



Instituut ELAN
Instituut voor
Expertise-ontwikkeling in het VO
Lerarenopleiding
Aansluiting VO-HO
Nascholing in het VO



Professionalising teachers for implementing web based working spaces

Dick Slettenhaar, University of Twente, Institute ELAN
Sjoerd de Vries, Universiteit Twente, Communicatie Wetenschappen
Jos Beun, Het Assink Lyceum, Haaksbergen
Steven Verwaard, University of Twente, Communicatie Wetenschappen
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Universiteit Twente
GW - ELAN
Postbus 217
7500 AE ENSCHEDE

tel.: 053 - 489 3560
fax: 053 - 489 4755
elan@edte.utwente.nl
<http://www.utwente.nl/elan>

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1 Abstract

The research presented is a case study after the implementation of an innovation. The innovation is the 'Medieval Lab'. This is an online working space for students (grade 12). In this working space the students learn by 'enquiry learning'. Fitting out the lab and managing it calls for the development of specific competences in teachers. Research aimed at finding clues for supporting the development of these specific competences is started.

In and around the 'Medieval Lab' students, teachers and other actors form a Community of Practise (CoP; Lave and Wenger, 1991).

As a first step in the research, Actor Network Theory (ANT; Fox, 2005) is used to identify the actors and to analyse their relations and identifying conflicts in the actor network. These conflicts will give direction to the development of services and instruments that support the development of the specific competences the teachers need and the interventions needed to overcome these conflicts.

The central question in the research, presented here, is: which actor networks play a role in the innovation? Derived from that: which are the correspondences and the differences between the actor networks?

In particular, the answers to the latter question will, is expected, give starting-points for interventions. These interventions will be supported by services and instruments as stated before.

A additional aim is to gain experience with the use of ANT in an educational context.

Applying ANT showed that the human actors in the network had different perceptions of the roles and/or the intentions of each other. Based on these outcomes interventions and next steps in the research are planned.

ANT seems to be a powerful instrument for mapping actors, their relations and identifying conflicts in networks.

2 Introduction

2.1 Subject/problem

The research presented is a case study after the implementation of an innovation. The innovation is the 'Medieval Lab'. This is an online working space for students (grade 12). In this working space the students learn by 'enquiry learning'. Fitting out the lab and managing it calls for the development of specific competences in teachers. Research aimed at finding clues for supporting the development of these specific competences is started.

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An additional aim is to gain experience with the use of ANT in an educational context.

2.2 Relevance

Online research labs, collaboratories, communities of practice, and many more concepts are used to address networked groupware applications used for knowledge development and exploitation. In the context of this paper, we are interested in an authentic workspace, the 'Medieval Lab', and media channels for learners and other 'co-workers'. Within these workspaces we develop didactical arrangements that enable learners to work together with teachers, professionals to 'produce productions'. These productions may be issued by media channels.

The 'Medieval Lab' is applied in higher secondary education. The central theme is 'social, economical, and cultural aspects of the historical period between 1100 and 1400'. In our case, these labs do function as independent web applications; however they are part of an integrated lab platform Sciencelabs (www.dinkel.konict.nl). This lab platform offers integrated services, like personal study rooms, job aids, webcast facilities, a helpdesk, metadata profiles and publication opportunities (eZines: electronic magazines).

Teachers play different roles within the lab platform, like coach of learning processes, producer of new content and knowledge circulator with colleagues.

The object of Actor Network Theorie is to explain how networks grow. ANT has been developed by Callon en Latour (Fox, 2005). The theory gives clues for describing equal actors bound in a network to gain a certain goal (Stalder, 1997). A network not only consists of humans and social groups, but also of artefacts like documents, etc. (Walsham, 1997 in Gao, 2005, p.257). These actors need to be treated equally when analysed (symmetrical analysis: Fox, 2005). Not every actor is 'visible' for every other actor. Sometimes, actors are hidden behind another actor that acts as a black box. In case of conflicts actors 'open up' the black box and act upon the hidden actors (Fox, 2005).



