EDUCATION INQUIRY

Volume 2, No. 3, September 2011

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Umeå School of Education
Umeå University
Sweden

EDUCATION INQUIRY

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OPEN SECTION

Education Inquiry
Vol. 2, No. 3, September 2011, pp.475–495

Students' learning styles compared with their teachers' learning styles in upper secondary school – a mismatched combination

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Abstract

The background to this study is the large number of students who fail to finish upper secondary school with passing grades. The overall aim of this study was to examine one parameter in the didactic interaction between teachers and students, namely differences and similarities in learning styles. This study therefore compares teachers' and students' learning styles profiles in the two major orientations in upper secondary school. The study involved 53 secondary school teachers and 101 high school students who were randomly selected. The learning styles assessment PEPS was used to identify 20 different traits. Three groups were compared and analysed by using an F-test and an analysis of variance (ANOVA). The statistical analysis showed that the teachers have a greater need for light and temperature, are more motivated, more conformist, have less need for structure and authority and are more alert in the morning and less in the afternoon compared with the students. The two student groups revealed no statistically significant differences between them. The results are of value for people involved in the planning of teacher education, practicing teachers and students themselves. The results indicate the need for expanded educational strategies and an in-depth didactic discussion of practical activities.

Keywords: learning styles, teaching styles, the Dunn & Dunn Learning Styles Model, upper secondary schools

Introduction

Every third student leaves upper secondary school without a full rating. A quarter of all students leave with incomplete grades and in some municipalities the figure exceeds 40 percent (Skolverket, 2010a). One discernible reason behind the incomplete grades is the poor relationships between students and teachers. Another factor is the school's ability to be flexible in terms of different approaches (Skolverket 2010b). Schools do not take sufficient account of students' specific situations and needs (Skolverket, 2001; Hugo, 2006). Another reason mentioned is that the school's content is not seen to be meaningful for many students and that the content is not perceived as being adapted to them (Hugo, 2006). Further, the schools have been criticised for allocating too little time to core activities and ensuring that teachers

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 ISSN 2000-4508, pp.475–495

adequately meet students and address them in their learning needs (Fölster, Morin & Renstad, 2009). Only a third of teachers' time, 32 percent, is given to students and their learning. The situation in secondary schools in the Nordic countries seems to be the same. High dropout rates and a low throughput of students are considered to be major problems (Jørgensen, 2010).

This also effects access to higher education where the changes from elite to mass higher education lead to multiple challenges with regard to pedagogy (Kreber, 2007) and involve altering traditional approaches to teaching and assessment practices so "*that not only 'all' get admitted into our programs but 'all' also have a fair chance to succeed"* (Kreber, 2007 p. 3).

Both international (McKinsey reports) and Swedish (SOU 2009/10: 89) research show that teachers' competence is crucial for students' academic achievement. The quality of teachers is thus crucial to the quality of the education system. The only way to improve performance is to improve education. If the system supports and facilitates high quality teaching, good results are achieved.

> If you work as a teacher or tutor, or in any other way of learning processes, you should think about your own thinking style which probably dominates your approach to teaching perhaps more than you think. We tend to teach in the same way we think about learning (Albrecht, p 45).

The above quotation clarifies the purpose of the study, namely to examine similarities and differences in learning styles between teachers and students at secondary schools. If teachers tend to teach as they themselves learn (Steinberg, 2005; Albrecht; 2003), this may be *one* explanation of the difficulty students have in assimilating some teaching.

Teacher education is going to be reformed in Sweden and the teacher bill highlights that education and skills are two of the most important factors for a successful school. Areas to be included in the educational science core include development and learning, social relationships and leadership. Both leadership and learning include an awareness of students' and groups' ways of learning, and teachers' awareness of their own learning and their teaching style to meet the mission of education for all. Students are different and so too are teachers. But how much do teachers know about the student group they encounter? The individual variations are great – but how is it at the group level? Do the different classes differ from each other concerning the best way to learn, their so-called learning style? And how can teachers match them as well as possible?

In secondary schools different requirements are often compared with previous studies. Many have trouble finding good study skills and appropriate learning strategies (Mörtsell, 2007). Teachers in high schools strive for educational programming and constructive teaching (Fransson & Moberg, 2001; Lantz, 2007). All young people in Sweden who have finished compulsory school are permitted to have three years of education at the upper-secondary level. This is free and non-compulsory and provides a platform of knowledge for further studies and a future career. The upper-secondary

level offers 17 national programmes, which last for three years. Some programmes are more academic and others are more practically-oriented courses (vocational education). These are divided into mandatory courses, optional courses, individual choices, core subjects and project work.

What is a learning style?

The term learning style may include more than 70 different models with conflicting assumptions about learning, and with different designs and starting points (Coffield, Ecclestone, Hall & Moseley, 2004). There are many different theories and models of learning styles with varying dimensions and variables. They focus on different aspects, cognitive processes, skills, sensory modalities, learning processes, thinking styles etc. Theories of learning style simply assume that everyone can learn, but in different ways and on different levels. The area is comprehensive and addresses both individual and group levels, but also affects organisations as a whole, e.g. how the theory can be applied in schools with parents, students and staff in collaboration (Riding & Rayner, 1998).

Several researchers have attempted to categorise the different styles and models, ancillary, hierarchical, pragmatic, researched etc. The analysis of Adrian Furnham (2010) has its origins in psychology. Figure 1 shows a grouping of examples of different theorists, dividing them by character and personalities on the basis of individual differences.

