Appendix A

Classroom social climate inventory: Geometry lessons

1. Domain: Interpersonal Relationship		
Dimensions and subdimensions	Scales	Comments and examples
1.a Verbal and non-verbal communication of the teacher		
Position in the classroom	In front of the blackboard D1A.1.T	The teacher is in front of the blackboard or in the immediate vicinity of the blackboard.
	Amongst students D1A.2.T	The teacher is among students in the classroom.
	At the desk D1A.3.T	The teacher is sitting at the desk. The teacher is standing right next to the desk.
	Somewhere in the classroom D1A.4.T	The teacher is somewhere else in the classroom (e.g., at the bookshelf).
	Unidentifiable D1A.5.T	The teacher's position is unidentifiable (e.g., no other items are present, so that the position of the teacher cannot be identified). The position of the teacher is inconclusive.
	Unavailable D1A.6.T	The teacher is not shown in the drawing.
Support by the teacher	Assistance D1A.7.T	The teacher helps the students handle the assignment by pointing them in the right direction or by giving explanations/helpful hints (e.g., "Think of a similar assignment/problem.").
	Positive feedback D1A.8.T	The teacher gives positive feedback to the students (e.g., "That's right.", "Good job.").

	Negative feedback D1A.9.T	The teacher gives negative feedback to the students (e.g., “That’s wrong.”, “You solved the assignment in the wrong way.”).
	Mathematics-related question D1A.10.T	The teacher asks mathematical questions (e.g., “How would you solve this problem?”, “What solid is shown on the blackboard?”).
	Mathematics-related statement D1A.11.T	The teacher expresses a mathematical statement (e.g., “This shape is called a parallelogram.”) or the teacher gives students an assignment (e.g., “Draw a diagonal, please.”). The teacher writes/shows mathematical content on the blackboard.
	Observation D1A.12.T	The teacher quietly observes the students while they work on their assignments. The teacher walks through the rows and looks at the children’s work.
	Non-mathematical comment D1A.13.T	The teacher makes a non-mathematical comment (e.g., “Today it’s hot outside.”).
	Passive D1A.14.T	The teacher is a passive person in the classroom. The teacher neither speaks/teaches nor thinks about mathematical content.
	Unavailable/ Unidentifiable D1A.15.T	The drawing does not show any support by the teacher. Support by the teacher is unidentifiable.
1.b Verbal and non-verbal communication of the students		
Position in the classroom	Only one student is shown at the blackboard/at the table D1B.1.S	The drawing shows only one student, which results in being unable to make a clear statement about the position of other students. Also, the arrangement of the tables does not allow a general statement about other students’ presence or position.
	At the table D1B.2.S	The students are sitting at their tables.
	Next to the teacher D1B.3.S	The students are standing next to their teacher.
	In front of the blackboard D1B.4.S	The students are standing in front of the blackboard.

	Amongst other students D1B.5.S	The students are amongst other students and are not sitting at their own table.
	Somewhere in the classroom D1B.6.S	The students are somewhere else in the classroom (e.g., standing in the corner, by the cupboard).
	Unidentifiable D1B.7.S	The student's position is unidentifiable (e.g., no tables are drawn).
	Unavailable D1B.8.S	No students are shown in the drawing. Just the teacher or just the classroom is drawn.
Participation	Working on assignments at the table D1B.9.S	The students work diligently on their assignments at their desks.
	Working on the assignment on the blackboard D1B.10.S	One student solves the task on the blackboard.
	Listening D1B.11.S	The students listen to their teacher (e.g., The students are facing the teacher. The teacher is speaking and it is clear that the students are listening to their teacher).
	Responding D1B.12.S	The students respond to their teacher's question (e.g., Teacher: "What solid can you identify?" Students: "I can see a cube.").
	Asking a question D1B.13.S	The students ask a question (e.g., "Did I do that the right way?", "How do I solve this problem?").
	Asking for assistance D1B.14.S	The students ask for help. The students show that they need assistance (e.g., "Mrs. … I can't do this.", "I don't understand it.").
	Reviewing/Talking about D1B.15.S	The students and the teacher solve a problem together on the blackboard. They talk about a particular mathematical problem.
	Discussion D1B.16.S	The students participate in a discussion (e.g., the students raise their hands).