Figure 1. Screenshot of the 'Medieval Lab'

3 Method

3.1 Service tracking method: a design research approach

Gravemeijer (2001) sees (developmental) research as a process in which thought experiment and practise experiment alternate. A thought experiment leads to an Hypothetical Execution Trajectory (HET) which contains goals, plans and hypothesis of the execution of the HET.

In the following practise experiment the HET is performed, which leads to some sort of results. After that, as part of the next thought experiment, a reflection on the results takes place. New insights are gained, which lead to the growth of know how, the conjectured local theory. Based upon this reflection the next thought experiment is performed, or the gained insights are laid down in the conjectured local theory, i.e. in the form of a proven concept.

Streefland sees (developmental) research from the point of view of the level theory of Van Hiele (1986) as a (collective) learning process of progressive theorizing which connects the conjectured local theory to general theory.

Van den Akker distinguishes three phases in (constructivistic developmental) research: the preliminary phase with a front-end analysis which leads to a prototype. The prototype is evaluated with formative evaluation. The next phase is the formative phase in which the pilot is improved by formative evaluation. The last phase is the retrospective phase in which the final version of the pilot is reformulated into a design by summative evaluation.

Armanto (2002) distinguishes as outcomes of this process successively the desk version, the early version, the try-out version and the ornate version

From these approaches we distill our approach. It includes three phases (see Figure 2).