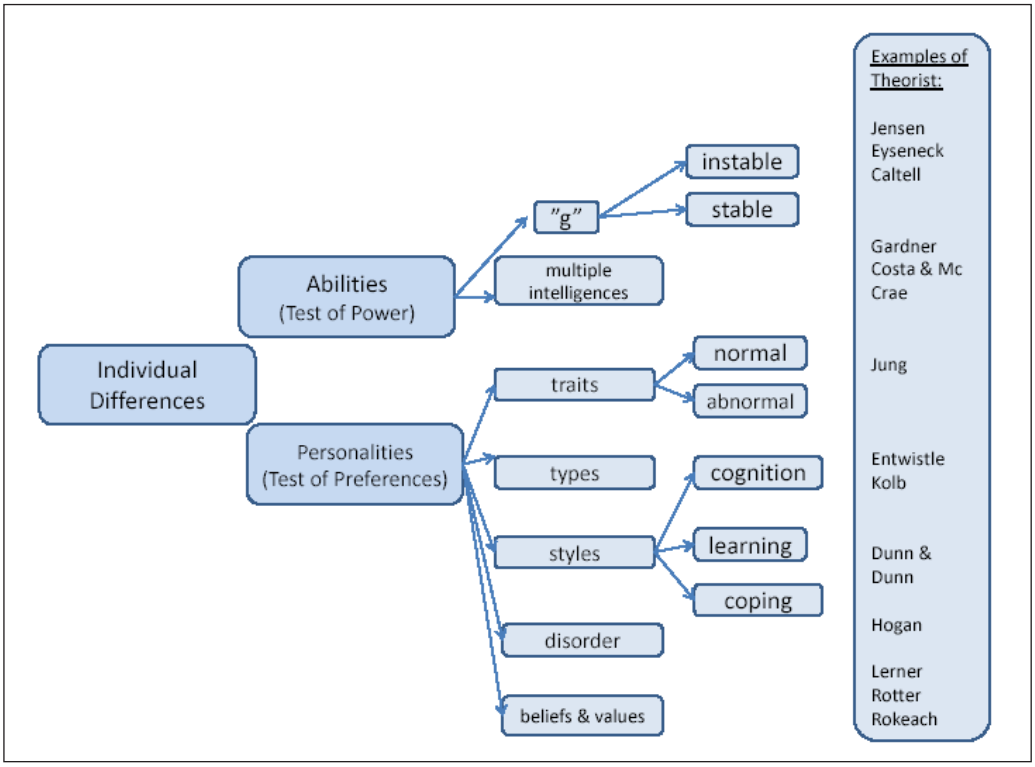

Figure 1 Professor Adrian Furnham's categorisations of learning styles

As for personalities, they can be tested with respect to preferences. Furnham finds at least five distinctive areas: the characteristics, types, styles, disorders and beliefs plus values. Within each area group, he exemplifies different theorists and in the field of "styles" we find the specified groups such as cognition, learning and coping. One theoretical direction in styles for learning is the Dunn & Dunn Model. In conclusion, we note that there is a broad field encompassing many different disciplines and that research contributes by always adding new dimensions. It is important to position them regarding what is covered in the next section.

In Scandinavia, the two most famous and well used models are Kolb's Learning Styles Model, which describes information processing and is frequently used as a starting point in problem-based learning (Hård af Segerstad, Klasson & Tebelius, 1996), and Dunn's Learning Styles Model, which is multidimensional and widely used in elementary and high schools as well as adult education (Boström & Lassen, 2006).

The Dunn and Dunn Learning Styles Model[1]

Dunn's Model is probably the most internationally dispersed, researched and practically used learning styles theory (Buli-Holmgren, Guldahl & Jensen, 2007; Lauridsen, 2009). It focuses on elements that are crucial for learning new and difficult academic information. Learning styles preferences[2] are a combination of both biological and learned patterns, which means that identical methods, environments, materials and instructions are effective for some individuals but ineffective for others (Thies, 1999 - 2000). Most people have preferences, but the individual style elements stand out significantly. Style features vary depending on academic achievement, gender, age, culture, and information processing.

Forty years of research have shown that there are 20 different factors (also called elements) that have an objective and measurable impact on learning. In qualified international research these 20 factors have revealed a statistical significance of predictability at the level of 95%. The factors are divided into five basic stimuli affecting each individual's abilities: environmental, emotional, sociological, physiological and psychological elements (Dunn & Griggs, 2007).

At the individual level, it is essential to be aware of what affects motivation, concentration and retention to be able to match this with strategies. This model is applicable to direct learning situations and should not be confused with psychological models or tests. It is not about talents, personalities and attitudes. It focuses on learning what is perceived as difficult and new.

Previous research

There are about 900 scientific studies of Dunn's Model. Research on the model and its use is dispersed in about 130 universities worldwide (www.learningstyles.net). This model has examined many different aspects: different types of schools, age groups and populations. Many studies have focused on differences in the participants' per-

formance, retention, attitudes and behaviour. Others have focused on meta-learning and school improvement.

Learning styles in high schools

Internationally, there are many studies of Dunn's Model in secondary high schools. They cover different topics with a methodical match, but also empirical studies with stylistic traits other than perceptual preferences (Dunn & Griggs, 2007). A couple of dozen studies have been conducted to identify and compare students' ways of writing (15 years and 17 years) in various countries, including Brazil, Sweden and Hungary. The results reveal some cultural differences, but these are larger within countries than between countries (Honigsfeld, 2007). There is no research on student groups' preferences in comparison with various study options in secondary schools.

In the Nordic countries there is one thesis on high school students and grammar teaching (Boström, 2004a). Students in both vocational and academic programmes participated in an experimental study. The results showed the statistical significance of achievements, attitudes, evaluation and understanding of the usefulness of grammar with learning styles instructions compared with traditional teaching.

Norway has a national evaluation which shows that education based on learning styles affects teachers' perceptions of action competence. The teachers who taught with learning styles as a basis adapted themselves more often to students' learning preferences, co-operated and reflected more with their colleagues, were more development-oriented and more open to change (Wærness, Lindvig, Andresen & Nissen-Lie, 2005) compared with those who did not use learning styles as a pedagogical basis. With these positive results, the researchers conclude the following when speaking of learning styles; *"… more awareness about learning styles from teachers gives more opportunity for addressing students' individual learning*" (p. 79).

Research on teachers in upper secondary schools

Teachers learning styles preferences have been little explored. Dunn and Griggs (2007) find that 65% of teachers in high school are analytic, while at least 55% of the students are the opposite, namely, global. In Brunei, 185 teachers' teaching styles in secondary school were compared with students' learning styles. The teachers turned out to be "fairly traditional", i.e. they taught with visual and auditory methods, while their students' preferences were in the range extremely "low" or "high" in terms of sensory modalities, i.e. many learned best in completely different ways than through the teacher's teaching methods (Pengiran-Jadid, 2007). Some of these students may not be successful unless they are taught through "hands-on" methods or by being practically involved in learning. The researcher concludes the following; "*Those findings suggest the need for widely diverse teaching approaches"* (p. 139). In Scandinavia there is no research on teachers' preferences in comparison with those of students.

