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PREFERENCES FOR VARIOUS LEARNING ENVIRONMENTS: TEACHERS' AND PARENTS' PERCEPTIONS

Received 23 January 2002; accepted (in revised form) 7 October 2002

ABSTRACT. In the last ten years, a number of innovations, mainly inspired by constructivist notions of learning, have been introduced at various levels of the Dutch educational system. However, constructivist learning environments are rarely implemented. Teachers tend to stick to expository and structured learning environments. This consistent finding requires research in order to gain insight into teachers' preferences for learning environments and to determine the factors that support and impede the realization of these learning environments. Regarding the influence of social backgrounds on student learning, is it also important to take stock of parental views on learning environments.

This study is focused on teachers' preferences for learning environments, their reported teaching behavior, and how these match with parents' preferences. Three parallel questionnaires were developed for teachers (n = 285), students (n = 951), and parents (n = 636) to measure preferences and behavior at different levels of education, for three types of learning environments: direct instruction; discovery learning; and authentic pedagogy. The results show that teachers often prefer direct instruction, and seldom promote discovery learning. While teachers sometimes realize authentic pedagogy, constructive learning tasks are seldom used. Teachers' reported practice and parents' preferences for their children appear to correspond reasonably.

Results of multiple regression analyses show that the use of the three types of learning environments yield different predictors. For the use of discovery learning and authentic pedagogy, confidence in students' regulative skills is an important predictor. In predicting the use of direct instruction, the teacher's own conception of learning turns out to be an important predictor.

KEY WORDS: conceptions of learning, conceptions of teaching, educational measurement, learning environments, parental perceptions, questionnaires, teacher perceptions

1. Introduction

Internationally, major changes in curricula that have been implemented at various levels of educational systems include new mathematics, communicative foreign language teaching, problem-based learning, middle school curricula, and self-regulated learning. The Dutch Advisory Council for Education, in its report *Room for Learning* (1994), suggested that the development of 'knowledge as a tool' was a major task of elementary and

Learning Environments Research **6**: 77–110, 2003.

junior high school instruction. The council formulated three principles on the basis of which this task could be realized: (1) learning as the extension and reconstruction of knowledge; (2) learning as a social process; and (3) learning how to deal with problems independently. These recommendations reflect changed views of learning and teaching.

However, constructivist learning environments are rarely implemented. Teachers tend to stick to expository and structured learning environments, as we point out below. This consistent finding requires research in order to gain insight into teachers' preferences for learning environments and to determine the factors that support and impede the realization of these learning environments. Regarding the influence of social backgrounds on student learning, it is also important to take stock of parental views on learning environments.

In the present study, we focused on the application of learning environments that result from modern views of learning and on the application of learning environments based on more traditional conceptions of learning. In addition, we paid attention to parents who also hold certain views of learning and teaching, which could be conveyed to their children and, as a consequence, might or might not be in line with teachers' practices. Therefore, teachers' practices and parents' preferences were compared. Dominant views on learning and teaching held by policy makers and researchers could well conflict with parents' views.

In 1999, a research project entitled 'New Learning', commissioned by a Dutch educational advisory institute (KPC Group), was started to investigate students', teachers' and parents' views on learning and teaching within different types of education (Theunissen & Visser, 1999). In this article, we report parents' preferences and teachers' reported practices with regard to learning environments.

2. Conceptions of Learning and Teaching

2.1. *Changing Notions of Learning and Learning Environments*

Contemporary innovations in learning environments, such as 'Schools for Thought' (Lamon, 1995), mathematics in rich contexts, or authentic pedagogy can be considered reactions to the type of formal school learning that has been criticized by Resnick (1987). At the same time, opposing views on learning and teaching have a longer history. Eisner and Vallance (1974) and Miller and Seller (1985) have summarized different perspectives on curriculum, which reflect opposing views, such as teaching as transmis-

sion, transaction, or transformation. In the first view, the goal of teaching is transmission of knowledge. In the second view, problem solving and interaction between student, teacher, and curriculum are aimed at. In the third view, students create their own knowledge in learning environments that are aimed at discovery and self-realization. Dewey (1902/1956) made a different distinction far earlier: education aimed at the child or education aimed at the curriculum.

The innovative learning environments mentioned above could be considered as consequences of a shift from transmission-oriented views towards transaction-oriented and transformation-oriented views on learning and teaching.

In the present study, we focused on the actual arrangement of learning environments in Dutch primary and secondary education. The theoretical concepts that we used were drawn from educational psychology. In general, it can be stated that psychological views on learning have had repercussions for the arrangement of learning environments. Some developments are summarized below.

De Klerk and Simons (1988) describe the development from product-oriented to process-oriented conceptions of learning. They state that product-oriented conceptions are based on behaviorist theories of learning in which the acquisition of knowledge and skills takes place through small steps, each of which is accompanied by reinforcement. Consequently, in the design of learning environments, knowledge is decomposed into small manageable pieces to be mastered by the learner. During the process of knowledge or skills acquisition, systematic reinforcement is provided for the learner. The mastery learning approach can be considered an example of product-oriented learning. Internal mental processes are not taken into account in the design of the learning environment.

In cognitive and metacognitive conceptions of learning, referred to as 'process oriented' by De Klerk and Simons, the importance of mental processes during knowledge acquisition is emphasized. In the design of learning environments, the deliberate activation of mental processes is considered as vital. Learning functions such as activating prior knowledge, motivating to start learning, and regulating and monitoring learning are addressed deliberately.

In the most recent conceptions of learning, based on constructivist learning theories, the active construction of meaning is stressed even more. In addition, learning is conceived of as an interactive process, embedded in a specific socio-cultural context. From this point of view, knowledge is inextricably interwoven with the social and physical environment in which

it is developed and applied. It is not an abstract entity in itself. For a large part, the context determines the structure and content of, and the connection between, the concepts used. Knowledge is related to increasing and changing insights into the culture of knowledge users. In other words, learning is 'situated'. According to this view, learning is always situated (Lave, 1991). In addition, within constructivist notions of learning, the acquisition of knowledge is regarded as a process of cooperation and co-construction of knowledge. This principle is applied in the 'community of learners' approach (Brown & Campione, 1994; Campione, Shapiro & Brown, 1995).

In contemporary educational innovations, we notice that elements of process-oriented and constructivist-oriented conceptions are increasingly being embraced. During the last decade, international research interests have shifted towards the design and implementation of learning environments inspired by constructivist notions of learning. At the same time, the results from school effectiveness research within the context of mathematics and mother tongue education suggest that the best results are found in structured, teacher-led environments (Creemers, 1991; Wang, Haertel & Walberg, 1990). However, it is unsure whether these kinds of learning environments are most effective under all circumstances. Besides, learning environments can differ depending on the kind of knowledge and skills to be acquired and on the fulfillment of certain conditions at the class and school levels. To conduct research into teachers' preferences for learning environments, we need to gain more insight into the various dilemmas or options that teachers face when designing them. In section 2.2, these dilemmas are described in further detail.