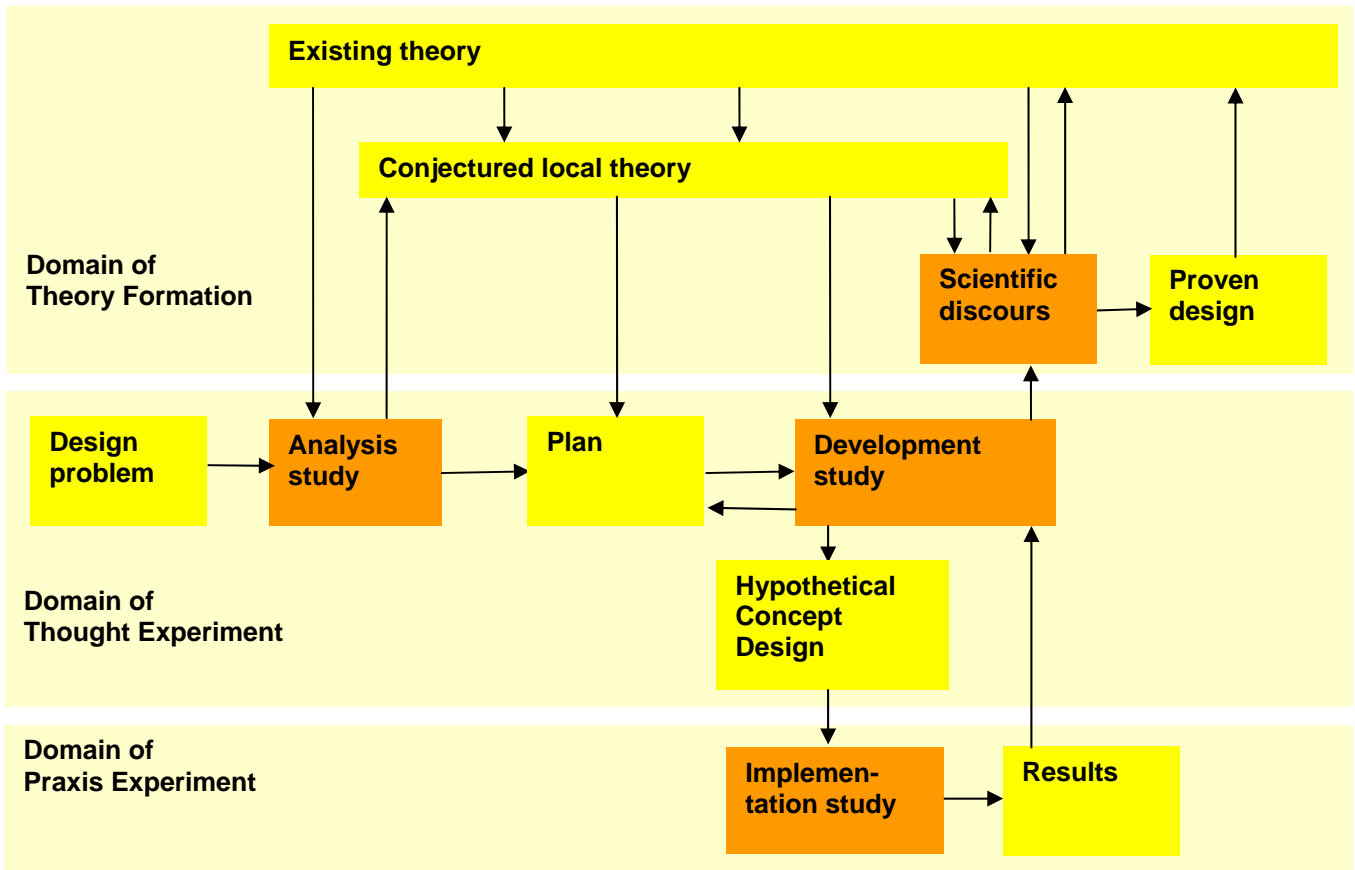


Figure 2: DeResA: A practical DDesign REsearch Approach

The first phase refers to analysis study. Based on these studies, decisions are made regarding the design and implementation of for instance a research lab. These decisions can be described in a plan, for instance ‘the global functional structure of a social science lab (1). The second phase is called development study, where guidelines are studied and produced and a research lab is realized based on these guidelines (3). Guidelines and lab are called the concept design. The third research phase is called implementation study. We consider these studies as studies focusing on a specific aspect of a concept design in a specific context of use. Phases two and three are (mostly) part of an iteration process in which the original goals are ‘closed in’ until the goals are met in a satisfying way. As a result, we may get a proven concept that meets the expectations of users.

In order to be useful the transitions between the various phases of DeResA have to be equipped with instruments. These instruments will be context dependent.

3.2 Procedure

De steps in DeResA are followed

Analysis study

A reference model is constructed.

Participants in the research are one principal, 1 teacher, 10 students. These participants have been interviewed. The interviews were semi structured.

The interviews all had the same content and structure. Questions asked concerned name, role within the school and towards the innovation, the network as they saw it (actors, relations, weights), knowledge and skills needed.

Data is analysed quantitative in frequency, mean and standard deviation. Data is analysed qualitative on actors mentioned, similarities and differences.

4 Results

4.1 Analysis study

In the Analysis study a reference model is constructed (Figure 3)