	Positive expression D1B.17.S	The students make a positive comment about mathematics (e.g., “That’s easy.”, “That’s interesting.”, “I’m good at math.”).
	Negative expression D1B.18.S	The students make a negative comment about mathematics (e.g., “That’s difficult.”, “That’s boring.”, “I’m bad at math.”).
	Non-mathematical comment D1B.19.S	The students talk about non-mathematical topics. The students think about non-mathematical topics (e.g., “I’m tired.”, “It’s raining outside.”, “He’s stupid.”, “What’s for lunch?”). Thought bubbles are illustrated.
	Passive D1B.20.S	The students are passive persons in the classroom. The students do not speak/learn or think about mathematical content (e.g., The students are looking through the window. No hand raising. No communication. No speech bubbles. No thought bubbles). No involvement or participation is drawn.
	Unidentifiable D1B.21.S	The involvement of the students is unidentifiable.
	Unavailable D1B.22.S	The involvement of the students is not shown in the drawing.
Affiliation	No communication with other students while working on the assignments D1B.23.S	The students are working on their own. They do not talk about the assignment with other students. They do not exchange solutions/ideas.
	Student-student communication D1B.24.S	The students talk about the assignment. They exchange ideas/solutions with each other.
	Student-student encouragement D1B.25.S	The students encourage each other (e.g., “You can do it!”).
	Student-student help request D1B.26.S	Students ask other students for help (e.g., “Can you help me?”, “How can I solve this task?”).
	Student-student support D1B.27.S	The students support each other (e.g., “I can explain it to you!”, “I will help you.”).

	Negative comments towards other students D1B.28.S	The students make negative comments to other students (e.g., “Shut up!”). The students talk about non-mathematical content.
	Unidentifiable/ Unavailable D1B.29.S	The communication with other students is unidentifiable/not shown in the drawing (e.g., only one student was drawn in the picture. The process of working is not drawn).
1.c Organization		
Working method	Teacher-centered instruction D1C.1	The teacher stands in front of the class, teaches and provides input. The students write in their notebooks.
	Individual work D1C.2	The students sit at their desks and work individually on their assignments.
	Group work D1C.3	The students work together in groups. They discuss the task/talk about the task.
	Working with a partner D1C.4	The students discuss the assignment with another student. The students work with a partner.
	Work/discussion while sitting in a circle (half circle) D1C.5	The students sit in a circle (or half circle) and work on/discuss the assignment.
	Unidentifiable/ Unavailable D1C.6	The method is unidentifiable. The method is not shown in the drawing.
Classroom seating arrangement	Traditional classroom arrangement D1C.7	The tables are arranged in rows.
	U-shaped arrangement D1C.8	The tables are arranged in a U-shape pattern.
	Mixed arrangement D1C.9	The seating arrangement is mixed (single tables and group tables).

	Circle/Half circle arrangement D1C.10	Desks or chairs are arranged in a circle or half circle.
	Group tables D1C.11	The classroom has group tables.
	Unidentifiable D1C.12	The seating arrangement is unidentifiable (e.g., only one desk is drawn).
	Unavailable D1C.13	There is no seating arrangement. There are no tables drawn.

