

# The effects of synchronous versus asynchronous coaching on the pedagogical action of trainee teachers in plenary situations

Ralph W. Hooreman\* Piet A.M. Kommers Wim M.G. Jochems  
\*Corresponding Author

**Abstract:** Historically the nature of coaching teachers is asynchronously: a reflective discussion with the supervisory coach is the follow-up after a lesson has been taught. We expect that synchronous (immediate) coaching may complement and to a certain extent supplant the asynchronous feedback. Nonetheless, in order to investigate the additional effects of combining synchronous and asynchronous coaching, it is essential to obtain an insight into the effects of synchronous interventions separately from the asynchronous condition.

Test subjects were assigned random to two conditions: synchronous versus asynchronous. The participants were required to show teacher behaviour on the basis of video fragments. An observer scored the quality of this pedagogical action. It appeared from this study that synchronous coaching had significantly greater effects than the asynchronous condition on the quality of the pedagogical action of the trainee teacher.

**Keywords:** teacher education; educational technology; synchronous coaching; feedback; vocational education.

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## 1. Introduction

The nature of regular coaching of trainee teachers is historically asynchronous. The trainee teaches in a plenary mode while being observed by the school practice supervisor and receives feedback in the form of a discussion in which the development of competencies of the aspiring teacher is at stake. The quality of the actual pedagogical action is measured with the dedicated competence assessment tool. This assessment instrument is based upon seven underlying competencies:

1. interpersonal competence;
2. pedagogical competence;
3. subject contents competence;
4. organizational competence;
5. competence in the co-operation with colleagues;
6. competence in co-operating with external actors like parents etc. and
7. competence to reflect and develop.

The underlying assumption is that the level of manifested ideal behaviour shown by the trainee can be observed and rated to the scale of underlying competencies as defined on beforehand.

A big advantage of the asynchronous alternative is that the student has the time to learn from mistakes and to experiment to a certain extent within the limits of sensible education.

Compared to the asynchronous alternative, the synchronous method has the advantage of confronting and at the same time protecting the student with disciplinary problems against painful confrontations such as a lesson running out of hands completely. At critical moments, the coach can draw the attention of the young teacher to what is going on within the students and send him/her a very direct hint on what to do now and how to proceed further, in order to let the trainee experience the success of the complementary intervention.

Comparable practices of “whispering in the ears” via the earpiece are seen nowadays

1. In top sports, including the formula-1 racing where besides asynchronous supervision, synchronous coaching is also applied. We assume on the basis of the theory mentioned below that the quality of the pedagogical action is also improved through immediate coaching.
2. In presenters and programme leaders who are seconded by directors and professionals.
3. In coaching of parents by family therapist who attempts to repair disastrous miscommunication with the partner and with the children.

Therefore, it may be expected that the coaching of teacher trainees will be improved by the integration of synchronous coaching similarly.

Dolk, Korthagen & Wubbels (2000) and Korthagen & Lagerwerf (2001) stress in contrast to Corporaal (1988) that teacher behaviour is not exclusively rational and not

intentional even. The teacher behaviour is often a result of previously experienced reflexes, emotions, routines and intuitions. This non-intentional behaviour manifests especially in situations in which there is no time to consider alternative behaviour.

If the coach, on the basis of behaviour indicators, concludes that the behaviour is in contradiction with the ideally accepted behaviour then he/she may immediately draw the attention of the teacher to this by whispering.

The reward is that the young teacher experiences that the class feels better and sees that the material is transferred much better. As soon as the teacher has adjusted his behaviour on the basis of the “whispering” and has experienced the positive reactions of the students, room is created mentally to get a “grip” on the situation once again. The teacher also has more “cognitive capacity” again to prepare for the continuation of the lesson.

The behaviour that was originally present at the non-intentional Gestalt level (Dolk, e.a., 2000) is as it were “lifted” from the reflex level to the level of overview and insight through “whispering” intervention. In terms of cognition this is called “raising to schema level” (Korthagen & Lagerwerf, 2001). A characteristic of this “higher” behaviour level is that the teacher can now establish relationships between the actual- and desirable behaviour so that the behaviour develops positively over a period of time. A certain amount of “routine” arises, and as the young teacher develops more, a broader and more adequate behavioural repertoire arises whereby attention for other aspects of teaching becomes available. The relapsing to “new” routines is called “level reduction” whereby observation and reaction of the teacher are steered through Gestalts. Functioning at Gestalt level is characterised by a higher level of fluency, whereby attention is completely free for other aspects of the pedagogical situation (Lampert, 1989).