2.2. *Learning Environments: Dimensions and Antecedents*

Recently, Roelofs, Van der Linden, and Erkens (2000) distinguished six dimensions on which learning environments can differ:

1. construction of knowledge versus transmission of knowledge;
2. learning in complete task situations versus learning by means of split tasks;
3. personal meaning versus teacher-led meaning;
4. professional or scientific contexts versus formal contexts;
5. cooperation and communication versus individual learning;
6. developing learning climate (growth in expertise versus momentary mastering).

These opposites can be considered as continua with two extremes. The right-hand extremes represent the transmission model of learning environments. In this model, transmission of knowledge is a key characteristic, along with a process of teacher-led mastering of bodies of knowledge drawn from a fixed curriculum. Mastery of isolated skills is acquired by means of individual effort.

The left-hand extremes represent the model of discovery learning in which self-realization is a central characteristic. According to this conception of learning, learners construct their own knowledge by means of interaction with fellow learners starting from a complete task which is drawn from a professional context and which is personally meaningful to the learner. The learning climate is adjusted to the level of development of the learner. Making errors is considered inherent to the learning process.

Differences in learning environments can be characterized by means of these dimensions. In practice, these extremes will not be seen very often in their pure form. Mixed forms are more likely.

Results from studies point out that, during the implementation of authentic pedagogy in the context of Dutch secondary education, teachers pay little attention to the knowledge-construction process. Learning situations in which students work cooperatively on constructive, integrative assignments, breaking down the boundaries of the subject, the textbook, and even the situation in class, are hardly ever found. In explaining this teaching practice, teachers claim that (Grade 7) students and especially less able students benefit considerably from learning the basics before being confronted with complete or complex tasks. In this respect, they cover their textbooks. Another reason for not using complete tasks is lack of time, owing to an already overloaded curriculum (Roelofs & Terwel, 1999).

Apparently, different factors, in this case the perception of student characteristics, could explain the choice of certain learning environments. The choice or preference for learning environments, varying from transmission-oriented to discovery-oriented, could be determined by factors at the student, teacher, and school levels.

Lowyck (1995) distinguishes, at the teacher level, teachers' own educational experiences, their social background, and their affinity with theories and views of learning and teaching. One well-known factor is the influence of one's preferred teaching style on the choice of learning environments. Research studies have revealed opposing styles, which are related with the extremes described above (Bennett, 1976; Solomon & Kendall, 1979): formal versus open; traditional versus innovative; expository versus discovery; and teacher-centered versus student-centered. In

addition, teachers' attitudes towards educational innovations are repeatedly mentioned as a vital factor for choosing alternative learning environments (Fullan, 1992; Fullan & Pomfret, 1977).

At the school level, physical conditions are mentioned regarding the classroom, timetable, group size, textbooks and media (Lowyck, 1995; Roelofs, Vermeulen & Houtveen, 1998). In a prior study, Roelofs and Terwel (1999) reported that, according to the teachers, mathematical textbooks seldom offer room for students to develop their own solution strategies to a mathematical problem.

As stated before, student characteristics, more specifically teacher perception of these characteristics, constitute an important factor influencing the choice and realization of learning environments. Brophy and Evertson (1981) and Good and Brophy (1984, 2000) found that teachers' expectations of students do affect instructional behavior. In addition, teachers' subjective theories about students' characteristics influence the way in which the learning environment is arranged (Lee, 1996).

3. Learning Environments and Parents' Preferences

Changes in conceptions of learning and learning environments take place within a broader societal context in which parents play an important role. Themes like the (free) choice of schools, the middle school, and multicultural education have resulted in extensive debates in which parents have been involved. The effects of parenting styles and academic aspirations on academic achievement and school attitudes have also been demonstrated in various studies (Chrispeels, 1996; Levine & Lezotte, 1995; Marjoribanks, 1995, 1996).

In studying learning environments, parents can be involved for various purposes. A search in ERIC and PSYCHLIT databases using the key words of 'parents' perceptions', 'teaching', 'learning environment', 'curriculum', and 'student outcomes' (in varying combinations) resulted in a large number of references to parental perceptions regarding teaching. An analysis of titles and abstracts identifies the following purposes for involving parents in studying learning environments:

- determining the degree of parents' participation in educational matters and the influence of participation on the design of the learning environment;
- evaluation of teacher behavior by means of questionnaires for parents;

- mapping parents' perceptions with regard to school improvement projects aimed at students at risk or students with different cultural-ethnic backgrounds;
- taking stock of parental wishes and preferences with regard to dealing with learning problems, concerning their own children;
- mapping parents' perceptions with regard to learning environments within curricular domains.

Within studies of learning environments, two approaches are clearly visible. First, a qualitative approach, involving data drawn from interviews and cases, enables idiosyncratic views of learning environments to emerge. In this approach, only a few *a priori* theoretical concepts are used. Comparisons between parents', students', and teachers' perceptions tend to yield qualitatively different results (see Dodd, 1995).

In a second, more quantitative approach, data are gathered by means of questionnaires administered to parents, teachers, and students. In these questionnaires, concepts and dimensions are carefully operationalized and, in turn, results from groups are compared quantitatively (see for example Gardner, 1995; Ostrander, 1996; Zill & Nolin, 1994). In this approach, it is assumed that the dimensions are theoretically well described.

Specific outcomes with regard to preferred learning environments, combined with data about actual teacher practice, are scarce. Results from the remaining small number of studies show that parents, compared with teachers, prefer a more traditional learning environment for their children.

Schlak (1994) explored the age-old debate of what makes a good kindergarten program by examining teachers' and parents' perceptions and expectations of kindergarten programs. The results indicate that both groups agreed that cognitive development and academic skills are of primary importance. The results also indicate that parents placed greater value on direct instruction, while teachers placed greater value on the use of a variety of materials for learning.

Wise (1993) found slightly different results. She examined parent and teacher attitudes toward developmentally-appropriate instructional practice compared to traditional skill-based instruction in the classroom. The study surveyed parents and teachers of kindergarten, first, and second grade students in Marin County, California. The results of the surveys show that most parents and teachers strongly favored a majority of the concepts of developmentally-appropriate instructional practice and generally preferred such instruction over traditional skills-based instruction. Both parents and teachers believe that a student-centered curriculum was an important factor in children's education. However, a majority of the parents indicate

that they believe that workbooks and textbooks were valuable learning tools, and this differs from teacher opinion.

Dutch studies into parental preferences have not been so much aimed at the specific design of the learning environment. Cadot and Versloot (1987) examined parents' opinions by means of two scales: traditional views and modern views. Scores were related to parental school choice, but no data were available on their specific views.

None of the studies mentioned above covers dimensions of fundamentally different learning environments in detail. In the present study, these dimensions have been worked out for important aspects of learning environments. These data can shed more light on the degree to which modern educational innovations can meet parental acceptance.

4. Research Questions

This study focused on the actual realization of learning environments by teachers and on parental preferences. In the study, the six dimensions mentioned earlier were worked out in detail in order to describe (reported) teacher behavior and parents' views. In addition, the predictive power of some factors considered important for teacher behavior was studied. In summary the following research questions were addressed:

1. In what way can the arrangement of learning environments in Dutch primary and secondary education be characterized by means of a set of design dimensions?
2. To what extent does the actual learning environment reported by teachers correspond with parental preferences for their own children?
3. What is the relation between the realization of different learning environments, on the one hand, and teachers' own views on learning, their perception of student characteristics, their attitude toward contemporary educational innovations, and their perceptions of class-level and school-level conditions, on the other hand?