Learning styles and leadership

As one learns, one tends to teach, educate and lead others. It is therefore important for teachers to reflect on themselves and their strategies in teaching situations. Our traits affect all our relationships and performances (Steinberg, 2004). An important and decisive factor for success in teaching is good relations between leaders and students (Hattie, 2009; Sylwester, 1997). It is about weaving together learning, relationships and leadership. A platform for this to succeed is that we understand people's unique ways of learning and try to match them (Dunn & Dunn, 1999). Knowing how students learn is an important starting point for instruction, both individually and in groups (Grinder, 2000).

Awareness and learning styles are thus important for teachers to really be able to individualise the school, organise and manage the activities (known as classroom management) so that they promote learning (Stensmo, 2008). Cavas (2010) points out the importance of teachers' awareness of their preferences and the author argues that the concept of learning styles is one of the most important factors explaining the differences in teaching and learning processes. Teachers' ways of developing, organising and directing activities are the basis for creating individual learning environments. Teachers as leaders must reflect on effective learning and individualisation should be based on students' needs. Stensmo (2000) notes there is no uniform way of managing and learning to suit all students, but that an educator must find their best way. Understanding their own strategies gives a greater insight into their own and others' behaviour, and how this has repercussions on teaching (Hultberg, 2008). Studies on teachers learning are rare, according to Vermunt (2010), and he recommends that research concerning teachers' and students' learning in interaction should be promoted.

Learning Styles and Teacher Students

From the United States there are many studies about learning styles pedagogy in teacher training education or in in-service training for teachers. One concrete example is the teacher education programme at St Joseph's College, NY, where courses in different subjects, mathematics methods for example, are taught through the individual's perceptual preferences (Burke, 2000). Burke points out that it is particularly important to pay attention to the emotional elements and the need to give each student individual study strategies after taking the learning styles assessment. She also notes the need to adjust instructional methods to different groups.

Teacher education at the University of Texas offers the following recommendations for the integration of learning styles pedagogy (Whitley & Littleton, 2000):

- Identify the individual profiles and group profiles and see the group trends. A concrete example of a methodological consequence is that for a group-oriented student a cooperative learning class can be used.

- Interpret the profiles so that each student becomes aware of his/her best way to learn.
- Encourage students to study according to their strengths.
- Propose individual study strategies rather than one type of study skills.

For teachers and also prospective teachers, learning styles requires pedagogy to be taught according to their preferences, as emphasised by Dunn and Burke (2007). These students will then gain personal insights into how to successfully work with the children who fail at school. These researchers argue that teachers are aware that many students fail at school, but they do not know how to teach "non-traditional" children and this is a direct result of the teacher education programme which has not given them the didactic skills. Burke and Dunn highlight that teaching students with different learning styles is not difficult, but it is very different from what teachers generally do.

Stensmo (2006) points to the importance of differentiating instructions. He compares a group of student teachers in practical and aesthetic subjects with regard to perceptual preferences with a normally distributed group of teachers. Prospective teachers in practical and aesthetic subjects seem to learn more kinesthetically (with the whole body involved) compared with "normal" prospective student teachers. Stensmo concludes the following:

> When encountering teachers and students with a common academic learning profile the former are underdogs. To meet their needs a greater variation in teaching, learning and examination at the university must be implemented (p. 12).

Purpose and questions

The background to this study is students' deteriorating performances at upper secondary school and the main aim is to examine one variable in the didactic interaction, namely the relationship between students and the teacher specifically in terms of learning styles.

The purpose of this study is twofold: to compare teachers' and student groups' (academic and vocational) learning styles in secondary high school in Sweden. The data that will be used are their assessments at the group level. The intention is to examine whether and to what extent there are differences and similarities and to then analyse the reasons for the results. Another intention is to reflect on the possible consequences for learning, leadership and educational planning. The study sought to answer the following questions:

Q1. To what extent are there significant differences between teachers and students' learning styles profiles in high school?
Q2. To what extent are there significant differences between academic and vocational classes?

Method and Procedure

The study included 53 high school teachers (15 men and 38 women) and 102 secondary school students (36 from academic and 66 from vocational programmes) randomly selected. There were 52 women and 50 men. The data were collected in 2008-2010. The academic orientation was represented by students from the Social Science Programme (SP), which is suitable for students interested in social issues in a broad sense. The Social Science Programme primarily prepares students for further study. Completion of the programme qualifies students for most social science-related undergraduate programmes at universities or university colleges. Students from the Electricity Programme (EC) and Hotel and Restaurant Programme (HR) represented the vocational classes. The Electricity Programme is for students interested in working with electrical installations, technology and electronics. Theoretical knowledge is combined with practical work. The Hotel and Restaurant Programme is for students interested in preparing healthy and tasty meals, as well as laying tables and serving guests. Theoretical knowledge is combined with practical work.

The students were tested with the Productivity Environmental Preference Survey (PEPS) (Dunn, Dunn & Price, 1984, 1991, 2000). The test consists of 100 claims in five gradations (a sort of Likert scale) with reversible questions. The responses were processed by computer to obtain an individual average of each preference. The individual profile shows an average for each question on a 60-point scale (see Annex 1), although group profiles with mean values of each element will be added. They also marked each student's values as low (averaging 20 - 40), flexible (average 40-60) and high (mean 60 - 80). These values were calculated at the individual level for each group and used for the interferiel statistics. The descriptive statistics are thus based on the exact mean of each element, while the interferiel statistics are based on averages for each individual classified in main groups: low, flexible or high (mean).

This study compared four groups and the material was analysed by using an F-test and an analysis of variance (ANOVA). The main hypothesis of this study is that differences in learning styles preferences exist both between teachers and students and between the two study areas. Means and standard deviations were calculated for the descriptive statistics.

Results

Descriptive results

Table 1 shows the percentage breakdown for each learning styles preference. The majority of teachers' and students' preferences are in the range between 40 and 60, which indicates flexibility. This means that as long as they are interested in the content they learn, but when they are not interested, they learn superficially and receive short-term memory (Dunn & Griggs, 2007). It is notable that to a greater extent teachers are flexible compared with the students. Table 1 also shows the percentage split below 40 and above 60 for each preference. Markers in these fields indicate the students' strengths and needs, i.e. what is important for them to be able to learn effectively.