It is stressed above that synchronous coaching can guard trainee teachers against traumatic confrontations in the classroom. In addition, it can be stated that the essential competence of recognising the lesson situations and the choice of appropriate teaching reaction through a synchronous intervention brings it closer to the real practice. The short period between observation, pedagogical reaction and feedback has as the advantage that it is remembered better. There is a second argument for further investigations into the possibilities of synchronous coaching of teachers based on the report by Kulik & Kulik (1988) who indeed established that in connection with the ‘timing of feedback’ immediate feedback was preferable beyond delayed feedback. Mason & Bruning (1999) stated hereby as a condition that “cognitive overload” should be avoided (Sweller, 1999, 2003).

Accordingly, it may be expected that teacher behaviour is steered better through the synchronous intervention than through the traditional (delayed) feedback.

### *1.1. Configuration considerations*

Learning to teach demands a lot from a trainee teacher. For example, dealing with students and offering structured lessons according to his competence that develops over the years. An additional factor demanding attention, the synchronous intervention, may pose a threat for the occurrence of an overload.

The synchronous intervention should be short and clear to avoid “cognitive overload”. This is achieved by whispering only the keywords from the behaviour indicator upon which the teacher behaviour was considered to be less competent. The synchronous intervention will serve as a reference point during a discussion. The coach refers to the behaviour indicator, which he had whispered, eventually supplemented with video material of the lesson. The trainee teacher remembers the moment at which the specific behaviour indicator was whispered, so that the process of awareness is continued further. The discussed Gestalt perspective in this context stresses the relationship network between actual- and desired behaviour (Dolk, e.a., 2000). It has to be remarked that coupled to the feedback theory, in connection with ‘the timing of feedback’, that during the synchronous intervention knowledge arises that in the asynchronous discussion serves as ‘prior knowledge’ (Hannafin, Hannafin & Dalton, 1993; Lawless & Brown, 1997).

We expect that synchronous coaching would form a valuable addition to the regular asynchronous coaching. To test this expectation, both conditions were initially investigated separately.

The hypothesis of this study was formulated on the basis of the plan above: synchronous coaching has an additional positive effect than an asynchronous coaching on the quality of the pedagogical action of the trainee teacher.

## **2. Method**

### *2.1. Participants*

The participants were 40 randomly selected second and third year bachelor of education students. They were divided into 2 groups. 20 students in group 1 received the synchronous experimental coaching. The other 20 students in group 2 received the regular asynchronous coaching (asynchronous intervention).

The average age of the participants who received asynchronous coaching was 21.8 with a standard deviation of 1.9 year. The average age of the participants who received synchronous coaching was 21.1 with a standard deviation of 1.6. Mean deviation was caused by the fact that 9 (5 asynchronous, 4 synchronous) of the 40 students had initially “primary vocational education”, prior to starting the bachelor of education course. The synchronous group had only two students who had just started the course.

It is possible to follow a bachelor of education study in three disciplines: science, language and social sciences. Each of these disciplines consists of different sub-disciplines; for example ‘language’ can be divided into French and English. In this study we did not distinguish between school subjects because the coaching focused on general teaching behaviour and not on teaching behaviour that was linked to specialized subject knowledge.

### *2.2. Materials*

The Fontys competence assessment VO/BVE was used to measure the improvement in the quality of the pedagogical action of the trainee teacher. This instrument describes seven competencies, which should be satisfied by a newly qualified teacher. The

accompanying behaviour indicator should also be looked at in order to evaluate whether a competence has been achieved.

In this study, the quality of the pedagogical action was scored using a five point Likert scale ranging from (1) to (5). The two extremes (1) and (5) indicate respectively, that the teacher shows very doubtful non-competent behaviour or that the teacher shows ideal competent behaviour without any doubt.

The conclusion of a joint project carried out in co-operation with the Digital University was that the acceptance/appreciation with regard to synchronous coaching may be made operational on the basis of three items:

- 1) Comfort of wearing an earpiece.
- 2) Distraction from the actual lesson.
- 3) Being able to convert the synchronous intervention into concrete action.

After the experiment, each test subject underwent an interview in which these items were discussed.

In this study, twenty written fragments were also used besides the two instruments described above. Per fragment, based on one behavioural indicator, the teacher behaviour can be stated as non-competent. The 20 fragments were filmed in two ways. The two versions differed from each other on the basis of two criteria. First, the sequence of filming the fragments was changed. Secondly, small changes were introduced in the fragments, without changing the indicator that points to non-competent behaviour. With regards to changes, one may consider using various groups of actors.

