Designing a research methodology based on a theory of learning: A practical case in teacher training

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Purpose

• To show and discuss an example of:
  • choosing a theory of learning and
  • designing a methodology, based on that theory, for exploring a phenomenon

Some of the problems of research

• Finding and defining a problem
• Choosing a theory
• Making the theory operational
• Constructing coding and analyzing instruments
• Using and refining the instruments
• Producing results
• Interpreting results

Research context
Four studies
Problem
Theory
Methodology
Results

Context

Discussion

From theory to methodology
New problem definition
Methodology
Study

Problem
Theory
Methodology

From theory to methodology
New problem definition
Methodology
Research context

- Ph.D. dissertation
- Didactical knowledge development in a pre-service teacher training program
- Methods course
  - Last year mathematics students with no teaching experience
  - Centered on curriculum design
  - History of mathematics education, curriculum, foundations of school mathematics and curriculum organizers

Working methodology

- Pre-service teachers organized in groups
- Each group chooses a topic
Research problem

- To explore, describe and characterize the evolution in the didactical knowledge of the groups of pre-service teachers on content analysis along the method course.
Four studies

Presentations
- Qualitative
- Audio recording of group working at home
- Process of negotiation of meaning

Productions and performance
- Quantitative
- Information in transparencies
- Comparing groups
- Characterization of stages
- Development

One group interaction

Didactical unit design
- Quantitative and qualitative
- Use of content analysis notions
- Stage and variables meanings

Context and information sources
- Selection of a group of pre-service teachers
- Group composition
- Audio recording of group interaction preparing their work
- 950.5 minutes recorded
Example of a transcription

• In the following episode, the group establishes the formula of the acceleration, finding it in a textbook [053,21646,22094]:
  • P3: ( ). Ey, look! The representation of the position.
  • PX: The position.
  • P3: You see? The representation of the position has the form of a parabola.
  • P2: Yes, look, path of particles in space ( ).

First approach to the problem

• Two purposes
  • Describe the evolution of this group's didactical knowledge
  • Use this information to explain some of the results of the other studies
• Process versus results
  • The other studies explore and characterize the result of the work of the groups
  • This study looks into the details of the process producing those results
• Focus on the group's didactical knowledge
  • Construction and development of social meanings
  • Based on individual meanings

Choosing a learning theory

• How to describe the learning of a group?
  • The appearance, development, negotiation, materialization, and use of the group's social meanings
• We found that learning theories focusing on the learning of the individual were not relevant
• From the social theories of learning we chose Wenger's
  • It takes into account most of the other theories ideas that are relevant for our problem
Social theory of learning

- Social theory and other theories of learning
  - It is one of several complementary theories of learning
  - It is not necessarily contradictory with other views about learning
  - Each theory focuses on different aspects
  - Learning is multidimensional problem
- Learning as a social phenomenon

Learning as a social practice

Meaning (negotiation)  Practice  Community  Identity

Our (changing) ability—individually and collectively—to experience our life and the world as meaningful changes who we are and creates personal narratives of becoming in the context of our communities.

How in which... Shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action as competence.

The negotiation of meaning emerges from the interaction of two processes:
- Participation
  - We establish relationships with other people
  - We define our way to belong to the communities in which we engage on some enterprises
  - We develop our identity
- Reification
  - process of giving form to our experience by producing objects that congeal this experience into “thingness”. Every community produces its abstractions, tools, symbols, stories, terms and concepts that reifies some of that practice in congealed form.
Learning as a social practice

- Process through which we experience the world meaningfully
- Source of coherence of the communities
- Does not exist in abstract
- Exists because people engage in actions whose meanings are negotiated

Learning emerges in practice

- Evolving forms of mutual engagement
- Understanding and tuning the enterprise
- Developing the repertoire

How to engage

- Aligning the enterprise
- Defining identities
- Establishing who is who, who is good at what, who knows what

Relations

- A community represents the history of a practice in its process of negotiation of meaning
- Communities can be seen as histories of shared learning, learning as the engine of practice, and the practices as shared histories of learning
- The combination of participation and reification determine and affect the conformation of practice, and define the direction in the negotiation of meaning
- In this way, different types of participants are established. Among them, the beginner, whose incorporation to the community implies a a process of legitimate peripheral participation
**Learning**