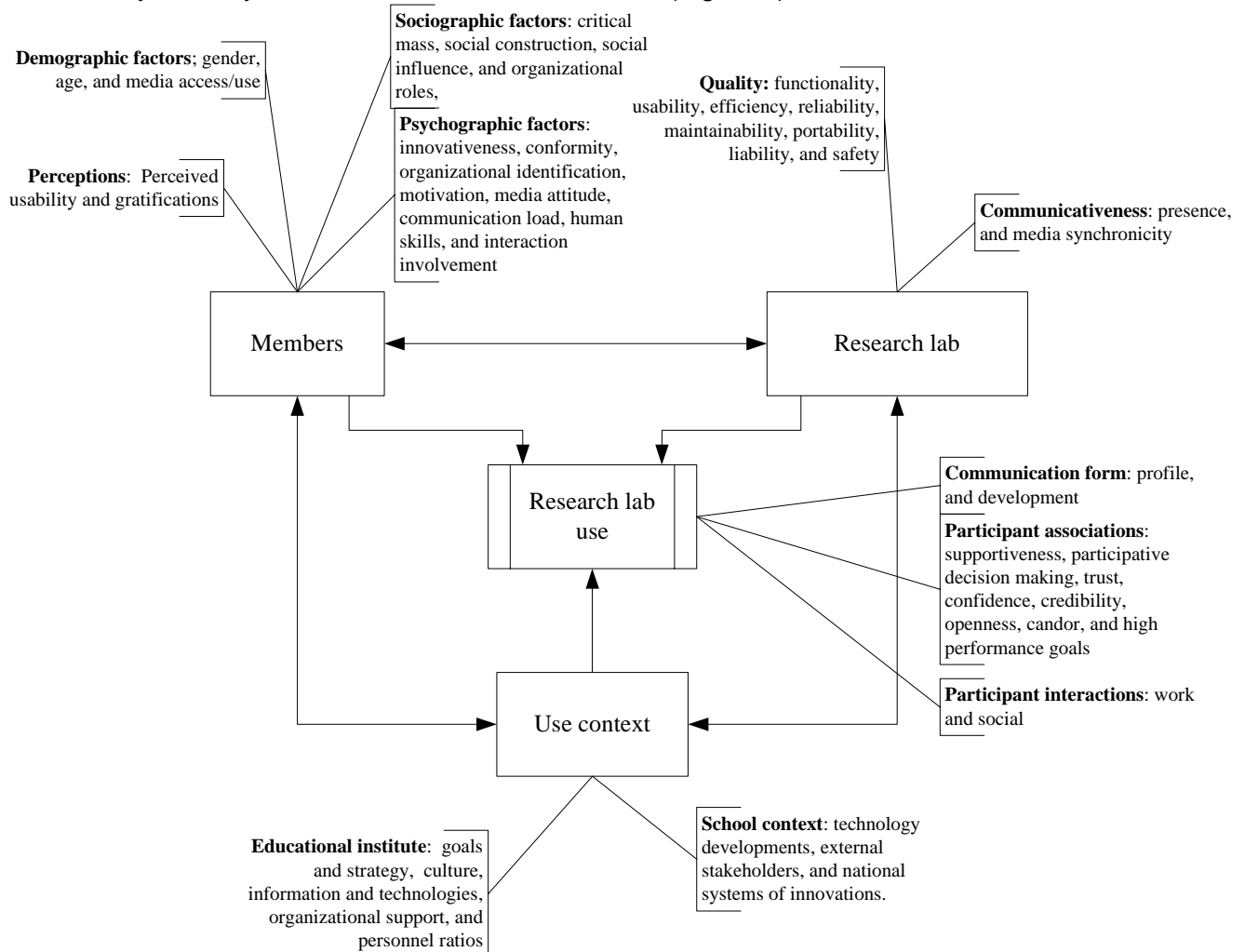


Figure 3: Reference model for research labs

4.2 Implementation study

Figure 4 shows an example of a network, drawn by a student.

