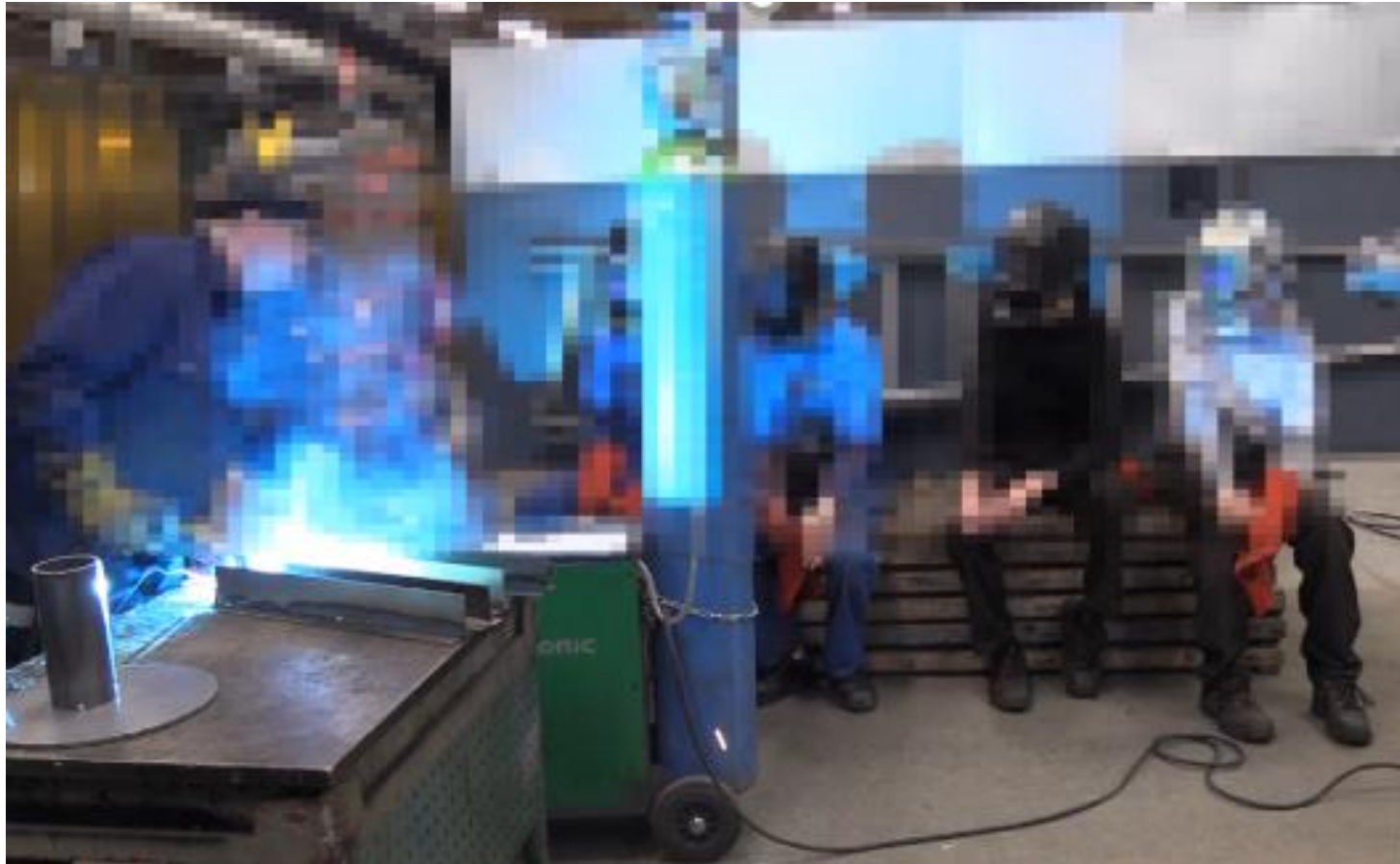


# Subject specific pedagogy in technical vocational education – the implementation of a new way of teaching



Subject specific pedagogy in technical vocational education – the implementation of a new way of teaching...  
...in welding education

Context:

- the quantity of welders around the world is overwhelming
- extensive research in the welding engineering business, in areas such as welding procedures, welding equipment, additive material, steel constructions and automatization
- educational research regarding welding has focused on the introduction of virtual reality technology (Huang et al., 2020; Rodríguez-Martín & Rodríguez-González, 2019; Torres et.al, 2017)

Action research project:

- *Learning to weld in vocational education*

The focus of this paper:

- How can tools from CAVTA provide support for the teaching of settings regarding MIG/MAG welding?