5. Instruments and Data Collection

5.1. *Instruments for Teachers*

5.1.1. *Design of Learning Environments*

The design of the learning environments, teachers' views on learning, perceptions of student characteristics, and perception of class and school-

level conditions were examined by means of questionnaires for teachers. In one questionnaire, the realization of four characteristics of modern learning environments is assessed and summarized by means of the Meaningful and Strategic Learning Environments (MSL) scale (Roelofs & Houtveen, 1998, 2002). In two questionnaires, the use of two specific types of learning environments was operationalized: direct instruction; and discovery learning.

The MSL questionnaire consists of 52 Likert-type items and contains four scales, each representing the three aspects of the learning environment: instruction, learning task, and assessment. The first scale concerns the extent to which teachers relate instruction to the students' personal worlds (14 items, $\alpha = 0.80$). Some sample items are "In my choice of subjects, I try to relate to the students' interests as much as possible" and "I choose examples that appeal to students". The second scale represents the degree to which attention is paid to process-oriented instruction (16 items, $\alpha = 0.80$). Some sample items are "I ask students how they arrived at a solution, and which steps in their thought processes were taken" and "I try to instruct in a manner which makes students think about the way in which to carry out a learning task". The third scale (10 items, $\alpha = 0.79$) represents the degree to which the teacher promotes cooperation and interaction in the learning environment. Some sample items are "In my class, students present the results of assignments to fellow students" and "In the event of group assignments, I assign students to come up with a joint result". The fourth scale (12 items, $\alpha = 0.80$) measures the extent to which teachers use constructive learning tasks which transcend the textbook. A sample item is "In class, students come into contact with knowledge users outside the school". In terms of the two extremes of transmission versus transformation, the first two scales can be positioned theoretically in the center between the two extremes. The latter two scales take a position right of center.

In addition, a questionnaire representing the use of direct instruction was developed, based on scales used in previous studies (Roelofs, Raemaekers & Veenman, 1991; Roelofs, Veenman & Raemaekers, 1994). The resulting scale (14 items, $\alpha = 0.79$) can be considered as an indicator of a transmission-oriented learning environment in which many activities, including constructing meaning, are in essence teacher-led. It must be noted, however, that the model is not purely product oriented. Some sample items are "At the start of the lesson, I give a summary of previous content matter" and "I give short and clear assignments, which can be carried out without serious problems".

A third instrument for learning environments was developed to measure the extent to which the teacher promotes discovery learning. The instrument is based on the concept of discovery learning as defined by Wild (1994). A learning environment in which discovery is of primary importance, that can be located on the right-hand side of the continuum, is referred to as 'transformation'. Some sample items are "I have my students ask themselves learning questions so they can figure out for themselves what they need to know" and "My students decide for themselves how much time they need to spend on their learning task".

5.1.2. *Conceptions of Own Learning*

Based on a Dutch learning style inventory, a questionnaire for teachers, measuring their own learning conceptions was developed. Based on the Inventory of Learning Styles (ILS) (Brand-Gruwel & Teurlings, 1998; Roosendaal & Vermunt, 1995; Vermunt, 1992, 1998), scales for teacher learning conceptions were developed. In the original Vermunt inventory, five conceptions of learning were distinguished. In this study, reliable scales could be developed for four of the five conceptions.

The first scale measures the learning conception which is indicated as 'externally controlled intake of knowledge' (6 items, $\alpha = 0.68$). In this conception, learning is seen as the reproduction of ideas and facts offered by teachers and books. The second learning conception, 'use of knowledge', is measured by means of a four-item scale ($\alpha = 0.61$). In this learning conception, learning is seen as the process of knowledge-acquisition and skills-acquisition with the purpose of use in practice. The third scale representing a learning conception, indicated as 'stimulating instruction' (4 items, $\alpha = 0.78$), represents a conception in which teacher directions are seen as vital in all kinds of learning processes. A fourth scale represents the conception 'learning together' (5 items, $\alpha = 0.75$). In this conception of learning, great value is attached to cooperating with peers when carrying out learning tasks. Teachers with this learning conception think that they can learn from their peers, and that they prefer to share learning tasks. For the fifth learning conception, 'construction of knowledge', which in previous studies appeared in reliable scales, no reliable scale resulted.

In addition, we developed a scale to measure a preference for learning by discovery. This scale would make the range of learning conceptions between intake and construction more complete. The resulting scale 'preference for discovery learning' is reasonably reliable (8 items, $\alpha = 0.69$). Some sample items are "Learning is seeking information to answer learning questions I pose myself" and "I prefer to be enabled to solve problems in my own way".

5.1.3. *Antecedent Factors for Choice of Learning Environments*

Finally, a questionnaire was developed to measure antecedent factors for choosing learning environments, based on instruments in previous studies (Roelofs & Houtveen, 1998; Roelofs & Terwel, 1999). After reliability analyses, three reliable scales resulted. First, 'confidence in students' self-regulation' (10 items, $\alpha = 0.87$). Some sample items are "I think my students are capable of determining what they need to learn" and "Students should have more opportunities to decide for themselves how they carry out assignments". Second, 'acknowledgement of a changing teacher role' is a proxy for teacher attitude towards contemporary educational innovations (11 items, $\alpha = 0.73$). Some sample items are "As a result of contemporary innovations, I have to change my teaching practice" and "Along with developments of information technology, the teachers' role will change from transmitter of knowledge into facilitator of learning". Third, a scale measures the 'readiness of the physical school environment for self-regulated learning and cooperative learning' (4 items, $\alpha = 0.81$). Some example items are "Our school building is not suited for having students cooperate in small groups" and "Our information centers and library are not equipped for self-regulated learning".

5.2. *Instruments for Parents*

Analogous to the teacher questionnaire, a questionnaire for parents was developed in which parents are confronted with teacher and student activities that belong to different types of learning environments. Parents were asked to what extent they agreed with the suggested activities, and to what extent they considered these activities suitable for their own children. Reliability analyses resulted in three reliable scales. Each of the scales represents a location on the continuum between transmission and transformation. The first scale, 'preference for instruction for meaningful and strategic learning' (17 items, $\alpha = 0.67$), contains all aspects of MSL as represented by the teacher scales. A sample item is "Lessons at school should be connected to what students encounter in their daily lives". The second scale is 'preference for discovery learning' (10 items, $\alpha = 0.78$). A sample item is "Students should get opportunities to construct their own assignments to work on". The third scale was not developed parallel to the teacher scale, but nonetheless represents a preference for a teacher-led transmission-oriented learning environment. Some sample items are "The teacher should model step by step how an assignment is to be carried out", "Teachers should often check the extent to which students mas-

ter the content matter", and "At school, students should mainly learn factual knowledge".