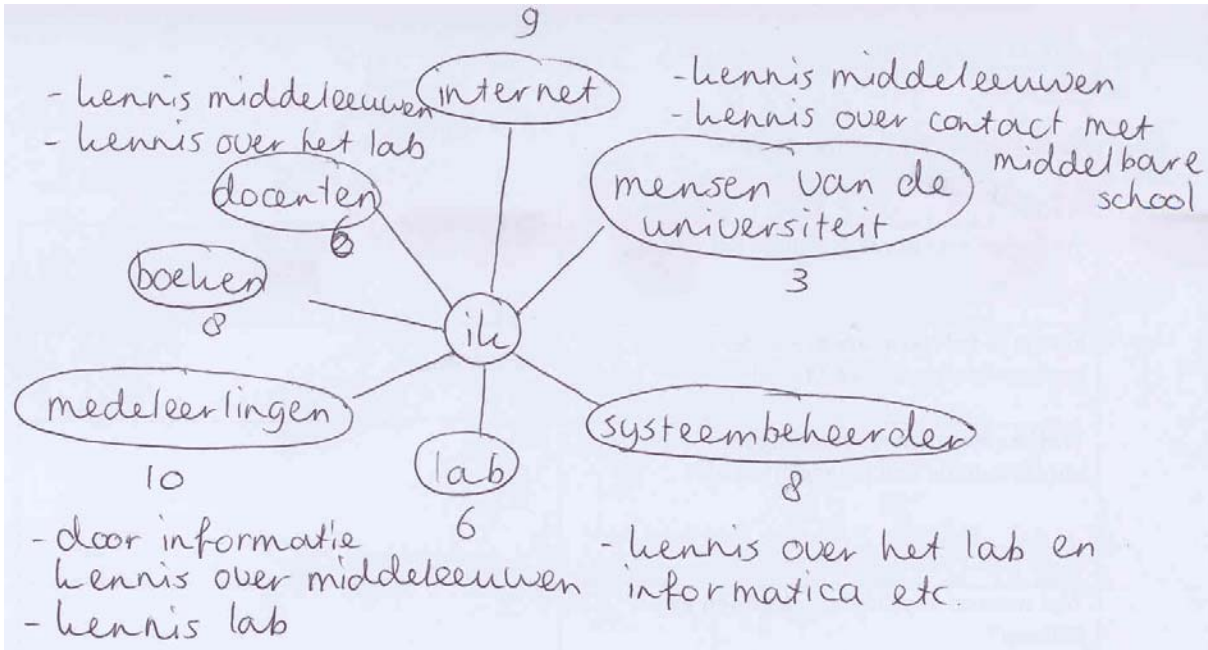


Figure 4. Example of a network, drawn by a student

In the following tables (Table 1 t/m 4) the data of the interviews have been summarized.

Table 1. Actor network of a student that did work with the ME-lab

| Role | Leerling, heeft gewerkt met ME-lab | | | Quantity: 5 | |
|--------------------|------------------------------------|--------|-----|--|---|
| Actor | # | Weight | | Know/being capable of | Remarks |
| | f | m | SD | | |
| Student individual | 5 | - | - | Coöperation Knowledge of lab and internet Capable of working with the lab | |
| Students | 5 | 9,4 | 0,8 | Knowledge of lab and internet (2 x) Capable of working with the lab (3 x) Know what the assignment is Coöperation Acquire knowledge about the middle ages by working with the lab | |
| Teachers | 5 | 7,0 | 1,3 | Knowledge of internet and computer (3 x) Knowledge of subject matter (3 x) Being able to explain (3 x) Capable of helping by solving problems Combining the normal lessons with the lab Influencing subject matter Urging students to work No: 'autonomous learning'/do it yourself Give clues | |
| Moderator | - | - | - | | |
| Profile team | - | - | - | | 'invisible' in network or these students |
| Board | 0 | - | - | | 'Invisible' in network for these students |

| Role | Leerling, heeft gewerkt met ME-lab | | | Quantity: 5 |
|-----------------------|---|-----|-----|---|
| System administrator | 4 | 7,5 | 0,9 | Knowledge of internet and computer (3 x) Make the lab work (2 x) |
| External (university) | 4 | 6,3 | 2,0 | Knowledge of internet Knowledge of subject matter Knowledge of secondary education Develop the ME Lab (2 x) |
| Internet | 5 | 7,0 | 3,1 | |
| Books | 4 | 7,8 | 0,8 | |
| Info, other | 4 | 7,3 | 1,2 | |
| ME-lab | 4 | 4,6 | 1,9 | |
| Implementation | | | | Passwords and user names should be known It must be clear what you have to do (5 x) Bring under attention regularly |