### *2.3. Design and Procedure*

#### *2.3.1. Pre-test*

The 40 randomly selected second and third year students were individually presented with 20 fragments on paper. Per fragment, the teacher behaviour was referred to as non-competent based on 1 behaviour indicator. From the 20 situations described on the paper, 8 were radically altered in consultation with educational experts because the indicator upon which the teacher behaviour could be labelled as non-competent was insufficiently clear.

Based on the described situations, the test subjects were required verbally to mention the indicator referring to non-competent teacher behaviour. An observer scored the quality of the explanation using the (1) to (5) scale of the competence assessment. Prior to the experiment, it was tested whether the observations of the observer corroborated those of the experts. The experts were associated with the teacher-training programme and had the task of establishing the level of competence of the teachers. Cohen's kappa for inter-rater reliability was 0.67.

#### *2.3.2. Experiment*

Twenty students (group 1), were subjected to the synchronous intervention, whereas the remaining 20 students (group 2) were subjected to the asynchronous condition.

In the synchronous condition 20 video fragments (version 1) were presented to group 1. These video fragments were recorded on the basis of the 20 described fragments. Once a fragment was over, the screen went blank and the test subject showed a fellow student and the observer his/her ideal teacher behaviour. The video fragment particularly showed teacher behaviour that was incorrect on the basis of one behaviour indicator. The test subject must show that he/she is able to rectify the incorrect teacher behaviour. If in the observer's opinion the quality of the pedagogical action deserved a score of less than (5), then the keywords of the appropriate behaviour indicator are whispered.

After the experiment, the test subjects of group 1 were involved in an individual interview. The measuring instrument "acceptation/appreciation with regard to synchronous coaching" was discussed. The test subjects were required to indicate if wearing the ear piece was comfortable, or whether they were distracted from the actual lesson by the synchronous intervention and finally whether they were able to convert the synchronous intervention into concrete action.

In the asynchronous condition, the remaining 20 test subjects were involved in a discussion if in the observer's opinion the manifested teacher behaviour was of low quality. This meant that the discussion was directed at the fragments based on which the teacher showed behaviour that received a score of lower than the maximum score of (5) from the observer. The used procedure was further completely identical to that for the synchronous coaching.

### *2.3.3 Post-test*

The test subjects were exposed once more to the video fragments (Version 2). Once again, after each fragment they were required to show how they would act in a comparable situation. Each video fragment once again contained non-competent behaviour on the basis of one exact behaviour indicator. The procedure was comparable with that of the experiment. However, Version 2 of the video fragments differed from version 1 in two criteria. At first, the sequence of the fragments on the DVD was changed. Secondly, there were minor alterations in the fragments without changing the indicator pointing to non-competent behaviour. One may consider employing various groups of actors for this purpose.

### *2.4. Data analyses*

To determine the underlying structure of the "competence assessment", principal component analyses were conducted, followed by rotation to simple structure by means of Varimax rotation (Eigenvalues > 1.0). For each factor items were deleted with loadings < 0.4. It was necessary to conduct this factor analyses because the "competence assessment" had not been validated in previous research.

To investigate whether synchronous coaching had a more positive effect on the quality of the pedagogical action of the trainee teacher, the following were analysed:

1. In which condition was the progression the highest from the average of the 20 fragments?
2. Is there an observable difference in the conditions pre- and post-test per fragment?

3. Is there an observable progression (pre- and post-test) per condition and per fragment?
4. Is the total effect size acceptable?
5. Whether the students who scored low in the pre-test develop more positively through synchronous intervention than in the asynchronous variant?
6. Are certain competencies unsuitable for exposure in synchronous coaching?

### 3. Results

#### 3.1. Reliability of the “competence assessment”

Principal component analysis on a rotated component matrix resulted into 7 components (Eigenvalues > 1.0), which were rotated to simple structure by means of Varimax rotation. Cronbach’s alpha for the ‘competence assessment’ as a whole was 0.88, which is a high value according to Field (2005).

#### 3.2. Analysis of effects of coaching

1. A total overview of the average of the 20 fragments, conditions and situations are shown in Table 1. It can be clearly observed that the synchronous intervention has a more positive effect than the asynchronous condition on the quality of the pedagogical action. The synchronous progression is 1.48, whereas the asynchronous progression is only 0.59.