5.3. *Instruments for Students*

Finally, a questionnaire was developed to measure students' perceptions of actually realized learning environments. Student data were used to validate teacher perceptions of their own teaching behavior. As was the case with the parents' questionnaire, again the three main types of learning environments were operationalized. However, reliability analyses resulted in only two reliable scales. The first scale is 'realization of meaningful and strategic learning environments' (MSL; 14 items, $\alpha = 0.77$). As was the case with the parallel parents' scale, this scale does not contain separate subscales, but all important aspects of MSL are represented. Some sample items are "The assignments we carry out connect to our daily lives. In these assignments, we have to apply what we have learned" and "In our lessons we use not only textbooks but also other things like newspapers, the computer, or video". The second scale is 'realization of discovery learning' (7 items, $\alpha = 0.70$), which was developed parallel to the teacher and parent scale. A sample item is "We are allowed to construct assignments on our own, which can be carried out in our own way". Finally, no reliable scale could be constructed for direct instruction.

6. Subjects, Sample and Data Collection

The data collection took place in the fall of the 1999–2000 school year. A total of 951 students, 285 teachers, and 636 parents participated. The respondents came from nine primary schools, six secondary schools, and four schools for secondary vocational education. Ninety (90) teachers came from primary education, 150 teachers came from secondary education, and 45 teachers came from secondary vocational education. The numbers of students from these types of education were 410, 411 and 130, respectively. Parents were asked to respond to the questions about the type of education followed by their children. Thus, 304 parents directed their responses to primary education, 266 to secondary education, and 66 to secondary vocational education. The sample of teachers consisted of 42% women; 13% of the teachers were younger than 30 years, 21% were between 30 and 40 years, 39% were between 40 and 50 years, and 27% were older than 50 years. From the group as a whole, 47% had been working as a teacher longer than 20 years.

The sample of students consisted of 50% boys and 50% girls. Students from primary education came from Grades 5 (55%) and 6 (45%). To avoid burdening participating secondary school teachers with a large extra workload, primarily teachers and students from middle grades were asked to participate. As a result, 47% of the general secondary education students came from Grade 10 and 19% came from Grade 9. For all types of education, the percentages of respondents present in Grade 7, 8, 11, and 12 were 14, 10, 5, and 5%, respectively. Students from the two highest streams of general education (30 and 39% versus 4 and 13%) were over-represented compared to the two lower types. From the senior secondary vocational education, which students enter at about age 16 years, 56% came from the third year of the course, and 5, 24 and 15% came from year 1, 2 and 4 of the course, respectively. For 85% of all the students, both parents were born in The Netherlands. In sum, the sample is not representative of the lower grades and course years, or of the lower types of general secondary education.

The sample of parents consisted of 71% women; 53% of the sample of parents were aged between 40 and 50 years, and 37% between 30 and 40 years. Ninety four percent (94%) of the parents were born in The Netherlands. In the sample of parents, women are over-represented. At the same time, ethnic minority parents (6.6%) are slightly underrepresented compared with population statistics (9.5%). Regarding parents' education, the sample is only representative for the share of parents who completed university education (9.4%) and parents who completed junior vocational education (14.4%). The sample is less representative of parents who completed other forms of education. All in all, generalization to the total population of parents should be done with care.

7. Data Analyses

Characterization of actual learning environments (research question 1) took place by means of descriptive statistics. The teacher was used as the unit of analysis. Parents' preferences for learning environments are described (research question 2) in a similar manner. Differences between the degrees of realization of learning environments across educational types were tested by means of analyses of variance. Differences between parental preferences were tested in a similar way.

A more sophisticated nested design, in which students answer questions about their own teacher, was not feasible for budgetary reasons.[1] However, to match parent data and student data, on the one hand, with teacher

data, on the other hand (research question 1 and 2), all data were aggregated on the school level. To relate teacher perceptions with students' and parents' perceptions, Pearson product-moment correlations were computed using an aggregated file consisting of scale data for 19 schools.

Finally, stepwise multiple regression analyses were used to study the relation between the realization of different learning environments, on the one hand, and teachers' own views of learning, their perceptions of student characteristics, and their perceptions of class and school level conditions, on the other hand.

8. Results

8.1. *Realization of Learning Environments by Teachers*

Descriptive statistics for the scales representing different learning environments are presented in Table I. Comparing the realization of the three types of learning environments, we notice first that teachers most often pay attention to direct instruction on a regular basis (mean = 2.7). To a lesser extent, teachers realize meaningful and strategic learning environments and, even less frequently, they realize a discovery-learning environment (mean = 2.0).

TABLE I

Descriptive Statistics for Teacher Scales Concerning the Realization of Different Learning Environments

Scale	Mean	*SD*	Min.	Max.	*N*
Meaningful and strategic learning environment (52 items, $\alpha = 0.89$)	2.4	0.3	1.6	3.6	267
Connection to students' personal worlds (14 items, $\alpha = 0.80$)	2.6	0.4	1.3	3.6	266
Process-oriented instruction (16 items, $\alpha = 0.80$)	2.6	0.4	1.4	3.9	264
Constructive learning tasks (12 items, $\alpha = 0.80$)	2.1	0.5	1.1	3.4	263
Cooperation and interaction (10 items, $\alpha = 0.79$)	2.3	0.5	1.1	3.7	267
Direct instruction (14 items, $\alpha = 0.79$)	2.7	0.4	1.7	3.8	267
Discovery learning (13 items, $\alpha = 0.82$)	2.0	0.5	1.1	3.5	270

Note. Frequency of use for all scales: 1 = (Almost) Never; 2 = Every Now and Then; 3 = Often; 4 = (Almost) Always.

Looking at the separate aspects of a meaningful and strategic learning environment, the following picture emerges. Relatively often, attention is paid to the connection to students' personal worlds (mean = 2.6) and process-oriented instruction (mean = 2.6). These two scales consist of instructional activities which reflect a good deal of teacher control. 'Process-oriented instruction' includes deliberate teacher activities aimed at encouraging students to reflect on their thinking process, such as process-oriented explanations (modeling, scaffolding), giving students time to respond to questions, emphasizing the use of strategies when carrying out learning tasks, delivering various forms of feedback aimed at processes as well as products. Most of the activities represented in this subscale take place on the initiative of the teacher, although this is not a synonym for knowledge transmission.

The items belonging to 'connection to students' personal worlds' are formulated in such a way that they represent teacher activities aimed at connecting their own program to the prior knowledge and interests of children. Amongst these are: connecting to prior knowledge and experiences of students at the start of new lesson topics; and demonstrating the relation between a topic and daily life or professional life.

To a somewhat lesser degree, learning environments are characterized by cooperation and interaction (mean = 2.3). This includes learning situations in which students carry out group assignments, in which they jointly construct knowledge, and during which they consult each other instead of the teacher. This also includes mutual presentation of results of assignments.

The final aspect of MSL, 'constructive learning tasks', is realized least frequently (mean = 2.1). Constructive learning tasks are long-term assignments that have relevance beyond school, and in which students come into contact with professional knowledge users by means of subject-transcending projects, independent collection of information, and performing research. In the accompanying learning environment, media other than the textbook are used, including modern media, magazines, journals, and materials brought from home. Assessment is a continuous process and has the form of portfolios. This kind of learning environment comes close to a discovery-oriented environment, but differs from it in such a way that students neither choose their own learning goals nor the object which is studied. The teacher plans these in advance.