2. Domain: Personal Growth	
Dimensions	Comments and examples
a. Goal orientation	
The goal of the lesson is clear. D2A.1	The teacher sets the assignment. The blackboard shows the mathematical content/assignments.
No mathematical content. D2A.2	The content of the lesson is not shown at all.
The teacher shows or identifies the mathematical content. D2A.3	The teacher teaches (e.g., The teacher explains how to solve a mathematical problem. The teacher demonstrates how to use a compass. The teacher informs the students about the lesson plan. The teacher's gestures clarify the mathematical content.).
The students work on their assignment. D2A.4	The goal of the lesson corresponds to the student's activity (e.g., The students work on the task that is written on the blackboard. The students work on the task that the teacher instructed beforehand.). Copying something from the blackboard does not fall into this category.

b. Teaching materials and tools D2B.1- D2B.11	1D-Objects D2B.1	1D-objects are shown on the blackboard/in the notebooks (e.g., line segment, half arrow, arrow).
	2D-shapes D2B.2	2D-shapes are shown on the blackboard/in the notebooks (e.g., triangle, square).
	3D-solids D2B.3	3D-solids are shown on the blackboard/in the notebooks (cube, prism, pyramid).
	2D-models D2B.4	2D-models are shown in the drawing (e.g., tangram).
	3D-models D2B.5	3D-models are shown in the drawing (e.g., wooden model of a cube, edge model of a cube).
	Angle D2B.6	Angles are shown on the blackboard/in the notebooks.
	Poster D2B.7	There are posters with mathematical content in the classroom (related to the goal of the lessons).
	Geometric tools (teacher) D2B.8	The teacher uses geometric tools (e.g., the teacher is holding a ruler).
	Geometric tools (students) D2B.9	The students use geometric tools (e.g., the students work with a compass, a ruler or a protractor).
	Other tools D2B.10	Additional teaching tools (e.g., pentominos) can be coded here that cannot be assigned to any of the existing categories.
	Unavailable D2B.11	There are no teaching materials or aids in the drawing.

3. Domain: Order	
Dimensions	Comments and examples
3.a Keeping order	
Led by the students D3A.1	The students tell other students how to behave (e.g., “Shhhh, you are not allowed to talk.”, “Don’t grouch/swear/offend others.”).
Led by the teacher D3A.2	The teacher instructs how to behave (e.g., “Sit quietly!”, “Be quiet!”).
Unavailable D3A.3	Neither the teacher nor the students instruct how to behave.

Appendix B

Classroom social climate inventory: Arithmetic lessons

1. Domain: Interpersonal Relationship		
Dimensions and subdimensions	Scales	Comments and examples
1.a Verbal and non-verbal communication of the teacher		
Position in the classroom	In front of the blackboard D1A.1.T	The teacher is in front of the blackboard or in the immediate vicinity of the blackboard.
	Amongst students D1A.2.T	The teacher is among students in the classroom.
	At the desk D1A.3.T	The teacher is sitting at the desk. The teacher is standing right next to the desk.
	Somewhere in the classroom D1A.4.T	The teacher is somewhere else in the classroom (e.g., at the bookshelf).
	Unidentifiable D1A.5.T	The teacher's position is unidentifiable (e.g., no other items are present, so that the position of the teacher cannot be identified). The position of the teacher is inconclusive.
	Unavailable D1A.6.T	The teacher is not shown in the drawing.
Support by the teacher	Assistance D1A.7.T	The teacher helps the students handle the assignment by pointing them in the right direction or by giving explanations/helpful hints (e.g., "Think of a similar assignment/problem.").
	Positive feedback D1A.8.T	The teacher gives positive feedback to the students (e.g., "That's right.", "Good job.").
	Negative feedback D1A.9.T	The teacher gives negative feedback to the students (e.g., "That's wrong.", "You solved the assignment in the wrong way.").