Moment/condition	Synchronous	Asynchronous
Pre-test	2.06	2.17
Post-test	3.54	2.76

*Table 1 “Mean comparison”*

2. From Table 2 it appears that exclusively in situation 12 of the pre-test there is a significant difference between the two conditions considering the quality of the pedagogical action.

However, the post-test shows significant differences in 18 situations in favour of the synchronous condition. Situation 9 shows no significant difference and the results in situation 10 were significantly better for the asynchronous condition (Table 3). It can be concluded that the test subjects of the two conditions were comparable considering the quality of the pedagogical action during the pre-test. During the post-test this is no longer the case in 90% of the situations, in favour of the synchronous condition.

Situation	N	$\mu_a$	$\mu_s$	t	df	Sig. (2-tailed)	Mean difference
12	20	3.2	2.5	2.333	38	0.025**	0.70
The other 19 (20-1)	20					>0.05	

\*\*Significant at the  $\alpha=0.05$  level,  $\mu_a$ =Asynchronous mean,  $\mu_s$ =Synchronous mean

*Table 2 “Pre-test: synchronous vs. asynchronous”*

Situation	N	$\mu_a$	$\mu_s$	t	df	Sig. (2-tailed)	Mean difference
9	20	3.05	2.80	1.086	38	0.284	0.25
10	20	4.10	3.55	2.476	38	0.018**	0.55
The other 18 (20-2)	20	< $\mu_s$	> $\mu_a$			<0.05**	

\*\*Significant at the  $\alpha=0.05$  level,  $\mu_a$ =Asynchronous mean,  $\mu_s$ =Synchronous mean

*Table 3 “Post-test: synchronous vs. asynchronous”*

3. Analyses point out (Table 4) that only in situation 18 of the synchronous condition, there is no significant difference between the pre- and post-test.

The asynchronous condition shows in 12 situations (2,4,6,8,9,10,14,15,17,18,19,20) a positive significant difference between the two measurement moments. In situation 12 the difference is negative and in the remaining 7 situations there is no difference at  $\alpha=0.05$  (Table 5). It can be concluded that the quality of the pedagogical action in the synchronous condition improved and this occurred in 60% of the cases in the asynchronous condition.

Situation	N	$\mu_b$	$\mu_a$	t	df	sig (2-tailed)
18	20	2.70	3.95	-3.206	39	0.05
The other 19 (20-1)	20	< $\mu_a$	> $\mu_b$			<0.05**

\*\*Significant at the  $\alpha=0.05$  level,  $\mu_a$ =After intervention,  $\mu_b$ =Before intervention

*Table 4 “Synchronous progression”*



Situation	N	$\mu_b$	$\mu_a$	t	df	sig (2-tailed)
1	20	2.10	2.75	-3.206	19	0.05
3	20	2.35	2.45	-0.462	19	0.649
5	20	2.15	2.60	-1.63	19	0.119
7	20	1.90	2.30	-1.453	19	0.163
11	20	2.10	2.50	-1.361	19	0.189
13	20	2.10	2.45	-1.324	19	0.201
16	20	2.20	2.40	-0.890	19	0.385
12	20	3.20	2.20		19	0.01***
				3.979	19	
The other 12 (20-8)	20	< $\mu_b$	> $\mu_b$			<0.05**

\*\*Significant at the  $\alpha=0.05$  level, \*\*\*Significant but negative progression,  $\mu_a$ =After intervention,  $\mu_b$ =Before intervention

Table 5 “Asynchronous progression”

4. G\*Power (Cohen, 1992) after conversion of Cohen’s d to Pearson’s r shows that in our experiment with  $\alpha=0.05$  the recommended power ( $1-\beta$ ) of 0.8 results in a large effect size ( $r=0,5$ ). The design provides significant results from which conclusions can be drawn.

5. The analysis per test subject demands a cut-off value. If a test subject achieves a total score of 40 in the pre-test, then the quality of the pedagogical action is regarded as particularly low. The scale of the competence assessment is indeed from (1) to (5). A total of 40 in 20 situations give an average score of 2 per situation indicating that the trainee teacher shows doubtful non-competent behaviour. From Table 3 it appears that the test subjects with the numbers 7 and 16 (synchronous) and 23 and 28 (asynchronous) score below the cut-off value of 40.

No cause could be found for the poor presentation during the pre-test of subjects 16, 23 and 28. However, from the analysis of the results of the measurement instrument “acceptation/appreciation with regard to synchronous coaching” of test subject 7, it appeared that she was not positive with regard to synchronous coaching. This would indicate that during the pre-test she was not motivated to participate.