Analyses of variance were used to test differences in realization of learning environments between types of education. The results indicate statistically significant differences for the following scales: meaningful and

strategic learning environment as a whole ($F[2, 264] = 11.2$, $p = 0.000$); connection to students' personal worlds ($F[2, 263] = 17.0$, $p = 0.000$); constructive learning tasks ($F[2, 260] = 14.2$, $p = 0.000$); cooperation and interaction ($F[2, 264] = 6.0$, $p = 0.003$); and discovery learning ($F[2, 267] = 5.2$, $p = 0.000$). Post hoc analyses (Scheffé) indicate that teachers from general secondary education attained lower scores on these scales than teachers from primary education.

The results for two scales representing students' perceptions of learning environments (meaningful and strategic learning environments and discovery learning) are displayed in Table II. In general, the results confirm the teachers' own perceptions of their behavior. However, students allocate to teachers from their schools lower scores than the teachers allocate to themselves (mean = 2.1 versus 2.4 and mean = 1.8 versus 2.0). Analyses of variance and post hoc comparisons again showed that teachers from general secondary education had attained significantly lower scores than teachers from other school types ($F[2, 935] = 24.1$, $p = 0.000$ and $F[2, 924] = 3.8$, $p = 0.000$).

Results from the teacher questionnaire, on the one hand, and the student questionnaire, on the other hand, aggregated at school level, correlate rather strongly. A correlation coefficient of 0.75 was found between the MSL teacher scale and the accompanying student scale and a coefficient of 0.59 for the discovery-teacher scale and the accompanying student scale. These results can be taken as indications of the validity of the teacher scales.

8.2. *Parents' Preferences*

The results for three scales for parents' preferences regarding learning environments (meaningful and strategic learning environment, discovery

TABLE II

Descriptive Statistics for Student Scales Concerning the Realization of Different Learning Environments

Scale	Mean	*SD*	Min.	Max.	*N*
Realization meaningful and strategic learning environment (14 items, $\alpha = 0.77$)	2.1	0.4	1.0	3.6	938
Realization of discovery learning (7 items, $\alpha = 0.70$)	1.8	0.5	1.0	4.0	927

Note. Frequency of use for all scales: 1 = (Almost) Never; 2 = Every Now and Then; 3 = Often; 4 = (Almost) Always.

TABLE III

Descriptive Statistics for Parents' Scales Concerning Preferences for Different Learning Environments for Their Own Children

Scale	Mean	*SD*	Min.	Max.	*N*
Agreement with meaningful and strategic learning environment (17 items, $\alpha = 0.67$)	3.2	0.3	1.8	4.0	628
Agreement with discovery learning (10 items, $\alpha = 0.78$)	2.5	0.4	1.1	4.0	624
Agreement with traditional teacher controlled learning environment (10 items, $\alpha = 0.73$)	2.8	0.4	1.6	4.0	618

Note. Range of scales: degree of agreement with use of instructional activities 1 = Fully Disagree; 2 = Disagree; 3 = Agree; 4 = Fully Agree.

learning, and traditional teacher-controlled learning environment) are displayed in Table III. The first two scales were developed parallel to the teacher scales; the third comprises a broader range of activities than direct instruction. 'Traditional teacher-controlled education' involves a preference for learning environments in which teachers stick to their textbooks, in which student progress is tested frequently, and in which the teacher determines the pace of learning.

In addition, preference for traditional education means that parents attach value to individual work, instruction delivered in small steps, grading of students' efforts, and emphasis on factual knowledge.

From Table III, we can infer that parents consider it important that their children learn in meaningful and strategic learning environments (mean = 3.2) but, at the same time, they also value some degree of traditional teacher-controlled learning environments (mean = 2.8). Parents are clearly less positive about a learning environment involving discovery learning (mean = 2.5). In general, parents value aspects of meaningful and strategic learning, but the learning environment should not turn into self-discovery.

Analyses of variance and post-hoc comparisons indicate that parents of students in secondary vocational education attach significantly more value to traditional learning environments than do parents of children in other types of education ($F[2, 615] = 4.15$, $p = 0.02$).

Looking at the correspondence between (reported) teacher behavior and parental preference, the following picture emerges. In absolute terms, the two data sources cannot be compared because they come from different types of questions (behavior perceptions and agreement with suggested activities). However, the infrequent use of discovery learning environments, compared with direct instruction, is mirrored by parents' prefer-

ences. The great value that parents place on meaningful and strategic learning environments (mean score well above the scale center) is not so clearly evident in teacher behavior (mean score below scale center).

Inspection of the correlations between school means for all learning environment scales and the corresponding parent preference scales shows the following picture. Parents' preference for meaningful and strategic learning shows a positive correlation ($r = 0.64$) with what teachers actually realize in this respect. No significant correlations were found between parental preferences for traditional learning environments and self-discovery, on the one hand, and actual realization of direct instruction and discovery learning, on the other hand.

8.3. *Predictors of Learning Environments*

Results of three stepwise multiple regression analyses are reported in Table IV. The dependent variables in these analyses are the realization of meaningful and strategic learning environments, and discovery learning and direct instruction. In each analysis, three blocks of predictors were entered in the regression equation, using a stepwise procedure: teacher characteristics (age and gender); school characteristics (type of education, school building suitable for cooperative and self-regulated learning); teachers' perceptions and attitudes (perceptions of student characteristics, attitude towards contemporary educational innovation, and teachers' own conceptions of learning).

The results indicate, first, that the selected teacher characteristics and school-level conditions do not account for a significant portion of variance in the realization of different learning environments. Apart from that, different predictors result for the three different types of learning environments. With regard to meaningful and strategic learning environments, three equivalent predictors appear: confidence in students' self-regulation ($\beta = 0.22$); acknowledgement that contemporary innovations require role changes on the part of the teacher ($\beta = 0.21$); and secondary education ($\beta = -0.22$). These results can be interpreted as follows: a meaningful and strategic learning environment is more often realized if teachers show more confidence in students' self-regulation, if teachers acknowledge that a role change is needed, and if teachers are not working in general secondary education.

Realization of a discovery-learning environment is predicted by only two factors that partly coincide with the predictors of the meaningful and strategic learning environment: confidence in students' self-regulation ($\beta = 0.40$); and preferences for learning together ($\beta = 0.15$).

TABLE IV

Predictors for the Use of Learning Environments: Results of Multiple Regression Analyses

Dependent variables	Meaningful and strategic learning environment			Discovery learning			Direct instruction		
	b	β	*t*	*b*	β	*t*	*b*	β	*t*
(Constant)	1.56		10.44***	0.76		4.09***	1.40		5.92***
Individual teacher characteristics									
Age[1]									
Gender (0 = male, 1 = female)									
School characteristics									
Teacher works in secondary education (0 = no, 1 = yes)	–0.15	–0.22	–3.77***						
School building suitable for co-operative and self-regulated learning									
Perception of student characteristics									
Confidence in students' self-regulation	0.16	0.22	3.74***	0.39	0.40	6.84***			
Attitude towards contemporary educational innovations									
Acknowledge role changes as teacher	0.36	0.21	3.44**						
Own conceptions of learning									
Preference for learning together	0.10	0.16	2.71**	0.13	0.15	2.56*			
Preference for externally-controlled learning							0.18	0.22	3.43**
Preference for learning to use knowledge							0.11	0.14	2.08*
Preference for discovery learning							0.13	0.13	2.04*
R^2	0.22			0.18			0.10		

Note. [1]Dummy-variables for three age categories: 1 = 21–30; 2 = 31–50; 3 = 51+; Range of scores for all scales 1–4, unless stated differently; *b* = unstandardized regression coefficients, β = standardized regression coefficients

Interestingly, the realization of direct instruction can be predicted by mutually different learning conceptions on the side of the teachers. The strongest predictor within this set is the teacher's own preference for externally controlled learning ($\beta = 0.22$). In addition, other preferences are predictive for direct instruction as well: preference for learning in order to apply knowledge ($\beta = 0.14$); and a preference for discovery learning ($\beta = 0.13$). The last learning conception mentioned can be seen as opposites to the first one. Possibly, teachers applying direct instruction could form a broad group.