# The implementation of a new way of teaching – CAVTA (Conversation Analysis and Variation Theory Approach)

## Emergence of the theoretic framework:

- Inspired by Emanuelsson's and Sahlström's (2008) ideas of combining conversation analysis and variation theory
- Asplund & Kilbrink (2018), Kilbrink, N., & Asplund, S.-B. (2020b) explored the combination as an analytic tool in technical vocational education
- Developed into a pedagogic approach in the project *Learning to weld in vocational education: "as a fundamental point of departure in teachers' work on planning, executing and evaluating their own teaching"* (Asplund & Kilbrink, 2020, s.4)




# CAVTA a new way of teaching practical objects of learning in technical vocational education


The simultaneous and intertwined combination of the two perspectives - CAVTA

Establishing a shared understanding of what they are orienting towards

1. T: får ja se om du förstod detta jag sa med e: jag ser  
can I see if you have understood what I said with e: I see  
2. att (.) de-det du gör nu är det korta rörelser eller är det  
that (.) wh-what you do now is that short movements or is it  
3. långa rörelser med tillsatsmaterialet?  
long movements with the additive material?  
4. S: långa va?  
long right?  
5. T: nej jag tyckte du gjorde rätt kort jag (.) ta:e: gö:  
no I thought you did quite long I thought (.) take:e: do:  
6. överdriv så får jag se hur du gör om det blir långa  
exaggerate so I can see how you do if it gets long  
7. rörelser  
movements  
8. S: (5.0)/(för vänster hand fram och tillbaka))




9. S: där är långa  
ther:e are long  
10. T: preci:s å då går du över å gör korta istället då  
exa:ctly and then you go over and do short ones instead then  
11. S: (6.0)/(gör små rörelser med vänster hand))



12. T: det är bra du har förstätt vad de: vad jag menar med det  
that's good you have understood what it what I mean with that

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(Kilbrink, Asplund & Axelsson, 2019)



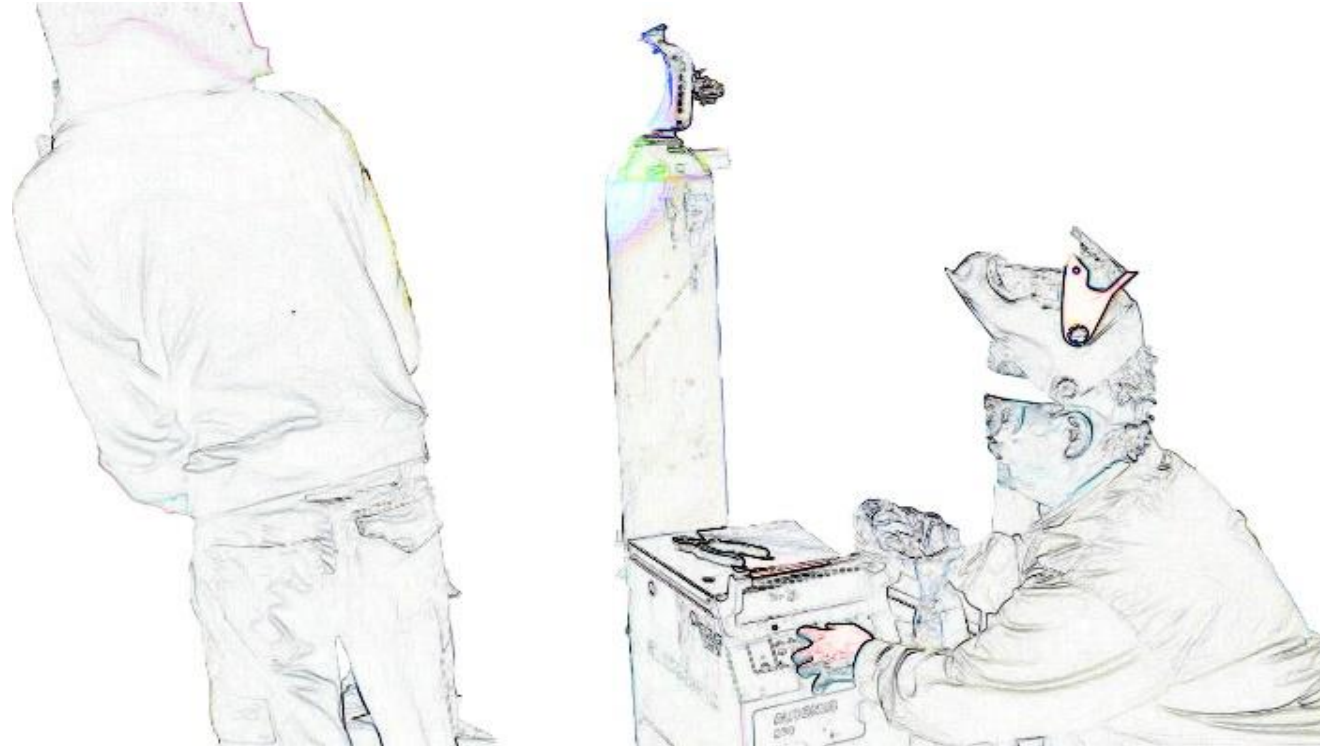
The biggest change throughout the cycles of the third year - the sound aspect