Table 1. Percentage distribution of learning styles preferences; secondary teachers (n = 53), EC students (n = 36), HR students (n = 30) and SP students (n = 36)

Elements	< 40				40 - 60				> 60			
	Teacher	EC	HR	SP	Teacher	EC	HR	SP	Teacher	EC	HR	SP
Sound	0	0	0	0	93	75	76	89		25	24	11
Light	17	58	39	40	70	42	59	60	12	0	3	0
Temperature	14	14	10	3	74	64	69	80,1	12	26	21	17
Design	3	25	34	31	79	58	66	57	18	17	0	11
Motivation	0	25	24	6	80	72	76	80	20	2	0	14
Persistence	2	3	3	0	74	86	97	86	24	11	0	14
Conformity	9	44	28	26	75	50	55	69	16	6	17	6
Structure	2	0	0	0	73	36	34	23	25	64	66	77
Self vs. group	5	17	3	17	63	39	34	49	32	44	62	34
Authorities	9	8	0	11	84	53	76	66	7	39	24	23
Routine vs. variation	14	28	28	17	86	72	72	74	0	0	0	8
Auditory	0	8	10	6	70	70	62	72	30	22	28	23
Visual	4	14	24	6	90	81	66	86	7	6	10	9
Tactile	9	8	10	17	84	81	69	74	7	14	21	9
Kinesthetic	4	6	10	3	91	83	83	92	5	11	7	6
Intake	16	16	0	6	70	58	69	72	14	25	31	23
E. Morn - Eve	8	36	28	43	72	58	72	57	20	6	0	0
Morning	24	47	28	34	63	39	45	57	12	14	28	9
Afternoon	8	0	4	3	62	33	48	37	30	67	48	60
Mobility	8	3	0	0	84	84	72	86	7	14	28	14

Environmental preferences

No individual in any of the groups wants the group to be completely silent. 25% of the students in HR and EC need *sound* in the background. The majority of teachers are flexible in terms of sound. The preference *light* indicates that students need much dimmer lights than the teachers, and almost no one prefers to work in clear light. With regard to *temperature,* the students seem to prefer warm rooms to a greater extent. The element *design* (furniture) clearly differs in outcome; students want informal settings to a much greater extent.

Emotional preferences

The emotional elements can be interpreted as follows: teachers in this study are not lowly *motivated* in contrast to students: 25% of the vocational students and 6% of the SP students are lowly motivated. Almost none of the vocational students are highly motivated in contrast to 19% of the teachers and 14% of the SP students. Teachers have high *persistence*, but no one in the HR class has. The element conformity shows significant differences in outcome. EC students have the highest proportion of non-conformity learners (44%), while for the HR and SP students the figure is 27.5%. We find most people with the opposite, high *conformity*, among teachers and HR students (approximately 17%). The need for high *structure* is evident for all three classes (64 - 77%), in contrast to the teachers (25%). Almost none of the informants learns best with an internal structure.

Sociological preferences

More students in the EC and SP classes are "*mavericks*", approximately 17% compared with the other two groups (3 - 5%). The spread between the groups is significant with regard to learning *in groups*. As many as 62% in the HR class prefer learning in groups, while the figures for the EC and SP classes are 44% and 34%. 32% of the teachers prefer groups. The need for *authority* is much higher for students than teachers (between 24% and 39%), while the figure for the teachers is 7%. Students in vocational programmes experience a slightly stronger need of *routine* in work methods compared with the SP students and teachers.

Perceptual preferences

Regarding the senses, we find the following differences: none of the teachers is low *auditory*, i.e. everyone can learn by listening. In contrast, 6 - 10% of the students are low-auditory. Teachers are also the most auditory of all four groups (30%), closely followed by the HR students. The low *visual* preferences show large differences between the groups, i.e. they do not learn best visually: 24% of the HR students, 14% of the EC students and 6% of the SP students. On the contrary, i.e. learning best visually, reflected no major discrepancies. As for *tactile* preferences, the HR class shows the greatest need for so-called "hands-on learning" at about 21%, while the corresponding share is 13 - 7% for the other groups. Low preferences for tactile learning occur with the SP students (17%), who differ from the other three groups (80 - 10%). The need to learn with the whole body involved, *kinesthetically*, shows no marked differences between the four groups.

Other

Concerning *intake*, students have a greater need for this than the teachers. No one in the HR class has a non-preference for this preference. The major difference regarding the *time of day* appears to differ between the groups as follows: Teachers are much

more morning people than the students, who in turn prefer the afternoon far more than teachers. The need differs between the groups as follows: the HR students are most in need (27%), followed by the EC and SP students (14%) and, with the least needs, the teachers (7%).

Conclusion

There are differences and similarities between the groups, but the teachers and students in the SP programme are more similar in their learning styles compared with the SP students and the vocational students. This applies to 18 of the 20 style features. Another clear distinction is teachers' stronger preferences for flexibility in their profiles.

To clarify the results between the two groups, comparisons for each preference are shown in the bar graphs below. They are divided into areas of high (Figure 1) and low average value (Figure 2), which illustrate the groups' tendencies of strengths and needs.