9. Conclusions and Discussion

Looking back at the results, we can conclude that learning environments are more often oriented at transmission than at discovery and negotiation. However, looking at the realization of different dimensions of learning environments, one cannot speak of a pure transmission model.

Teachers do use direct instruction but, in doing so, they do not restrict themselves to presenting knowledge products. They pay attention to the process of knowledge acquisition, although they do so on their own initiative. The responsibility for the acquisition process is not often delegated to their students. In addition, teachers address students' prior knowledge, interests, and personal worlds, insofar as it is feasible within their curricular program. Cooperation and interaction sometimes take place in the learning environment, but again learning activities are teacher controlled, leaving little responsibility to the students. In terms of the dimension of individual learning versus co-construction of knowledge, the learning environment falls between the two extremes.

Teachers seldom choose learning environments which aim at discovery of knowledge. Learning environments characterized by knowledge construction, using complex learning tasks, in which research activities and independent information collection take place, seldom occur. These findings support the findings from previous studies in The Netherlands (Kuiper, 1993; Roelofs & Houtveen, 2002; Roelofs & Terwel, 1999; Terwel, Vermeulen & Volman, 1996; Withagen, Oud-de Glas, Smeets & Buis, 1996) and in the USA (Newmann, Marks & Gamoran, 1996).

In addition, we found that the situation differed with the type of education. All types of learning environments, ranging from direct instruction to discovery learning, are realized less frequently by secondary school teachers than by primary school teachers and vocational teachers. Appar-

ently, primary teachers more deliberately create learning environments than their colleagues in secondary education. A possible explanation for this finding is that the secondary school curriculum is characterized by a split-subjects approach. The various subjects are taught by different teachers. The ideal of constructive learning environments might be hard to attain as long as learning activities do not transcend subject boundaries. In primary schools, the curriculum is also split into different subjects. However, these subjects are taught by the same teacher in the same physical classroom, which might form a supportive condition for creating a learning community. In secondary vocational education, the curriculum is structured along a system of specific vocational qualifications, which could foster learning environments that aim for authentic learning, involving complex vocationally-oriented learning tasks.

Although parental preferences and teacher behavior cannot be compared directly, there are indications that there is no large gap between them. Parents do not attach high value to discovery learning. Teacher-controlled learning environments, including frequent testing of students' progress, are valued more by parents. From the results, we might infer that parents consider as most valuable those learning environments that consist of a mix of measures that are partly teacher-controlled and partly student-controlled and that relate to the use of constructive learning tasks, the connection to students' personal worlds, process-oriented instruction, and cooperative learning.

Scores on the teacher scale measuring perceived practice on these aspects correlate significantly with the matching parent scale. Parental preferences for the extremes of discovery learning and direct instruction hardly correspond to teachers' reported practices. There are no clear indications that parents attach greater value to transmission-oriented learning environments compared with teachers, as might be expected on the basis of the Schlak (1994) and Wise (1993) studies. The difference in results could be attributed to cultural differences between USA parents and Dutch parents. Besides, the focus in these quoted studies is on kindergarten contexts, whereas we focused on Grades 6–12.

Considering parental preferences in more general terms, we can conclude that parents show a favorable attitude towards process-oriented, constructive, and collaborative learning environments, as long as teachers keep a strong grip on the learning process.

Apart from that, not all the parental data were analyzed in detail. In a follow-up article, we plan to analyze differences between parent preferences and the factors that might be held responsible for these differences.

More in-depth analyses show that different groups of parents can be distinguished by different types of preferences.

The results regarding predictive factors for the realization of learning environments (research question 3) largely confirm our expectations. Predictive factors for a discovery learning environment and a mixed learning environment are the teachers' confidence in students' self-regulation and their acknowledgement of a changing role within contemporary learning environments. The predictive power of teachers' preference to learn in cooperation with peers might reflect a more general preference to cooperate with colleagues. The willingness to collaborate with colleagues appears to be of major importance for the implementation of modern learning environments (cf. Newmann & Wehlage, 1993; Newmann et al., 1996).

What is remarkable, however, is the finding that the realization of direct instruction is predicted by various conceptions of one's own learning. Possibly, direct instruction is generally valued within teaching practices. A different explanation might be that one's own conceptions of learning, from the point of view of experts, is seen as different from the way in which novices should learn within a given domain.

With regard to the predictive factors, it must be noted that many other factors at the class and school level were not involved in this study. Among these are teachers' own (perceived) competence and the quality of staff development. These omissions could have influenced the results of our multiple regression analyses.

Regarding recommendations for follow-up study, we distinguish two themes: variants of learning environments; and studying parental preferences.

Future study of dimensions of learning environments would enable a more transparent view of the options and conditions regarding different variants of learning environments. To that end, a more detailed descriptive frame should be developed which covers additional characteristics of learning environments and conditions under which these can be realized. More specifically, a distinction should be drawn between the types of learning outcomes to be attained. Possible aspects of learning outcomes are: the stability and flexibility of knowledge use; the authenticity of contexts for use; the level of mastery; and the tolerance for errors in performance. Recently, Elshout-Mohr, Van Hout-Wolters, and Broekkamp (1998/1999) distinguished eight different types of instructional learning episodes in which different goals stand central, each requiring qualitatively-different learning processes to be realized in qualitatively-different learning environments.

In addition, follow-up study should shed more light on the way in which the design of a learning environment is influenced by the content and the structure of a knowledge domain. In addition, conditions for the use of different types of learning environments can be a fruitful direction for further theory building and teaching practice. Among these are: the educational context (type of school, formal or informal schooling context); the possibilities and boundaries of the physical learning environment (rooms and furniture, media, technology, group composition); and, finally, conditions at the teacher and school-management level. Different scenarios of learning environments within well-defined domains and contextual constraints could be developed and tested in (quasi-) experimental designs.

The second theme involves the study of parental preferences for learning environments for their children. Research into these preferences is likely to be useful in order to come to grips with parental involvement with schooling in general and with learning environments in particular. The influence of parents' involvement on students' academic achievement, their academic self-concepts, and their school attitudes has been demonstrated in a number of studies (Chrispeels, 1996; Levine & Lezotte, 1995; Marjoribanks, 1995, 1996). It can be expected that, in future educational innovations, parents' views will play an important role, because parents are an important linking pin between the school environment and the world outside school. Specifically, more detailed qualitative data can be acquired about specific family opportunity structures (cf. Marjoribanks, 1995), in terms of the way in which parents perceive and facilitate strategic and meaningful learning activities for their children. After all, not only do students' and teachers' roles change with changing views of learning, but parents' roles will do so too.