From Table 6 it also appears that teachers who scored low in both conditions in the pre-test progress more than the average teacher. Non-competent teachers who receive synchronous coaching develop themselves better than those in the asynchronous variant. It is valid for both conditions that the teachers after receiving the coaching no longer can be labelled as poor, considering that the difference with the identical average value (after intervention) is negligible.

Participant/moment	Pre-test	Post-test	Post-Pre
7 (synchronous)	38	71	33
16 (synchronous)	38	68	30
23 (asynchronous)	40	58	18
28 (asynchronous)	39	58	19
$\mu$ (Synchronous)	42.65	70.85	28.2
$\mu$ (asynchronous)	43.4	55.25	11.85

Table 6 “Progression of less competent teachers”

6. Table 7 consists of a description of the relative progression per situation, arranged according to the level at which synchronous coaching is effective. It appears from this table that the regular asynchronous coaching in situations 6,9 and 10 has a more positive effect than the synchronous variant on the quality of the pedagogical action. In Appendix 1 it appears from the indication “C2” that the behaviour indicators, which in these situations have been incorporated into the video material, can all be placed under the second competence: “Pedagogical competence”. This result does not mean that the second competence is unsuitable for improvement through a synchronous intervention. In our experiment, the second competence has been incorporated into eight situations. The asynchronous condition provided better results in only 3 of the 8 situations.

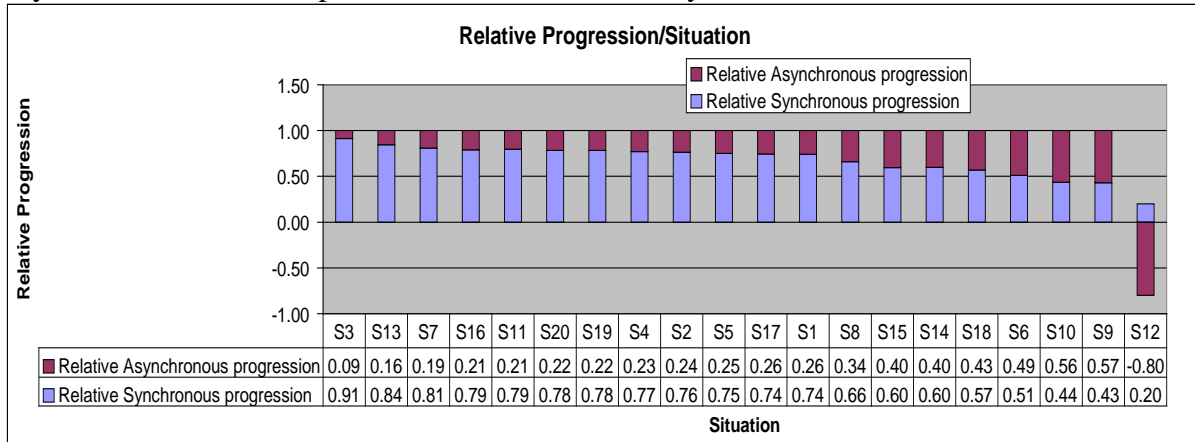


Table 7 “Relative progression/situation”

From the theory it appeared that “cognitive overload” should be avoided. Whispering of the keywords of the behaviour indicator based upon which the behaviour can be considered as non-competent, takes care that there is no actual overload. Since the behaviour indicators are not related to the subject contents of the lesson, it is particularly difficult to influence the subject content level of the lesson using the described technique of whispering the third competence “subject contents competence”. This suspicion is confirmed by the results. The synchronous progression in situation 18 (Competence 3) is only 0.3 higher than the asynchronous progression and is thus considerably smaller than the difference in progression that is achieved on the average in situations, which fall under the first- and fourth competencies (Table 8).

The first “Interpersonal competence” and fourth competence “organizational competence” therefore also appear to be highly suitable for synchronous interventions. The latter can also be deduced from Table 8. The difference in progression between the first- and fourth competencies is calculated on the basis of the average progression of the situations belonging to these competencies (see Enclosure 1).