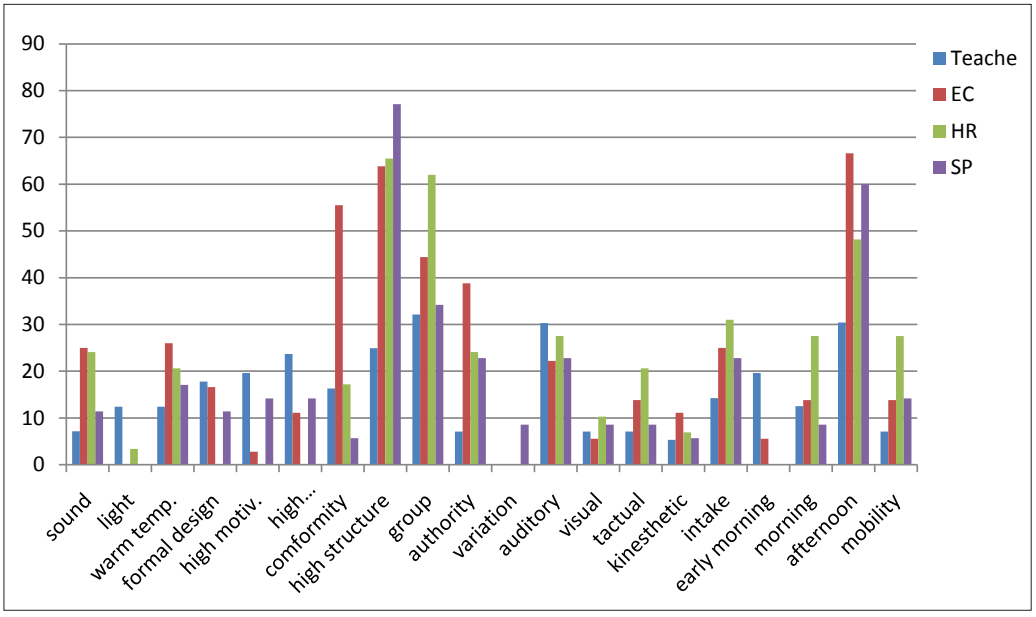

Figure 2 Percentage distribution of learning styles preferences with high averages

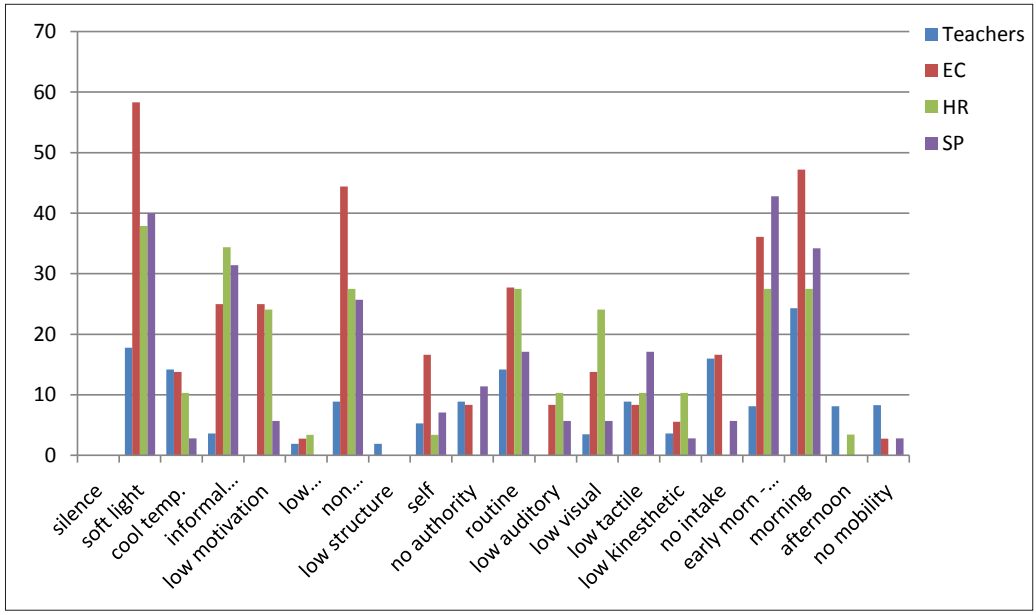

Figure 3 Percentage distribution of learning styles preferences with low averages

Statistical significance

A series of one-way analysis of variance (ANOVA) tests were conducted to assess learning styles among the four achievement groups. These ANOVAs revealed significant F-values for five learning styles elements and the follow-up tests identified seven pairwise differences. Significant means, standard derivations and F-values are reported in Table 2, while in pairs differences are described in a narrative format.

Table 2 Teachers' and students' learning styles preferences: mean, standard deviation, and significant F-values

	Teachers (n= 53)		EC students (n = 36)		HR students (n = 30)		SP students (n = 35)		
Elements	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**F**
Light	1.98	0.604	1.42	0.500	1.67	0.547	1.60	0.497	8.328 **
Temperature	2.15	0.456	1.91	0.658	1.67	0.479	1.83	0.618	5.537*
Motivation	2.13	0.440	1.78	0.485	1.77	0.430	2.06	0.482	6.682**
Conformity	2.08	0.513	1.61	0.599	1.70	0.466	1.83	0.568	6.222**
Structure	2.28	0.495	2.64	0.487	2.60	0.563	2.71	0.458	6.675**
Authorities	1.98	0.366	2.28	0.615	2.17	0.461	2.14	0.550	2.728*
Early morn.	2.09	0.597	1.69	0.624	1.73	0.450	1.60	0.497	6.973**
Afternoon	2.13	0.612	2.58	0.500	2.40	0.563	2.63	0.490	7.405**
Mobility	1.96	0.437	2.14	0.424	2.23	0.430	2.11	0.404	2.925*

*= sig<.05, **= sig <.001

The comparisons in pairs showed the following statistically significant results:

Teachers compared with students: The teachers: a) need more light compared with the EC and SP students; b) have a stronger need for warm environments compared to the HR students; c) have a higher intrinsic motivation than the HR and EC students; d) have a higher degree of persistence than the EC and HR students; e) have less need for structure than all three classes; f) have less need for authority figures compared with the EC students; g) are more alert in the morning compared to all three student groups; and h) are less alert in the afternoon than the EC and SP students. The study shows that teachers' style characteristics differ most from the EC students with seven preferences and the other two groups with four preferences.

Students: When comparing the students in the academic classes with the vocational students there are no statistical differences in the survey, nor between the two vocational classes.

Discussion and conclusions

The aim of this study was to find out how different and similar teachers and students are in programmes with a different orientation in secondary schools in Sweden in terms of their learning styles preferences. The results reveal a mismatch in terms of learning styles between teachers and students in the studied classes in Sweden, which is in line with international research on similar populations (Dunn & Griggs, 2007; Pengiran-Jadid, 2007).

The research questions sought to ascertain the extent to which significant differences exist between teachers and students. The study compared learning styles profiles between secondary school teachers (n = 53) with students (n = 101), and compared the two groups (vocational, n = 66 and academic classes, n = 35) between each other. The study included students of the Social Science Programme (SP students), students of the Electricity Programme (EC students) and of the Hotel and Restaurant programme (HR students).