Author note

We would like to thank Piet Sanders (Citogroep) and Marianne Sanders (Tilburg University) for reading and editing the manuscript, and Jos Theunissen for being involved in the study during the construction of the questionnaires.

Notes

1. The three types of data (teacher, students, parents) have not been collected – for budgetary reasons – in ways that permit linking every student and every parent to one particular teacher. Therefore the data could not be merged at the teacher level. Subsequently, it was not possible to carry out analyses at the teacher level in which three parallel measures of learning environment (teacher, parent, student) were included.

APPENDIX A

TEACHER SCALES FOR DESIGN OF LEARNING ENVIRONMENT

a1. Teachers: Connection to Students' Personal Worlds

a When I introduce a new topic, I first determine what the students already know about it.
b I adapt the content of my lessons as much as possible to the students' perceptions of their environment.
c During my lessons, I offer students the opportunity to discuss their own experiences or information they have on the topic.
d I choose examples that appeal to students.
e I try to choose topics that relate to the students' interests.
f I assign students problems that are meaningful to them so that they want to find a solution.
g I try to indicate why each subject I deal with is important for them.
h I give assignments that relate to daily life, in which students have to apply previously acquired knowledge.
i In my tests, I give assignments that are derived from daily life or from a specific profession.
j I pay attention to the value of content matter for professional practice or for situations in daily life.
k I ask my students what they already know about a lesson topic and let them share their knowledge.
l I try to indicate the value of each lesson topic for future use.
m I give assignments that are personally meaningful to the students.
p I make a connection between lesson objectives and the students' own goals.

a2. Teachers: Process-Oriented Instruction

a When a student asks a question, I give a clue (or scaffold) instead of the correct answer.
b I ask students how they arrived at a solution, and what the steps in their thought processes were.
c In giving marks, I give greater weight to approaching the problem correctly and thinking it through properly than to producing the right answer.
d I make evident to the students that understanding the strategy used is at least as important as giving the right answer.
e My exams consist of a small number of complex assignments requiring several steps in the students' thought processes.
f I try to teach in such a way that students think about the way to tackle learning tasks.
g I stimulate students to discover the solution to a problem or assignment on their own.
h If a student gives the wrong answer to my question, I offer him/her a second chance to come up with the correct answer.
i When I ask a question during my lessons, I give students time for reflection before calling on one of them.

j I give assignments which allow students to determine for themselves how to arrive at a solution.
l I refer students to resources (like sections in a book), that they can use as a means of feedback.
m I stimulate my students to set goals for themselves.
n As a form of feedback during my lessons, I give additional information on the results of learning tasks.
o As a form of feedback during my lessons, I restructure the results of learning tasks.
p As a form of feedback during my lessons, I completely correct the results of learning tasks.
q As a form of feedback during my lessons, I confirm correct results of learning tasks.

a3. Teachers: Constructive Learning Tasks

a I have my students collect information independently on the subject matter of my lessons.
b I give assignments which require students to conduct a small research study.
c In class, I use media other than textbook material (e.g. newspapers, the computer, video).
d I give assignments which have relevance beyond school (e.g. interview someone).
e Students are assigned to independently think of concrete examples or applications of certain items of the subject matter.
f During and after my lessons, students come in contact with knowledge users outside the school (such as institutions, professionals, or just ordinary people).
g I give assignments which require students to apply knowledge from other school subjects.
h Students work on projects in which subject material from various subjects is integrated.
i I bring, or have students bring, items (e.g. posters, realia) to illustrate subject matter.
j I give assignments, which students can work on for more than one class period.
k I have my students keep a portfolio in which they collect and describe different products of assignments.
l I discuss the assessment of portfolios with my students.

a4. Teachers: Cooperation and Interaction

a I have my students work collaboratively in groups.
b In my class, students present the results of assignments to fellow students.
c The assessment of the results of group work takes place by means of a consultation between the teacher and the students.
d In the event of group assignments, I assign students to come up with a joint result.
e If, during independent work, students come across something they do not understand, I expect them to consult with a fellow student first.
f During group work, students are only allowed to ask me questions as a group, not individually.
h I pay a lot of attention to developing adequate group assignments.
i In the event of group work, I discuss the way in which students cooperated in their groups at the end of class.
j My students work on group assignments which require them to be mutually interdependent.

k In addition to the group result as a whole, students are also held accountable for their individual contribution to the group product.

b. Teachers: Direct Instruction

a At the start of the lesson, I give a summary of previous content matter.
b At the start of the lesson, I review as much prior knowledge as necessary for the students to understand the subsequent content matter well.
c I indicate in small steps exactly what the lesson objectives are.
d I give a detailed outline of the topics that will be dealt with in the lesson.
e I have my students repeat (parts of) my explanations to check whether they understand the content matter.
f During instruction I pose a lot of short questions to check whether students understand the content matter.
g During instruction I have my students practice a lot, followed by immediate feedback.
h I give short and clear assignments, which can be carried out without serious problems.
i Before my students start carrying out assignments, I tell them how these assignments are related to the lesson objectives.
j During my lessons, I continue practicing until virtually all the students master the content matter.
k I offer content matter in gradually increasing levels of complexity.
l Before my students start carrying out an assignment, I let them know that their work will be assessed.
m My assignments exactly match the content of my lesson.
n At the end of a lesson, I discuss the extent to which the lesson aims have been attained.

c. Teachers: Discovery Learning

a I have my students pose their own questions so they can figure out for themselves what they need to know.
b I have my students develop their own assignments.
c I have my students learn things which they consider important to know.
d When students have trouble carrying out learning tasks and ask me for help, I offer them a variety of materials with which they can come to their own solutions.
e My students develop their own assignments, and decide for themselves how to fulfill them.
f My students select the learning tasks they are going to perform.
g My students decide for themselves how much time they need to spend on their learning task.
h In my lessons, students mainly learn by discovery.
i My students choose for themselves which assignments they will fulfill.
j Students decide for themselves whether it is necessary to cooperate with fellow students.
k Students choose for themselves the moment at which they want to cooperate with fellow students.
l I have my students discover the way a problem is to be solved.
m Students work with self-instructing materials.