The teaching session of cycle 1, demonstration:



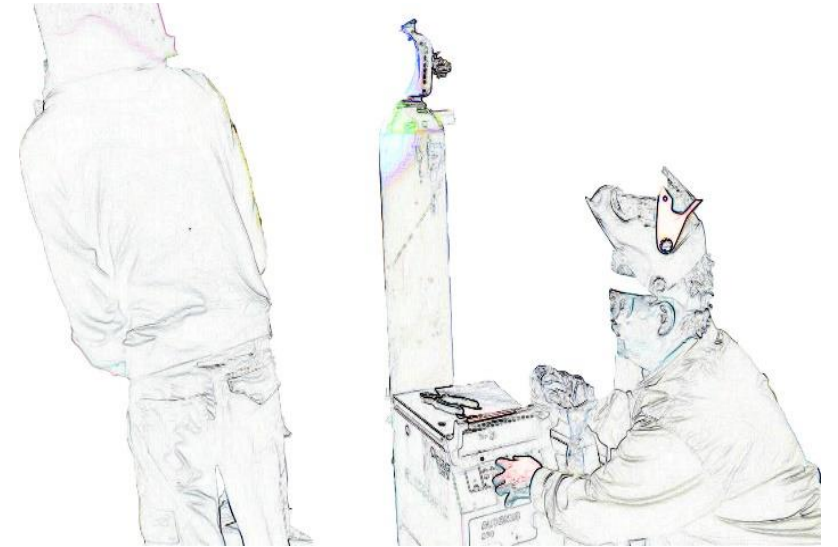
The biggest change throughout the cycles of the third year - the sound aspect

The teaching session of cycle 2, individual welding:



# The manifestation of CAVTA in the example – the enactment of the teaching session

- 1 ((the welding begins (4.0) – the sound is hissing, mixed with irregular popping sounds))
- 2 T: more wire (.) or less?
- 3 ((S turns his head towards T, but continues welding))
- 4 S: more
- 5 T: more
- 6 ((S is welding (4.0), while T slowly turns the knob controlling the wire speed, the sound changes towards a much more regular and sizzling sound))
- 7
- 8 S: and more
- 9 T: more?
- 10 S: yes:
- 11 ((S nods and continues welding (5.5) the continuous change in the sound towards the regular sizzling sound is simultaneous with T's increase of the wire speed))
- 12
- 13 S: more
- 14 T: more
- 15 ((S is welding (3.5), T slowly continues adjusting the wire speed, and the the sizzling sound becomes even more regular))
- 16
- 17 S: more
- 18 ((S continues welding (4.5), T still turns the knob which raises the wire speed and the frequency of the short circuits which cause the sizzling sound is much higher than at the beginning of the welding))
- 19
- 20
- 21 S: more
- 22 ((14 seconds excluded from the excerpt))
- 23 S: yes, that's about it, then
- 24 T: yes, you can stop, then