The Productivity Environmental Preference Survey (PEPS) was used to determine the students' preferences. The descriptive statistics illustrate large differences between the four groups, and statistical analysis shows significant differences for seven of the twenty traits between teachers and students, but not between the various student categories. Teachers prefer stronger light, they have a greater for warm surroundings, they are more motivated, more persistent, have less need for authority and structure, and have other best times (morning and not afternoon) compared with the students ($p < .05$). Among the three groups of students, there are no statistically significant differences when comparing the academic and vocational classes. The mismatch that is found in the study may be related to educational difficulties rather than learning problems. It is important that the teacher: a) understands their own learning style and how this may affect their teaching; b) understands their classes' profiles to better plan courses, classes and entire programmes; and c) can address students' individual learning (Wærness et al.).

Overall differences

The statistical differences between the teachers and students can be attributed to three factors:

a) The learning styles traits are not static but change over time and with life situations (Thies, 1999 – 2000). Teachers are, of course, an older population and many have had positive experiences in school and theoretical studies.

b) Teachers have succeeded through high education and have probably had a preference for, for example, intrinsic motivation, and persistence. Many have chosen the profession because they were successful as students at school (Steinberg, 2004).

c) Students, particularly those in vocational programmes, have selected a focus for an important purpose, probably because they are more interested in practical work. They are not primarily interested in theory and may have negative experiences in school.

One reason that there are no statistical differences between the academic and vocational students can be found in the admissions statistics. Some vocational programmes have a higher admission mean than the SP programme[3]. These students (SP) probably do not really know what to study and thus select the SP programme. It is "moderately" difficult and provides a broad jurisdiction. A general view is that the other two academic programmes (NV[4] and T[5]) are more difficult in theory than the SP programme. There might be other results including these two programmes.

The direct connection between the differences could also be due to age differences, maturity and surrounding structures in the community for different populations (Honigsfeld, 2007). The generation to which young people belong has more choices in life compared with the teachers. The presence of many choices leads to a greater need for structure (Grinder, 2000).

Specific differences

The differences in terms of light and temperature can be understood in international research which shows that these preferences change with age, i.e. the older we become, the greater the need we seem to have for bright light (Dunn & Griggs, 2007).

Regarding motivation and persistence there are differences between the teachers and vocational students. Teachers have a statistically higher motivation and are more adaptable than the students. This is quite natural since students who choose vocational programmes generally are not as interested in theoretical studies. Many of these students are governed by external motivation, i.e. they want to receive instant feedback and are motivated by external stimuli, which can also be attributed to their choice of study orientation. In theoretical studies this would require more intrinsic

motivation and it takes time before they see the results of what they have learned. The fact that students have significant differences regarding persistence could possibly be because they feel uncomfortable in teaching situations. They can feel stressful and they thus protest, provoke and feel they want to solve problems in their own way. This applies in particular to teaching situations in the core subjects, not in specific subjects (Gidlund, 2010).

Students' stronger need for structure compared with the teachers' can be brought back to just learning difficult and new knowledge. Teachers already know how to study, many have probably done well at school and they have cracked the school's codes (Dunn & Griggs, 2007, Steinberg, 2004), which does not match the students' experiences. Students feel secure in the know-how, where and why the information should be solved with role models and examples because they then feel more comfortable in the learning process (Bostrom, 2004b), and this is confirmed by this study.

The discrepancy between the students' and teachers' best time of day might be caused by the fact that they belong to different generations. Adolescents may have a lifestyle where they want to sleep in the mornings and start later in the day. They are more "desire children" who act according to their emotions and impulses, and many teachers belong to the "child duty" generation, and were brought up to follow the path of duty (Steinberg, 2004).

A reason for the EC students being in great need of authority figures compared with the teachers may be found in their future profession. Most of them will have a job where one has to do "the right thing", otherwise there could be unforeseen consequences. Therefore, one could imagine that the authorities are important to them. A practical example is electrical safety where, if they make errors, they could receive a dangerous shock, i.e. a tactile response. On the contrary, teachers are used to working on their own regardless of others' guiding directives. The other two student groups, SP and HR, will probably not be working in occupations that have dire consequences if they make work-related errors.

The fact the EC students are different compared with most teachers among the three classes can possibly be attributed to their future profession, although this needs further and complementary empirical research.

In a review of international studies on different populations one can observe that there usually are differences between different groups, but that individual differences are more marked (Honigsfeld, 2007). The following can be stated for the study populations: a) they cannot be compared with similar international studies since such studies do not exist; b) students' sensory preferences are more on the scale extremely "low" or "high", i.e. many learn better in completely different ways in comparison with the teacher (Pengrian-Jadid, 2007). This can particularly be applied to students in the vocational programmes that need more tactile and kinesthetic methods. Students in the SP programme seem to be more like the teachers in terms of the percentage distribution of sensory preferences.

Practical implications

To meet students' diverse needs, insights into learning styles preferences and a greater diversity in teaching, learning and assessment at secondary school are evident. The conclusions to draw from this study are students' need for large structures. Many (63 - 78%) learn better when there are frameworks, assumptions, plans and practices on how to learn difficult and new knowledge. The corresponding figure for teachers is 25%. As a teacher you must be aware not to let your own traits effect educational planning. With this understanding changes in pedagogy, as Kreber (2007) calls them, may be achieved so that everyone has an equal chance to succeed. Especially for our students in secondary schools, this may be an important aspect to better manage education with a full rating.

Another important conclusion from this and other studies (Boström, 2004b, Calissendorff, 2008) is that knowledge of human diversity affects learning at a deeper level, i.e. meta-cognitive skills develop. Students can understand both their own and others persons' learning better. They can also more easily find individual study strategies and therefore do better in their studies. Another important question is what teaching education can do to teach future teachers to take students' individual differences into account and understand the educational implications. It is important for new teachers that they have a strong interest in what they learn, lessons on the topic relevant to them, emotional touch, and options to cope with studies (Burke, 2000).

With learning styles profiles for both groups and classes, teachers can become aware of their own and students' differences (Cavas, 2010; Vermunt, 2010). Then we can acquire additional tools to meet the school vision of inclusion, individualisation and "a school for all". Stensmo (2000) summarises the learning style and leadership in these words:

> As students have to find their best way of working and learning, teachers must look for their best ways to teach and lead in the classroom and other teaching rooms (p. 130).