APPENDIX B

SCALES FOR TEACHERS' OWN CONCEPTIONS OF LEARNING

e. Teachers: Preference for Discovery Learning

a Learning is seeking information to answer questions I pose myself.
b I learn best when I try to answer a question I posed myself in my own way.
c I prefer to decide for myself what I am going to learn.
d I prefer to learn in my own way and not the way others think I should learn.
e When I learn something I want to know, I can memorize it easily.
f When I am not allowed to learn in my own way, my learning is not successful.
g I prefer to be allowed to solve a problem in my own way.
h I prefer to decide for myself whether or not to cooperate with others.

f. Teachers: Preference for Learning Together

a I prefer to cooperate on assignments with fellow students.
b I think it is important to check with fellow students whether I understand the subject matter adequately.
c I think it is important to get advice from fellow students regarding the way I can learn best.
d When I experience difficulties mastering subject matter, I prefer to ask my fellow students to explain it to me.
e I need to cooperate with fellow students when I study content matter.

g. Teachers: Preference for Externally Controlled Learning

a When I run into difficulties, the teacher should stimulate me to search for solutions.
b I think it is necessary for the teacher to stimulate me to compare different topics covered during a course.
c I think it is necessary for the teacher to stimulate me to test my mastery of the subject matter.
d A teacher has to stimulate me to reflect on my studying strategies and on the way to improve them.

h. Teachers: Preference for Learning to Use Knowledge

a To me learning means acquiring knowledge which is practical.
b To me learning means acquiring knowledge which I can use immediately or after some time.
c It is necessary for me to try to apply the content matter in practice.
d I prefer course meetings in which many examples are given regarding the content matter under discussion.

i. Teachers: Preference for Externally-Controlled Intake of Knowledge

a To me learning means trying to memorize the content matter being presented.
b I prefer being told exactly what to do in an assignment.
c The teacher needs to point out what is important or less important for me to know.
d I need to memorize definitions and other facts.
e I need to repeat the content matter until I know it by heart.
f I think that a teacher should check my mastery of the content matter.

APPENDIX C

TEACHER SCALES FOR ANTECEDENT FACTORS FOR CHOICE OF LEARNING ENVIRONMENTS

k. Teachers: Acknowledge Role Changes as Teacher

b As a result of contemporary educational innovations, I will have to makes changes in the way I teach.
c As a result of contemporary educational innovations, the use of whole-class teaching will decrease.
j The teacher's role will change from transmitter of knowledge into facilitator of students' learning processes.
k As a result of developments of information technology, the teacher's role will change from transmitter of knowledge into facilitator of learning.
i The teacher's role will change as a result of the increasing use of computers by students.
h As a result of recent developments in education, the frequency of immediate contact with students will decrease.
d As a result of contemporary educational innovations, students will more frequently be asked to work independently.
e As a result of contemporary educational innovations, students will become more responsible for their own learning process.
f As a result of recent developments, I offer my students more choice with respect to learning tasks.
l In the future, outside experts will be involved in education.
m In addition to teachers, other experts within the school will play an important role in providing instruction for students.

l. Teachers: Confidence in Students' Self-Regulation

a I think students are capable of determining *what* they need to learn.
b I think students are capable of determining *how* they need to learn.
d Students should be offered more opportunities to decide for themselves the order of their learning activities and how much time to give them.
e Students should be offered more opportunities to decide what task they want to carry out at a given moment.
f Students should be offered more opportunities to decide what subjects they want to work on.
g Students should be offered more materials, so that they can learn in their own way.
h Students should have more opportunities to decide for themselves *how* they carry out assignments.
i Students should have more opportunities to decide for themselves *when* to carry out an assignment.
j Students should have the opportunity to work on subjects they bring up themselves.
p Many students can't cope with the freedom of self-regulated learning.

m. Teachers: Suitability of the School Building for Cooperative and Self-Regulated Learning

k Our school building is not suited for having students work in small groups.
l In our school building, there is a lack of rooms in which students can work independently.
m Our information center and library are not equipped for self-regulated learning.
o It is necessary that our school building be made suitable for cooperative learning.

APPENDIX D

STUDENT SCALES CONCERNING THE REALIZATION OF DIFFERENT LEARNING ENVIRONMENTS

n. Students: Realization of Meaningful and Strategic Learning Environments

a When I have to study something, the teacher tells me first why it is important to know about the subject.
b The assignments we carry out relate to our daily lives. In these assignments, we have to apply what we have learned.
c The teacher asks us what we already know about a lesson topic.
d The teacher tells us what value the lesson topic has for future use.
e The teacher asks me what I did to arrive at the solution of an assignment.
f The teacher makes us think about the way we have to learn.
g The teacher stimulates me to find a solution to a problem on my own.
h We can determine ourselves how to carry out assignments the teacher gives.
i The teacher asks us to collect information independently on the lesson topic.
j I get assignments which require me to do research.
k In our lessons, we not only use textbooks but also other things like newspapers, the computer, or video.
l I get assignments in which I have to use knowledge from different school subjects.

o. Students: Realization of Discovery Learning

a We are allowed to develop our own assignments to work on.
c We are allowed to develop assignments on our own, which we can carry out in our own way.
d We are allowed to decide for ourselves which tasks we work on.
e We are allowed to decide for ourselves how much time we spend on our tasks.
f Our teacher allows us to choose assignments.
g We may decide for ourselves whether it is necessary to cooperate with fellow students on an assignment.
h We are allowed to discover ourselves how we solve a problem.

APPENDIX E

PARENTS' SCALES CONCERNING THE PREFERENCE FOR DIFFERENT LEARNING ENVIRONMENTS

o. Parents: Preference for Instruction for Meaningful and Strategic Learning

a Lessons at school should be connected to what students encounter in their daily lives.
b During lessons, students should have the opportunity to bring in their own experiences or information.
c The content of lessons should be connected to students' personal interests.
d Schools should pay attention to the value of content matter for various professions.
e I think it is important that students acknowledge the value of the lessons for their future.
f Teachers should allow students to decide which assignments they will carry out.
g For students, understanding the strategy for tackling a problem is at least as important as giving the right answer.
h Teachers should stimulate students to discover the solution to a problem or assignment on their own.
i Teachers should give assignments in such a way that students can determine for themselves how to arrive at a solution.
j Students should learn how to plan their learning activities when carrying out difficult tasks.
k Students should learn to collect information about lesson topics independently.
l I think it is important that schools use not only textbooks, but also other media like newspapers, the computer, or video.
m I think it is important that students work on projects in which they use content from various subjects.
n I think it is important that students work collaboratively in groups.
o If, during independent work, a student comes across with something he does not understand, he should ask a fellow student for help first.
p Students should work on group assignments in the execution of which they are mutually interdependent.
q In addition to the group result as a whole, students should also be held accountable for their individual contribution to the group product.

p. Parents: Preference for Discovery Learning

a Students should be allowed to develop their own assignments.
b At school, students should learn things which they themselves consider important.
c Students should have the opportunity to develop their own assignments to work on in their own way.
d Students should be allowed to decide for themselves which tasks they work on.
e Students should be allowed to decide for themselves how much time they spend on their tasks.
f In lessons, students should mainly learn by discovery.
g Students should be allowed to select their assignments.
h Students should decide for themselves whether it is necessary to cooperate on an assignment with fellow students.
i The teacher should have the students themselves discover the way a problem is to be solved.
j A teacher should only offer help when a student asks for it.

q. Parents: Preference for Teacher-Led Transmission-Oriented Learning Environment

a Teachers should stick to their textbooks during teaching.
b Teachers should often check the extent to which students have mastered the content matter.
c Teachers should check whether students carry out their assigned learning tasks adequately.
d Teachers should determine the pace of learning for all students.
e The advantages of cooperation between students do not outweigh the disadvantages.
f When students work collaboratively on an assignment, there will always be students who do nothing.
g Students should mainly work individually on assignments.
h The teacher should model step by step how an assignment is to be carried out.
i It is important that students get marks for what they are doing.
j At school, students should learn mainly factual knowledge.

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