	Mathematics-related question D1A.10.T	The teacher asks mathematical questions (e.g., “How would you solve this problem?”, “What is the result of the addition task?”).
	Mathematics-related statement D1A.11.T	The teacher expresses a mathematical statement (e.g., “Numbers 2, 3, 5 … are examples of prime numbers.”) or the teacher gives students an assignment (e.g., “Please continue the fifth row of multiplication tables.”). The teacher writes/shows mathematical content on the blackboard.
	Observation D1A.12.T	The teacher quietly observes the students while they work on their assignments. The teacher walks through the rows and looks at the children’s work.
	Non-mathematical comment D1A.13.T	The teacher makes a non-mathematical comment (e.g., “Today it’s hot outside.”).
	Passive D1A.14.T	The teacher is a passive person in the classroom. The teacher neither speaks/teaches nor thinks about mathematical content.
	Unavailable/ Unidentifiable D1A.15.T	The drawing does not show any support by the teacher. Support by the teacher is unidentifiable.
1.b Verbal and non-verbal communication of the students		
Position in the classroom	Only one student is shown at the blackboard/at the table D1B.1.S	The drawing shows only one student, which results in being to make a clear statement about the position of other students. Also, the arrangement of the tables does not allow a general statement about other students’ presence or position.
	At the table D1B.2.S	The students are sitting at their tables.
	Next to the teacher D1B.3.S	The students are standing next to their teacher.
	In front of the blackboard D1B.4.S	The students are standing in front of the blackboard.

	Amongst other students D1B.5.S	The students are amongst other students and not sitting at their own table.
	Somewhere in the classroom D1B.6.S	The students are somewhere else in the classroom (e.g., standing in the corner, by the cupboard).
	Unidentifiable D1B.7.S	The student's position is unidentifiable (e.g., no tables are drawn).
	Unavailable D1B.8.S	No students are shown in the drawing. Just the teacher or just the classroom is drawn.
Participation	Working on assignments at the table D1B.9.S	The students work diligently on their assignments at their desks.
	Working on the assignment on the blackboard D1B.10.S	One student solves the task on the blackboard.
	Listening D1B.11.S	The students listen to their teacher (e.g., The students are facing the teacher. The teacher speaks and it is obvious that the students are listening to their teacher.).
	Responding D1B.12.S	The students respond to their teacher's question (e.g., Teacher: "What is the answer to 8+9?" Students: "17.").
	Asking a question D1B.13.S	The students ask a question (e.g., "Did I do that the right way?", "How do I solve this problem?").
	Asking for assistance D1B.14.S	The students ask for help. The students show that they need assistance (e.g., "Mrs. … I can't do this.", "I don't understand it.").
	Reviewing/Talking about D1B.15.S	The students and the teacher solve a problem together on the blackboard. They talk about a particular mathematical problem.
	Discussion D1B.16.S	The students participate in a discussion (e.g., the students raise their hands).

	Positive expression D1B.17.S	The students make a positive comment about mathematics (e.g., “That’s easy.”, “That’s interesting.”, “I’m good at math.”).
	Negative expression D1B.18.S	The students make a negative comment about mathematics (e.g., “That’s difficult.”, “That’s boring.”, “I’m bad at math.”).
	Non-mathematical comment D1B.19.S	The students talk about non-mathematical topics. The students think about non-mathematical topics (e.g., “I’m tired.”, “It’s raining outside.”, “He’s stupid.”, “What’s for lunch?”). Thought bubbles are illustrated.
	Passive D1B.20.S	The students are passive persons in the classroom. The students neither speak/learn nor think about mathematical content (e.g., The students are looking through the window. No hand raising. No communication. No speech bubbles. No thought bubbles). No involvement or participation is drawn.
	Unidentifiable D1B.21.S	The involvement of the students is unidentifiable.
	Unavailable D1B.22.S	The involvement of the students is not shown in the drawing.
Affiliation	No communication with other students while working on the assignments D1B.23.S	The students are working on their own. They do not talk about the assignment to other students. They do not exchange solutions/ideas.
	Student-student communication D1B.24.S	The students talk about the assignment. They exchange ideas/solutions with each other.
	Student-student encouragement D1B.25.S	The students encourage each other (e.g., “You can do it!”).
	Student-student help request D1B.26.S	The students ask other students for help (e.g., “Can you help me?”, “How can I solve this task?”).
	Student-student support D1B.27.S	The students support each other (e.g., “I can explain it to you!”, “I will help you.”).