For everyone involved, it is crucial to understand that if you have the opportunity to learn through your preferences it is also easier to develop other traits. In order to do well in life in general and the future, it is important to broaden the learning strategies, according to Scandinavian research (Boström & Lassen, 2006; Buli-Holmgren et al. 2007; Hultberg, 2008; Hård af Segerstad et al., 1996, Lauridsen 2009). A consequence is the possibility of becoming less dependent on authority figures and building your own lifelong learning.

Concluding remarks

The Ancient Greeks already knew the importance of knowing oneself. Today's post-industrial information society makes demands not only on self-knowledge but also on knowledge of strategies and tools to manage and organise all the information and

process it to create understanding and skills. This is particularly true of all actors in the world of schools. Awareness of oneself as a teacher and of students' learning processes and using and reflecting on your leadership (Dunn & Dunn, 1999; Kroksmark, 2006; Stensmo, 2000; Hattie, 2009; Vermunt, 2010) is of paramount importance for teachers' professional development. Didactic implications will of course occur through this understanding.

To know and use learning style pedagogy supports an environment that supports lifelong learning. When people are involved in the process to discover how they learn, they can better build on their strengths and preferences (Burke, 2000; Dunn & Burke, 2007). Therefore, they can overcome barriers to learning and achievement, improve behaviour and attitudes to learning and develop a motivation for lifelong learning. For student teachers, knowledge of learning styles gives new tools to reach all children in the future (Whitley & Littleton, 2000). When you feel that the pedagogical approach has different consequences for different students, this can lead to a change in outlook on people and knowledge and, in turn, professional development.

This study only deals with three programmes in upper secondary school and a number of randomly selected teachers. The result might have been different if students from all 17 programmes were involved and the teachers were grouped by subject teachers and vocational teachers. There might be differences between applications and even between types of teachers. This study cannot be generalised to all teachers and all students, but it is credible for those who participated in this study. One should not believe that the consequences of the results can solve all educational problems and the major problem of incomplete grades. However, the results point to an important aspect that should be considered in educational planning, namely understanding the didactic interaction between teachers and students. The results only describe significant differences which exist between teachers and students, but say nothing about the repercussions this may have for teaching. This would therefore be an important theme for further study.

Future studies in this area should better identify various and several high school programmes and various teachers' groups, preferably over time. Other important aspects to consider are gender differences, different teaching styles and effects and the consequences of different learning environments.

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References

Albrecht, C. (2003). *The Power of Minds at Work: Organizational Intelligence in Action*. New York*;* AMACOM

Boström, L. (2004a). *Lärande & Metod. Lärstilsanpassad undervisning jämfört med traditionell undervisning i svensk grammatik*. (Avhandling Högskolan för lärande & kommunikation i Jönköping & Helsingfors Universitet).

Boström, L. (2004b). Lärande och strategier. *Didacta Varia*, 9 (2), 73 – 81

Boström, L. & Lassen, L. M. (2006). Unraveling learning, learning styles, learning strategies and meta-cognition. In *Education + Training,* Vol. 48 No. 2/3, 2006, 178-189.

Buli-Holmgren, J., Guldahl, T. & Jensen, R. (2007). *Refleksioner om opplæring; i et læringsstil-sperspektiv*. Oslo: Cappelen Damm.

Burke, K. (2000). A Paradigm Shift: Learning-Styles Implementation and Preservice Teachers. I Dunn & Griggs, (eds.). *Practical Approaches to Using Learning Styles in Higher Education, (*85 – 94). Westport, CT: Bergin & Garvey.

Calissendorff, M. (2008). *"Det är viktigt att känna att man duger!"* Resultat från enkät- och intervjuundersökning om SMI-studenter och lärstilar. Rapport, Stockholms Musikpedagogiska Institut (SMI).

Cavas, B. (2010). A Study on Pre- service Science, Class and Mathematics Teachers' Learning Styles in Turkey. I *Science Educational International.* Vol. 21. No. 1, 47 – 60

Coffield, F., Ecclestone, K., Hall, E. & Moseley, D. (2004). *Learning styles and pedagogy. A systematic and critical review*. Learning & Skills Research Centre. www.lsrc.ac.uk

Dunn, R & Burke, K (2007). Higher education and teachers certification programs: Needed ethical changes. *The Journal of Higher Education Management,* Vol. 22, 9 – 19.

Dunn, R. & Dunn, K. (1999). *The Complete Guide to the Learning Style in Service System*. Boston*:* Allyn & Bacon.

Dunn, R. & Griggs, S. A. (2007). *Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What?* NY: St. John's University, Center for the Study of Learning and Teaching Styles.

Dunn, R., Dunn, K. & Price, G.E. (1984, 1991, 2000). Productivity Environmental Preference Survey. Lawrence, KS: Price System

Fransson, Göran & Morberg, Åsa (2001). *De första ljuva åren: lärares första tid i yrket*. Lund: Studentlitteratur.

Furnham, A. (2010). Style in Education. Personality and Intelligence Predictors of Educational Outcomes. Paper presented at the Aviero, ELSIN conference 2010-06-28.

Fölster, Stefan, Morin, Anders & Renstig, Monica (2009*). Den orättvisa skolan*. Stockholm: Hjalmarson & Högberg Bokförlag

Gidlund, U. (2010). Muntlig kommunikation om lärstilspedagogik i praktiken. mars 2010.

Grinder, M. (2000). *A Healthy Classroom*. Seattle; Michael Grinder & Associates.

Hattie, 2009). *Visible Learning. A synthesis of over 800 meta-analyses relating to achievement*. NY: Routledge

Honigsfeld, A. (2007); Learning Styles of International Populations. I Dunn & Griggs (eds.) *Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What?* (121 – 123)NY: St. John's University, Center for the Study of Learning and Teaching Styles.

Hugo, Martin (2006). *Liv och lärande i gymnasieskolan: En studie om elevers och lärares erfarenheter i en liten grupp på gymnasieskolans individuella program*. (Doktorsavhandling). Jönköping: Högskolan för lärande och kommunikation.

Hultberg, C. (2008). Instrumental students' strategies for finding interpretations: complexity and individual variety. In *Psychology of Music 36*(1), 7–23.

