about these
teachers’ design practices consisted of mapping their approach. We asked the teachers to describe meticulously all the activities in developing a study unit. As a second method we collected data on design by positioning teachers’ on a nine point scale between low and high congruence with each of 29 activities of an ISD-expert’s design approach for study units. This would enable us to map the difference of an ISD approach with teachers’ usual approach. As a third method of data collection teachers had to position themselves on three nine-point scales with each six new teacher roles relevant to process oriented teaching and learning (Vermunt & Verloop, 1999). The first scale dealt with recognition of the role in teachers’ daily practice. The second scale dealt with importance of these six roles for the innovation of the teacher’s College curriculum. The third scale dealt with the urgency, the need for training in the new roles felt by instructor-teachers. These roles are: the teacher as diagnostician of the student’s learning and thinking strategies; the teacher as challenger of his students, to experiment with new learning and thinking strategies; the teacher as a model, who demonstrates learning strategies; the teacher as activator, of successfull earlier strategies; of monitor, or coach in self regulated learning; and finally as evalutor of the quality of the thinking strategies of the students.

The results of this exploration can be summarised as follows: we collected in total 118 activities with the first method. To reduce this amount of data and to clarify the differences of these elements with existing ISD approaches, we let two experts sort all activities over the seven categories of the widely accepted ISD model of Leshin, Pollock and Reigeluth (1992). Tabulated, the frequencies of activities over the Leshin model’s categories and the number of teachers, that generated these activities, look as follows:

<table>
<thead>
<tr>
<th>Design phase in the ISD model of Leshin et al.</th>
<th>Number of activities</th>
<th>Number of teachers that generated these activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyse the problem</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Analyse domains</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>Analyse &amp; sequence tasks</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Analyse &amp; sequence supporting content</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Specify learning events &amp; activities</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>Perform interactive message design</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Evaluate instruction</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Total number of activities</td>
<td>118</td>
<td></td>
</tr>
</tbody>
</table>

It is remarkable that only so few of the teachers generated so few activities in the phases of analysis of the (instructional design) problem, message design and evaluation
of instruction, compared to the number of activities in the other phases of design. The results on the comparison with an ISD’s expert activities are more or less comparable: the lowest median falls into the design categories of the problem analysis phase and the preparation of the evaluation phase. The results with the new roles are as follows: the recognition had the lowest scores for the roles of diagnostician, activator, and evaluator. The importance scores were in all of the roles higher than the recognition scores, except for the role of model. The urgency for training scores were the highest for the diagnostician and evaluator roles and lower for all other roles, which implies, teachers would like more training for these roles than for the other roles.

In conclusion our exploration revealed a consistent pattern of low scores on analysis or diagnosis on the one hand, and evaluation on the other hand. If we consider that design always consists of the five ‘ADDIE’ phases: analysis, design, development, implementation and evaluation (Visscher-Voerman, 1999), then the conclusion can be drawn, that these polytechnic’s teachers seem to show elementary lacks in two important phases of instructional design: analysis of the design problem and evaluation of implemented design. At the same time, the teachers indicate a need for training in these phases of design. This may be a first explanation of why the translation of new principles, demanding new teacher roles, other than the well-known transmitter role, into new learning tasks and study units is a problem for the teachers. Probably an approach without these lacks, for instance an ISD approach, could be profitable for the teachers’ design problems.

Web-based Experiment.

The results of the exploration were used to set up an experiment to measure the influence of training polytechnic’s teachers in instructional systems design. Thirty six instructor-teachers of 16 teacher-training colleges, ("Pabo’s") participated in the experiment. We randomly attributed the participants to one of two conditions. Condition 1 was the ISD training (ISD-condition). Condition 2 was a training of equal length to optimise the experience based design approach of the teachers (EXP-condition). Preceding the experiment the undivided total group received a questionnaire, with a replication of the role research from the exploratory study to depict the possible differences in the conditions considering new teacher roles. In each condition the experiment consisted of 20 hours of web based training, spread over four weeks of study. The training program consisted in both conditions of the same four blocks of one week in duration: introduction, evaluation, design of learning tasks, design and the curriculum. In both conditions, the training was followed by an experimental individual design task, which consisted of a global design of a study unit to be used by the teacher. During the design task the participant had to apply as much as possible of what was
learned in the web-based training. After delivery of these designs via the web, the participants received, also via the web, a rating scale of fifty 5-point Likert items, to evaluate the design approach as a possible support in design. The delivered designs were rated by two experts in instructional design on nine items concerning the quality of the design. Before presenting the results, we first give some more details of the differences between the training conditions.

In Condition 1, the ISD condition, the training consisted mainly of the “whole task approach” from the Four Component Instructional Design Model for complex cognitive skills (van Merriënboer, 1997). This model fits well to the design of competency based learning and learning professional tasks. The model’s main characteristic is a profound analysis of the constituent skills of a complex cognitive skill. Constituent skills can be recurrent or non-recurrent. For these different skills, schema formation follows different paths. The schemas of recurrent skills consist of rules of which the algorithms can be analyzed and described for active support during the acquiring process. Heuristics underlie non-recurrent complex cognitive skills and can be described in terms of the professional’s systematic approaches to problem solving. This process can be supported by a description of mental models and cognitive feedback during learning.

In condition 2, the Experience based condition, the training consisted mainly of three steps. The first step consists of a clear description of learning objectives. Not in formal terminology of end-terms but just in terms of what the teacher exactly wants the student to learn. Definition of outcomes is the second step. In the third step the teacher has to list appropriate instructional strategies such as project work, case based approach, and task approach. The next step is to generate possible learning tasks, through which the teacher tries to start active learning by the student. A final step is a reflective working through the interrelations between what is defined in the foregoing steps: what is the outcome of a task, how does the task contribute to the learning results, aimed at by the teacher, what kind of feedback on performance can be given by the teacher? This reflection helps to re-arrange the choices of the teacher as a kind of means-ends analysis in his instructional decision-making.

The results of the role-questionnaire, taken before the start of the experiment, supported the earlier findings of the exploratory study, indicating that the diagnostician-and evaluator roles had the lowest recognition scores and the highest score on urgency for training in these roles. For all other roles, the reverse was found. The results of the experiment showed positive training effects in both conditions. Most of the participants had enjoyed the flexibility of the web-based training in an instructional design approach, mainly because they could do it on moments convenient to them. A substantial part of
the participants experienced also some problems, especially in the planned collaborative exchanging of design idea’s during the training. This was due to unfamiliarity with discussion groups and the synchronizing of agenda’s. This problem was solved by more intense use of mail and individual feedback. In summary, the hypotheses that the ISD condition will be evaluated more positively than the EXP condition and that the ISD condition’s designs will be of higher quality.

Conclusions and discussion.

The findings in the exploratory study and the web-based experiment strengthen our idea that problems, polytechnics’ teachers experience while developing new study units are related to their lack of experience in instructional design. These findings can be interpreted in the light of the recent transition in roles from the teacher as transmitter of knowledge to the teacher as supporter of the learning process. To realise this new learning, the teacher has to do two things: one is to prepare for the new roles of coaching learning processes and the other is design the right learning processes. The six coaching roles and the role of designer are not yet common practice, especially not the diagnostician and evaluator roles. When teachers are going to take an active role in the curriculum process, as proposed by Lang et al. (1999), then both of these role aspects (coaching and designing) will become more and more important to learn, since there can be no coaching without design of tasks that are to be coached. A web-based training can offer teachers comfortable solutions for personal training needs.

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