- Practice is an unstable, emerging structure
- Learning in practice implies a mutual engagement in the search of joint enterprise with a shared repertoire
- Learning in practice involves three processes:
  - Evolving forms of mutual engagement
  - Understanding and tuning the enterprise
  - Developing the repertoire

**Learning components**

- Evolving forms of mutual engagement
  - How to engage
  - What helps and what bothers
  - Developing mutual relations
  - Defining identities
  - Establishing who is who, who is good at what, who knows what
- Understanding and tuning the enterprise
  - Aligning the engagement
  - Accountability and responsibilities
  - Defining and interpreting the enterprise
- Developing the repertoire
  - Renegotiating meanings
  - Producing and adopting tools, artifacts and representations
  - Recording and recalling events, inventing and redefining terms
  - Telling stories
  - Creating and breaking routines
Categories of analysis and aspects

- Mutual engagement
  - Environment
  - Identities
  - Relationships
  - Meaning
- Joint enterprise
  - External conditions
  - Content
  - Enterprise and responsibilities
- Shared repertoire
  - Resources for the negotiation of meaning
  - Other

Producing a set of codes

- Detailing the meaning of the categories of analysis
- Adapting those categories to the research problem
- Defining and revising the codes

Mutual engagement

- Mutual engagement
  - Environment
  - Identities
  - Relationships
  - Meaning
- Joint enterprise
- Shared repertoire

Mutual engagement

- Mutual engagement
  - Environment
    - What helps? What bothers?
      - Other courses
      - Literature
      - Classmates
      - Teaching experience
      - Textbooks
      - Other groups
      - Technology
      - Career training
- Identities
- Relationships
- Meaning
- Joint enterprise
- Shared repertoire
Mutual engagement

- Mutual engagement
  - Environment
  - Identities
    - How are they defined?
    - Who is good at what?
    - Who does what?
    - Who knows what?
  - Relationships
  - Meaning
- Joint enterprise
- Shared repertoire

Examples of codes

- Relating to an episode
- Teaching experience
  - At least one participant refers to his experience as teacher
  - Who is good at what
    - The group identifies a participant as competent for a task or a participant proposes himself as such
- Confusion on meaning
  - Evidence of confusion of one or more participants concerning the meaning of a given issue
- Commentaries to the transparencies
  - A reference is made to the commentaries to the transparencies
- What is valued
  - Evidence of aspects of the work that are valued by the group
  - Working routines
    - A working routine is established by the participants
- Connections
  - A reference is made to connections among systems of representation
We have used the theory for:
- identifying the categories of analysis
- choosing those aspects of the categories that interest us
- taking into account our research interests
  - We have formulated questions that give meaning to those aspects
- the research problem
  - How do the different forms of mutual engagement evolve?
  - How is the enterprise defined and tuned?
  - How do the shared repertoire, the style and the discourse develop?

Information available
- Audio recordings of the group working to solve the course tasks
- Transcription of those recordings
- Design of instruments for
  - Coding the transcriptions
  - Analyzing the results of coding
**Codes set**

- Producing a first set of codes based on
  - Categories, aspects and questions
- Checking the codes in practice
  - Refining, creating and eliminating codes while coding
- Final set of 94 codes
- An episode
  - A fragment of the transcriptions containing statements or interaction about an idea or message

**Coding process**

- Identifying, recording and characterizing episodes
  - Episodes of different lengths
  - Episodes within episodes
  - Different codes for one episode
- Episodes comments
Example of a coded transcription

In this episode, a participant whose behavior corresponds to complementary participation, complains about the behavior of the leader:

"I see, now he is the specialist. Since he has been teaching, he is the only one who knows everything"

Codes
- Personal relationships, leader, complementary participation

Comment
- There is tension again, they complain about the leader: he is the one who knows everything

Coding a tape transcription

- Identifying transcription episodes
- Assigning codes and comment to each episode
- Cyclic revision of the above
- Recording coding notes
- Recording episodes, codes and comments in the database

Coding an episode (example)