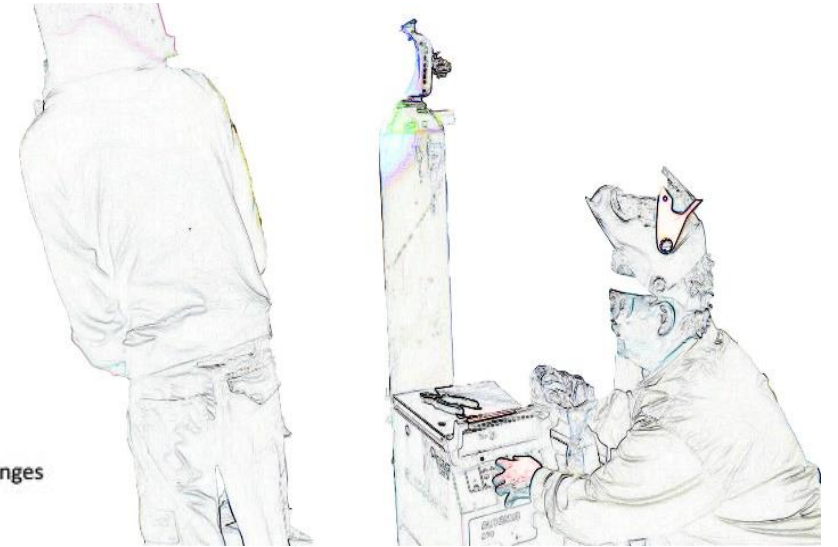


# The manifestation of CAVTA in the example – the enactment of the teaching session

CA:

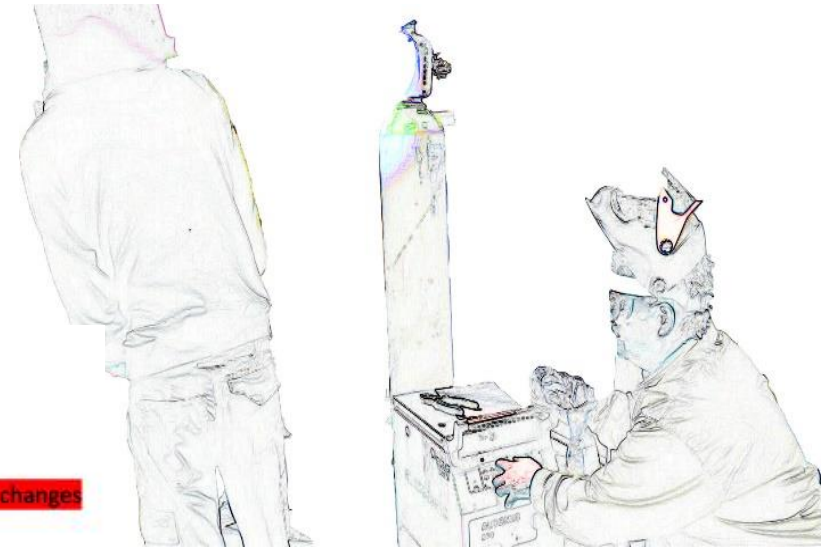
- Enabling interaction
- The use of multiple multimodal semiotic resources
- Orientation towards a shared understanding

1 ((the welding begins (4.0) – the sound is hissing, mixed with irregular popping sounds))  
2 T: more wire (.) or less?  
3 ((S turns his head towards T, but continues welding))  
4 S: more  
5 T: more  
6 ((S is welding (4.0), while T slowly turns the knob controlling the wire speed, the sound changes towards a much more regular and sizzling sound))  
7  
8 S: and more  
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13 S: more  
14 T: more  
15 ((S is welding (3.5), T slowly continues adjusting the wire speed, and the sizzling sound becomes even more regular))  
16  
17 S: more  
18 ((S continues welding (4.5), T still turns the knob which raises the wire speed and the frequency of the short circuits which cause the sizzling sound is much higher than at the beginning of the welding))  
19  
20  
21 S: more  
22 ((14 seconds excluded from the excerpt))  
23 S: yes, that's about it, then  
24 T: yes, you can stop, then