Table 2. Actor network of the students that did not work with the ME-lab yet

| Role | Leerling, gaat werken met ME-lab | | | Aantal: 5 | |
|-----------------------|---|---------------|-----|---|--|
| <i>Actor</i> | # | <i>Weight</i> | | <i>Know/being capable of</i> | <i>Remarks</i> |
| | f | m | SD | | |
| Student individual | 5 | - | - | | |
| Students | 4 | 7,3 | 1,9 | | |
| Teachers | 5 | 6,0 | 2,1 | Knowledge of internet and computer (4 x) Explain things well Give clues Influence on discussions Knowledge of subject matter (4 x) Showing interest Pass on to students | |
| Moderator | - | - | - | | |
| Profile team | - | - | - | | 'invisible' in network or these students |
| Board | 0 | - | - | | 'invisible' in network or these students |
| System administrator | 2 | 8,0 | 1,0 | Knowledge of the lab | |
| External (university) | 2 | 7,5 | 0,5 | Consulting teacher and students Influence on archive | |
| Internet | 4 | 7,3 | 1,2 | | |
| Books | 5 | 7,6 | 1,2 | | |
| Info, other | 3 | 6,3 | 2,5 | | |
| ME-lab | 4 | 8,3 | 0,4 | | |
| Implementation | | | | Clarity (3 x) Well ordered (3 x) Working connection (2 x) Good introduction Help pages Good communication between teachers, experts and pupils | |

Table 3. Actor network of a teacher that did not work with the ME-lab yet

| Role | Docent (Engels) | | | Quantity: 5 |
|-----------------------|-----------------|--------|----|---|
| | # | Weight | | Know/being capable of |
| Actor | f | m | SD | Remarks |
| Student individual | | - | - | |
| Students | | 6 | - | Using (and expanding) their natural curiosity and readiness to explore things Learning from each other |
| Teachers | | 6 | - | Subject matter coaching role (careful) Process guarding, progress talks |
| Moderator | | 9 | - | |
| Profile team | | - | - | |
| Board | | 2 | - | Supporting teachers and students |
| System administrator | | 2 | - | Support Help with construction lab Help with maintenance |
| External (university) | | 2 | - | Knowledge circulation with teachers in higher education Knowledge circle (also: sociability) |
| Internet | | 3 | - | |
| Books | | 2 | - | |
| Info, other | | 2 | - | |
| ME-lab | | - | - | |
| Implementation | | | | Motivation: To do more with the attractive sides of your main subject Cooperation with colleges Initiative by the working people, not from the authorities of the school |

Table 4. Actor network of the unit director

| Role | Unitdirecteur | | | Quantity: 1 |
|-----------------------|---------------|--------|----|---------------------------|
| | # | Weight | | Know/being capable of |
| Actor | f | m | SD | Remarks |
| Student individual | | - | - | |
| Students | | 8 | - | |
| Teachers | | 7 | - | Coaching |
| Moderator | | - | - | |
| Profile team | | 10 | - | Programmatic, theoretical |
| Board | | - | - | Guide, facilitate |
| System administrator | | 9 | - | Technical |
| External (university) | | - | - | |
| Internet | | - | - | |
| Books | | 6 | - | |
| Info, other | | 6 | - | |
| ME-lab | | 6 | - | Didactical, pedagogical |
| Implementation | | | | |

5 Discussion

The number of people that were interviewed is rather low, so the results should be interpreted with care. Nevertheless, some of the things that surfaced:

- The various aspects (like black boxes) of actor networks occurred as ANT mentions
- The actors that represented groups in the school (students, teachers, principals) had different perceptions of the roles and/or the intentions of each other
- Teachers are in need for contact with external expertise on teaching and learning

Based on these outcomes interventions are planned like

- Clarifying perceptions to the various actors
- Clarifying the didactical approach towards students. With consequences for the fine tuning of the didactical approach and of the online educational materials and the professionalising of the teachers
- Realisation of a knowledge circle on teaching and learning matters for teachers and external experts. Online and eye-to-eye. This will support the professionalising of the teachers

ANT seems to be a powerful instrument for mapping actors, their relations and identifying conflicts in networks.

Next steps in the research involve

- a more expanded and detailed mapping of the actor-networks using ANT.
- Analysis of the various aspects of the use of the 'Medieval Lab' platform by teachers and students
- Clarifying the competences, needed by the teachers and the students, in order to be able to use a lab platform like the 'Medieval Lab'

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