	Negative comments towards other students D1B.28.S	The students make negative comments to other students (e.g., “Shut up!”). The students talk about non-mathematical content.
	Unidentifiable/ Unavailable D1B.29.S	The communication with other students is unidentifiable/not shown in the drawing (e.g., only one student was drawn in the picture. The process of working is not drawn).
1.c Organization		
Working method	Teacher-centered instruction D1C.1	The teacher stands in front of the class, teaches and provides input. The students write in their notebooks.
	Individual work D1C.2	The students sit at their desks and work individually on their assignments.
	Group work D1C.3	The students work together in groups. They discuss the task/talk about the task.
	Working with a partner D1C.4	The students discuss the assignment with another student. The students work with a partner.
	Work/discussion while sitting in a circle (half circle) D1C.5	The students sit in a circle (or half circle) and work on/discuss the assignment.
	Unidentifiable/ Unavailable D1C.6	The method is unidentifiable. The method is not shown in the drawing.
Classroom seating arrangement	Traditional classroom arrangement D1C.7	The tables are arranged in rows.
	U-shaped arrangement D1C.8	The tables are arranged in a U-shape pattern.
	Mixed arrangement D1C.9	The seating arrangement is mixed (single tables and group tables).

	Circle/Half circle arrangement D1C.10	Desks or chairs are arranged in a circle or half circle.
	Group tables D1C.11	The classroom has group tables.
	Unidentifiable D1C.12	The seating arrangement is unidentifiable (e.g., only one desk is drawn).
	Unavailable D1C.13	There is no seating arrangement. There are no tables drawn.

2. Domain: Personal Growth	
Dimensions	Comments and examples
a. Goal orientation	
The goal of the lesson is clear. D2A.1	The teacher sets the assignment. The blackboard shows the mathematical content/assignments.
No mathematical content. D2A.2	The content of the lesson is not shown at all.
The teacher shows or identifies the mathematical content. D2A.3	The teacher teaches (e.g., The teacher explains how to solve a mathematical problem. The teacher demonstrates how to use a compass. The teacher informs the students about the lesson plan. The teacher's gestures clarify the mathematical content.).
The students work on their assignment. D2A.4	The goal of the lesson corresponds to the student's activity (e.g., The students work on the task that is written on the blackboard. The students work on the task that the teacher instructed beforehand.). Copying something from the blackboard does not fall into this category.

b. Teaching content/ materials and tools D2B.1- D2B.12	Addition tasks D2B.1	Addition tasks are shown on the blackboard/in the notebooks.
	Subtraction tasks D2B.2	Subtraction tasks are presented on the blackboard/in the notebooks.
	Multiplication tasks D2B.3	Multiplication tasks are presented on the blackboard/ in the notebooks.
	Division tasks D2B.4	Division tasks are presented on the blackboard/in the notebooks.
	Fractions D2B.5	Fractions are used in calculations. Fractions are shown on the blackboard/in the notebooks.
	Variables D2B.6	Variables are present in the task. Variables are shown on the blackboard.
	Calculating strategies D2B.7	The tasks are solved by written or semi-written calculation.
	Number line D2B.8	A number line is illustrated on the blackboard/in the notebooks.
	Place value chart D2B.9	A place value chart is illustrated on the blackboard/in the notebooks.
	Other content D2B.10	Additional teaching content can be coded here that cannot be assigned to any of the existing categories (e.g., square root, decimal numbers, arithmetic problems). The given content serves only as an example, further learning content is possible.
	Other tools (e.g., slide rule, placards/posters, reversible tiles, etc.) D2B.11	Additional teaching tools can be coded here that cannot be assigned to any of the existing categories (e.g., place cards). The given tools serve only as examples, further tools are possible.
	Unavailable D2B.12	There is no teaching content, materials or aids in the drawing.

3. Domain: Order	
Dimensions	Comments and examples
3.a Keeping order	
Led by the students D3A.1	The students tell other students how to behave (e.g., “Shhhh, you are not allowed to talk.”, “Don’t grouch/swear/offend others.”).
Led by the teacher D3A.2	The teacher instructs how to behave (e.g., “Sit quietly!”, “Be quiet!”).
Unavailable D3A.3	Neither the teacher nor the students instruct how to behave.