# The manifestation of CAVTA in the example – the enactment of the teaching session



## CA:

- Enabling interaction
- The use of multiple multimodal semiotic resources
- Orientation towards a shared understanding

1 ((the welding begins (4.0) – the sound is hissing, mixed with irregular popping sounds))  
2 T: more wire (.) or less?  
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12 sizzling sound is simultaneous with T's increase of the wire speed))  
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14 T: more  
15 ((S is welding (3.5), T slowly continues adjusting the wire speed, and the sizzling sound becomes  
16 even more regular))  
17 S: more  
18 ((S continues welding (4.5), T still turns the knob which raises the wire speed and the frequency  
19 of the short circuits which cause the sizzling sound is much higher than at the beginning of the  
20 welding))  
21 S: more  
22 ((14 seconds excluded from the excerpt))  
23 S: yes, that's about it, then  
24 T: yes, you can stop, then

## VT:

- A specified narrow object of learning
- A separation of an expected critical aspect via
- The variation of dimension called contrast
- The student's discernment
- The targeted critical feature

## Discussion and conclusion

CAVTA – a pedagogic approach inspired by...

- conversation analytic perspectives and
- variation theoretic ideas...

...seems to help the teacher probing into the students' learning progression, thus supporting the teacher to revise the teaching.

- In an ideal learning environment, these issues are dealt with in full-blown learning studies.
- Full-blown learning studies may be difficult to organize and to get means to, though. Nevertheless, CAVTA may also function as a more general approach for welding teachers.
- Review - Deeper knowledge on the object of learning as such (Lindberg et al, 2023)



## Further research

- Results – relevant for teaching practical objects of learning in other subject areas?
- Similarities and/or differences between Technical vocational objects of learning
- New project: *Approaches to subject-specific teaching for increasing opportunities for learning in vocational education* (Funded by the Swedish Institute for Educational Research (ref no 2022-00035))
- Collaboration with teachers from three technical vocational programs and aim to further study and develop teaching in different vocational subject-specific areas:
  - Construction and Installation Programme
  - Handicraft Programme
  - Vehicle and Transport Programme



# Publications deriving from *Learning to weld in vocational education*

Asplund and Kilbrink  
Empirical Res Voc Ed Train  
(2023) 1:21  
<https://doi.org/10.1186/s40461-020-0087-x>

Empirical Research in  
Vocational Education and Training

RESEARCH

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## Lessons from the welding booth: theories in practice in vocational education

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Karlstad, Sweden

### Abstract

This article reports results from a Learning study in which two university based researchers collaborate in a school. During three cycles of Variation Theory (Vt) the researchers explore how these theoretical concepts are used in practice when teacher and student work together and how these theoretical concepts can be used in the study content within vocational education.

**Keywords:** Learning, Variation Theory, Voc

### Introduction

Educational research has been fairly unilateral in the research that has been done on a scientific basis as in the present study. Over the

## Att lägga en TIG-svejsning – en learning study baserad på CAVTA

Nina Kilbrink & Stig-Börje Asplund

### Sammanfattning

Den här artikeln beskriver en learning study om hur svejsning med hjälp av samtalsanalys och variationsteori. Kombinationen av dessa två metoder kallas CAVTA (Conversation Analysis and Variation Theory) och används som en synliggjord undervisningsinnehåll i interaktionen mellan lärare och elever på lärandeobjektet att lägga en TIG-svejsning. Studien har genomförts i ett samarbete mellan två forskare och en svejslärare på en teknisk skola. Resultaten visar på hur man systematiskt kan arbeta med lärandeobjektet på vetenskaplig grund och hur detta kan bidra till för elever och att etablera en gemensam förståelse för det som ska läras ut.

**Nyckelord:** CAVTA, samtalsanalys, variationsteori, learning study, praktisk yrkesutbildning, praktiskt kunnande, svejsundervisning



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## Doing Fieldwork at HOME

THE ETHNOGRAPHY OF EDUCATION IN A...

Loukia K. Sarroub and Claire...