Recordings
├── Transcriptions
│   ├── Coding
│       ├── Identifying episodes
│       │   ├── Assigning
│       │       ├── Notes
│       │       └── Codes
│       │           └── Comments
│       └── Codes set
└── Theory
    └── Categories and aspects

7412 episode-code pairs
Coded synthesis 1

- 7412 records in the database
- Producing tapes’ transcription summaries
  - Working on codes, comments and notes
  - Producing listings of comments associated with codes and notes’ issues
- Summaries’ database
  - Tape number
  - Title
  - General description of the tape’s transcription
  - Topics included
  - Most relevant issues

Mutual engagement issues (example) 1

- First hour of preparation of the final document
- 1) Environment
- 2) Definition of identities
  - a) The leader’s role continues to be central in the planning of activities and the proposal of ideas
- 3) Relationships
  - a) There is less tension, they are tired and the leader seeks consensus
  - b) Intense participation
Coding synthesis 2

- The identification of issues
- Listing of issues summarizing the 950.5 minutes of recordings
- For example,
  - There is a leader and his behavior was crucial in the group's performance
- Need for coding analysis

### Coding analysis 1

- Three purposes
  - Describe each issue, identifying its main characteristics
  - Identify the episodes better representing those characteristics
  - Support the characterization of the issue with the episodes' evidence
- New methodological problem
  - Each issue might involve more than one code
  - High number of episodes for each code
  - For example, 475 episodes for the code "Search of meaning"
- Issues' database
  - Issue
  - Codes
  - Categories and aspects
Producing results 1

- Describing, characterizing and supporting an issue
  - General description of the issue
  - Description of its characteristics
  - Presentation, description and analysis of episodes supporting each characteristic

Producing results 2

- Producing a summary of the characterization of issues and the results related to each aspect
- Producing a summary of the results related to each category of analysis
- Going back to the theory in order to talk about the group’s learning
Example. Identities: leader's role

- Results
  - There is a leader
  - The other members behave in complementary participation manner
- Leader characterization
  - Plans the work outside the meetings
  - Organizes the tasks the other members are expected to do
  - Plans the work during the sessions
  - Directs the discussion, not allowing it to diverge
  - Encourages the other members to do their tasks
  - Suggests ideas and defines the discussions contents
  - Gives instructions
  - Verifies the work of the other members

Example: leader's role

- The leader takes the responsibility of planning the long term work and of organizing the tasks of the other participants
- For example, in a session preparing a presentation on the history of their subject matter, he defines the tasks the other participants should do before the next meeting
  - "I say: why don't each of us brings its part summarized and structured for coming saturday?" [044,49182,49425]
- The following is an example of two episodes in which the leader manages and steers the discussion in the search of the group's efficiency [052,29180,29373] and [065,55604,55685]:
  - P1: OK, I agree, but we have to talk about the groups, stop kidding... OK, besides those two large groups. The area calculation... Then, what?
  - (...)  
  - P1: ( ). OK, let's do it. What else? Problems... What else!

Scheme summarizing the procedure 1

- Transcriptions
- Coding
- Codes set
- Categories
- Theory of learning
- Episodes DB
- Summaries DB
- Issues DB
- Coding synthesis
- Comments & episodes
- Aspects
- Categories
- Notes to coding
- Coding synthesis
- Learning

Scheme summarizing the procedure 2

- Episodes DB
- Issues DB
- Analysis
- Representative episodes for each issue
- Characterizing the issue and supporting it on evidence
- Description of aspects of a category
- Description of social learning corresponding to a category
Results example: mutual engagement

• Four aspects:
  • environment, identities, relationships and meaning
• Environment:
  • teaching experience, practice course and textbooks as main elements
• Identities:
  • leader’s role and complementary participation
• Relationships:
  • relaxed working atmosphere with moments of tension
• Meaning:
  • permanent effort of meaning search, many occasions of meaning confusion and meaning conflict. Different mechanisms for resolving confusion and conflict, giving rise to meaning proposals involving some times meaning discovery that can become reified

Discussion

• One vision on learning
  • Emphasizes some aspects
  • Allows us to “see” phenomena that can be relevant and are obscure to other perspectives
• Complexity of the conceptual and methodological procedures
• Relationship with the study’s research problem
• Relationship with the research project goals

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