Hård af Segerstad, H., Klasson, A. & Tebelius, U. (1996). Vuxenpedagogik – att iscensätta vuxnas lärande. Lund: Studentlitteratur

Jørgensen, C. H. (2010). Frafald i de danske ungdomsutdannelserna. I (Markussen, E. (eds.) *Frafall i utdanningen for 16-20 åringer i Norden*. TemaNord 2010:517

Kreber, C. (2007). What's it really all about? The Scholarship of Teaching and Learning as an Authentic Practice. *International Journal for the Scholarship of Teaching and Learning*. Vol. 1. No. 1 (January, 20007), pp. 1-4.

Kroksmark, T. (2006). Dags att lägga ned IKEA-pedagogiken. *Pedagogiska Magasinet,* (3)

Lantz, John (2007). *Bilder av fysik*. Reports from MSI. Växjö University: Report 07154

Lauridsen, Ole (2009). *Fokus på læring: om læringsstile i dagligdagen professionelt og privat*. Köpenhamn: Akademisk forlag

McKinsey Reports (2007, September) *How the world's best-performing school systems come out of top*. Retrieved 18 January 2010 from www.mckinsey.com/App_Media/Reports/SSO/Worlds_School_Systems

Mörtsell, Elisabeth (2007). Att börja i gymnasiet. En kvalitativ studie av elevers upplevelser av första tiden i gymnasieskolan. I *Forskande lärare i praktiken*. Vol.2. Jönköping: Högskolan för lärande och kommunikation, 118 – 184.

Pengrian-Jadid, R. (2007). Learning Styles of Brunei Adolescents. I Dunn & Griggs (eds.) *Synthesis of the Dunn and Dunn Learning Style Model: Who, What, When, Where, and So What?* (121 – 123)NY: St. John's University, Center for the Study of Learning and Teaching Styles.

Riding, R. & Rayner, S. (1998). Cognitive Styles and Learning Strategies. Understanding style differences in learning and behavior. London: David Fulton.

Skolverket. (2010, a). PM**.** Enheten för utbildningsstatistik 2010-11-15 Dnr 71-2010:4 1 (7)

Skolverket. (2010, b). *Gymnasieskolan måste bli bättre på att stötta elever*. Pressmeddelande. 22 augusti 2010. www.skolverket.se

Skolverket (2001) *Utan fullständiga betyg – varför når inte alla elever målen?* Stockholm; Liber. *SOU 2009/10:89*. Bäst i klassen - en ny lärarutbildning.

Steinberg, J. (2004): *Världens bästa fröken. När modern pedagogik fungerar*. Lund; Gleerups.

Stensmo, Christer. (2008). *Ledarskap i klassrummet*. 2:a upplagan. Lund: Studentlitteratur.

Stensmo, C (2006). Perceptual preferences in learning among teacher education students in practical-aestethical subjects. Paper presented at the NFPF-konferens 9-11 mars i Örebro

Stensmo, Christer. (2000). *Ledarstilar i klassrummet*. Lund: Studentlitteratur.

Sylwester, R. (1997). *En skola för hjärnan*. Jönköping: Brain books.

Thies, A. P. (1999-2000). The neuropsychology of learning styles. *National Forum for Applied Educational Research Journal,* 13 (1), 50 – 62.

Wærness, J-I, Lindvig, Y. Andresen, R. & Nissen-Lie R.; (2005). Kartlegging av vidaregående opplaering i Östfold 2004/5. Oppfölgning av differentieringsprosjektet, F 2/2005

Vermunt, J.D. (2011). Pattern on student learning and teacher learning. In S. Rayner & E. Cools (eds.). *Style Differences in Cognition, Learning, and Management. Theory, Research, and Practice* (172 – 187). New York: Routledge

Whitley, J. & Littleton, P. (2000); One Texas University's Approach to Integrating Learning styles in Teacher Education: Talking the Talk and Walking the Walk. I Dunn & Griggs, (eds.). *Practical Approaches to Using Learning Styles in Higher Education (85 – 94)*. Westport, CT: Bergin & Garvey. www.learningstyles.net Retrieved 18 January 2010.

Endnotes

[1] Hereinafter referred to as Dunn's Model

[2] "Preference" means that this is an individual's strengths or needs regarding learning difficulties and new material (Dunn & Dunn, 1999). The preference is marked in the analyses of learning styles between 20-40 or 60-80 (see Annex 1).

[3] For social programmes are among the lowest in the admission points.

[4] NV = science programme

[5] T = technical programme

Annex 1 Individual profile

Productivity Environmental Preference Survey

Individual Profile

Name: **Sex:** Female **Date of Printing:** 2010-05-02

Year of Birth: <<< **Identification:** TY

Preference Summary

Scale	Score	20	30	40	50	60	70	80
1	50		Prefers Quiet		NOISE LEVEL		Prefers Sound	
2	46		Prefers Dim		* LIGHT		Prefers Bright	
3	43		Prefers Cool		* TEMPERATURE		Prefers Warm	
4	43		Prefers Informal		* DESIGN		Prefers Formal	
5	31		Low*		MOTIVATION		High	
6	50		Low		PERSISTENT		High	
7	44		Low		RESPONSIBLE(CONFORMING)		High	
8	57		Does Not Like		STRUCTURE *		High	
9	72		Prefers Alone		ALONE/PEERS		Prefers With Peers	
10	50		Does Not Want Present		AUTHORITY FIGURES		Wants Present	
11	30		Does Not Learn In		SEVERAL WAYS		Prefers Variety	
12	67		Does Not Prefer		AUDITORY		* Prefers	
13	38		Does Not Prefer *		VISUAL		Prefers	
14	35		Does Not Prefer *		TACTILE		Prefers	
15	50		Does Not Prefer		KINESTHETIC		Prefers	
16	45		Does Not Prefer		* INTAKE		Prefers	
17	55		Prefers Evening		TIME OF DAY *		Prefers Morning	
18	55		Does Not Prefer		LATE MORNING		Prefers	
19	53		Does Not Prefer		AFTERNOON		Prefers	
20	51		Does Not Prefer		NEEDS MOBILITY		Prefers	

This learning styles profile shows 20 different elements that are important for learning. It highlights strengths and needs as a darkened field placed to the left or right of the profile. When the asterisk is in the middle, this means that you are flexible in this area, or the element is sometimes important, sometimes not.

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