The current issue and full text archive of this journal is available on Emerald <https://www.emerald.com/insight/2046-8253.htm>

## Defining critical aspects in interaction: examples from learning study on welding based on CAVTA

Nina Kilbrink, Jan Axelsson and Stig-Börje Asplund  
Karlstad University, Karlstad, Sweden

### Abstract

**Purpose** – The purpose of this study is to explore how critical aspects can be defined in a learning study without conducting any pre-tests.  
**Design/methodology/approach** – In this study, the authors focus on empirical examples from a learning study on welding conducted in six iterative cycles, with conversation analysis and variation theory (CAVTA) as a theoretical basis. The welding lessons have been video-recorded, and in the study analysis examples where the teachers try to identify critical aspects of a vocational practical object interaction. CAVTA permeates the complete process, where the analysis has been part of the study and further developed when the six cycles were completed.

**Findings** – The results show how critical aspects can be made visible in the interaction between student(s) in the enacted learning situation. In the process, the authors work with the three core critical aspects, displayed critical aspects and targeted critical features in relation to a vocational object of learning where conducting a pre-test to define critical aspects is not educationally possible.  
**Originality/value** – Teaching vocational practical objects of learning could be seen as something that is not taught in the traditional way of learning and the use of the traditional pre-tests in learning is problematic. From that follows, that other ways of finding the critical aspects for the student vocational practical object of learning might be needed. In this study, such a way is presented.

**Keywords:** CAVTA, Critical aspects, Interaction, Learning study, Vocational practical objects of learning

**Paper type:** Research paper

### Introduction

When deciding what to teach, a teacher need not only the knowledge of the content and the educational objectives, but also what aspects of the learning content that cause difficulties for the group of students to be taught. Based on previous experiences or previous studies on subject didactics, teachers can be familiar with such possible aspects (Lo, 2012; Marton, 2013). However, studies dealing with vocational objects of learning in education are scarce (e.g. Asplund and Kilbrink, 2020; Kilbrink, 2018; Kilbrink and Asplund, 2020a; von Schantz Lundgren *et al.*, 2013), and teachers are left to their own experiences when trying to decide what to focus on in vocational subject specific didactics. On the other hand, according to Marton (2013), the most important resource regarding what aspects of the object of learning that are critical is the students. One important aspect of conducting a learning study is to define critical aspects of a specific group of students in relation to a chosen object of learning (Marton and Runesson, 2015; Lo, 2015).

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TEMA: KRAFFTFULL PROFESSIONSKUNSKAP I ÄMNESUNDERVISNING

FORSKNING OM UNDERVISNING OCH LÄRANDE 2023: 1 VOL. 11

29

## ”Du hör att nu liksom spinner han som en katt” – transformation av ett yrkeskunnande till ett undervisningsinnehåll

Jan Axelsson, Nina Kilbrink & Stig-Börje Asplund

### Sammanfattning

Den här artikeln behandlar transformation av yrkeskunnande till ett undervisningsinnehåll. Fokus är hur svejslärare synliggör ljud och hörseltryck i förhållande till lärandeobjektet ”Inställningar av strömstyrkan i svetsmetoden MIG/MAG”, samt hur elevernas förståelse kan utvecklas i undervisningen. Det saknas både praktiska studier och ämnesdidaktisk forskning i det forskningsfält som behandlar yrkesutbildning. Syftet är därför att bidra med kunskap om vad som händer när svejslärare i en learning study systematiskt tränar yrkesämneskunskap i undervisning av ett lärandeobjekt i svetsmetoden MIG/MAG. Empirin består av dokumenterade lärarlagssamtal och filmade undervisningspass. Resultatet påvisar yrkesämnesdidaktikens komplexitet och därigenom kopplingar till ett yrkeskunnandes transformation till ett undervisningsinnehåll.

**Nyckelord:** transformation, CAVTA, variationsteori, samtalsanalys, learning study, yrkesämnesdidaktik



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## Hur allt smälter samman i handlingens centrum

En yrkesämnesdidaktisk studie av transformation, variation och interaktion i svejsundervisning

Jan Axelsson

Fakulteten för humaniora och samhällsvetenskap

Pedagogiskt arbete

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# Questions?

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