Situation	Synchronous progression	Asynchronous Progression	$\Delta$ progression
18	1.25	0.95	0.3
$\mu_{c1}$	1.41	0.41	1.0
$\mu_{c4}$	1.39	0.74	0.65

Table 8 “Progression difference/situation”

#### 4. Conclusion and discussion

The null hypothesis that there is no difference in the effects between both conditions is rejected. Synchronous coaching has a more positive effect than asynchronous coaching on the quality of the pedagogical action of the trainee teacher. This conclusion can be refined with the knowledge that the reliability of the competence assessment and the effect size of the results are adequate:

##### 4.1. Overview of main effects

The test subjects who were exposed to the two conditions were comparable during the pre-test taking into account the quality of the pedagogical repertory. The synchronous condition led to an improvement in the quality of pedagogical action in 19 of the 20 situations. In the asynchronous condition this was the case in 12 of the in total 20 situations. Measured over all the situations, the total progression in the synchronous condition was 1.48 and in the asynchronous condition 0.59. In conclusion it can be stated that the synchronous condition has a more positive effect than asynchronous coaching on the quality of the pedagogical action. Theoretically, this means that there was no “Cognitive overload” (Sweller, 2003) and that the teacher establishes relationships between the actual- and the desirable behaviour through synchronous whispering (Dolk,).

##### 4.2. Analysis per test subject

Coaching is mainly meant for improving the teacher behaviour of less competent teachers. Less competent teachers who receive synchronous coaching developed better than those who were exposed to the asynchronous variant. Both groups of test subjects booked a higher progression than the average teacher. Teachers who were non-competent during the pre-test were during the post-test comparable with the average teacher.

On the basis of the results of this study, it is not possible to establish a cause for the fact that teachers presented poorly during the pre-test. Pedagogical competencies may be deficient. However, the limited acceptance/appreciation with regard to synchronous coaching could have also influenced the manifested pedagogical action. In our next study, we will pause at the question whether the associated learner characteristics such as personality traits and learning to teach orientations influence the success of synchronous coaching (Vermetten, Lodewijks & Vermunt, 2001).

### 4.3. Analysis per Competence

The competencies “Interpersonal competence” and “organizational competence” are suitable for synchronous coaching. For “pedagogical competence” this is doubtful and for “subject contents competence” this is not at all the case and an asynchronous approach will have a more positive effect on the pedagogical action. A cause of this is that the trainee teacher does not comprehend the whispering of the keywords of the behaviour indicator on the basis of which the pedagogical action can be regarded as non-competent and thus the reference point fails to not arise. However, there is a danger of “cognitive overload” if whispering increases.

Both conditions were investigated separately in this study. We expect that ideal coaching consists of a combination of both techniques. After all, synchronous intervention takes care that the process of self-awareness begins in the trainee teacher. A reference point arises to which the coach can refer to during discussion. This combination of intervention strategies will be investigated in one of our next studies.

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## **Appendix 1 “Elicited behaviour indicator per situation”**

*Remark: The number behind the “C” corresponds to the number of the competence.*

- Sit 1: C1.1. communicate effectively through verbal (e.g. volume, tempo, articulation, melody) and non-verbal techniques (e.g. facial expression, appearance, posture).
- Sit 2: C1.4. shows personal involvement and enthusiasm for individual students and groups of students.
- Sit 3: C1.7. corrects undesirable behaviour and rewards desired behaviour.
- Sit 4: C1.8. motivates his action in comprehensible language to students.
- Sit 5: C1.3. promotes effective communication through e.g. listening, summarising and through questions at the level of contents and involvement.
- Sit 6: C2.1. offers a safe environment in which students and teachers treat each other respectfully.
- Sit 7: C2.2. cares for a learning situation in which students can show their own input.
- Sit 8: C2.3. systematically uses the input of students in teaching.
- Sit 9: C2.4. stimulates discussion on norms and values between students.
- Sit 10: C2.5. challenges students to think along with him on their own development- and learning process.
- Sit 11: C2.6. considers cultural, social and emotional differences between students.
- Sit 12: C2.7. takes action where necessary to improve the social climate within the group.
- Sit 13: C2.8. signals and names developmental- and behavioural problems in students and refers further if necessary.
- Sit 14: C4.2. is consequent in applying rules and appointments.
- Sit 15: C4.1. states clearly the content, the form, the structure and the relevance of the (education) activity.
- Sit 16: C4.4. establishes priorities and divides the available time efficiently, both for himself and for the students.
- Sit 17: C4.5. knows how to cope with limited possibilities of the teaching facility and has alternatives for bottlenecks.
- Sit 18: C3.11. deals with actuality and practice in education.
- Sit 19: C6.1. applies relevant conversation skills and techniques (e.g. breaking bad news, giving advise).
- Sit 20: C7.6. is flexible and immune to stress: adapts to changing circumstances and has alternatives.