

# Benefits of the Person-Oriented Perspective for Program Evaluation: Analyzing the Differential Treatment Effects of the Vienna E-Lecturing Program

Dominik Lapka  
*University of Vienna, Austria*

Petra Wagner  
*Upper Austria University of Applied Sciences*

Barbara Schober  
*University of Vienna, Austria*

Petra Gradinger  
*University of Vienna, Austria*

Christiane Spiel  
*University of Vienna, Austria*

**Background:** In program evaluation interventions are usually examined for global effects but not always for differential effects. The reasoning behind the focus on global effects is that most of the concepts applied in data analyses, and most of the hypotheses being assessed, are variable-oriented. Consequently, existing differential effects will not be detected through global analyses based on a variable-oriented perspective. Accordingly, the intervention under evaluation will be wrongly considered to be ineffective.

**Purpose:** This contribution, therefore, argues for the application of person-oriented analyses in addition to the common variable-oriented approach in order to identify the differential effects of an intervention during evaluation.

**Setting:** Both approaches will be applied in the evaluation of a showcase program conducted in real life setting. The results of the two perspectives will be compared.

**Intervention:** An internet supported program for the promotion of self-regulated learning in an academic context called Vienna E-Lecturing (VEL).

**Research Design:** The evaluation of the VEL was conducted with a treatment-control-design. Data was collected at the beginning as well as at the end of the intervention.

**Data Collection and Analysis:** Data regarding motivation as well as factual knowledge was collected. All motivational variables were assessed using previously published scales consisting of 3-4

items. Factual knowledge in statistics and methodology was tested regarding the aspects of reproduction, comprehension and the production of methodological content.

**Findings:** The application of a variable-oriented perspective showed small effects with low practical relevance. Through the application of a person-oriented approach, and taking into account the theoretical framework of the intervention, three students groups which differed systematically in their learning motivation could be identified. For

two of these groups the intervention was very successful. The discussion provides recommendations on how person-oriented approaches can be used systematically in program evaluation.

**Keywords:** *person-oriented approach; program evaluation; differential effects; learning motivation; variable-oriented approach; academic context*

---

Compliance with specific standards when performing program-evaluations is required by the scientific community in order to ensure a high level of quality. Also, most of the goals of evaluation-customers can only be realized by adhering to scientific standards (cp. JCSEE, 1994), rendering them thus indispensable. One consequence of evaluations conducted under such standards is that, in general, programs lacking verifiable effects will not be implemented. One can question whether this decision is always right, as interventions are usually examined for global effects but not always for differential effects. The reasoning behind the focus on global effects is that most of the concepts applied in data analyses, and most of the hypotheses being assessed, are variable-oriented (von Eye, Bogat & Rhodes, 2006). Another reason is that, due to the common lack of prior knowledge, the formulation of differential hypotheses pertaining to the effects which can be expected from certain subgroups is rare. Consequently, existing differential effects will not be detected through global analyses based on a variable-oriented perspective. Accordingly, the intervention under evaluation will be wrongly considered to be ineffective, which in turn leads to financial losses and, of even more significance, viable educational support

will not become available. This contribution, therefore, argues for the application of person-oriented analyses in addition to the common variable-oriented approach in order to identify the differential effects of an intervention during evaluation. In the following paper, both approaches will be applied in the evaluation of a showcase program – an internet supported program for the promotion of self-regulated learning in an academic context (Vienna E-Lecturing [VEL]). The results of the two perspectives will be compared.

## Variable-Oriented versus Person-Oriented Approach

In order to verify the effects of a specific intervention, program evaluations in the simplest case compare a treatment group to a control group. In doing so, hypotheses are generally formulated on the variable level—for example the self-efficacy of the treatment group will increase. This leads to a comparison of group means, a process which can be applied in different grades of complexity. For the most part—as in the hypotheses described—each variable will rely on one single value to describe the entire treatment group, hence the name variable-oriented approach. From a

methodological perspective one assumes that, with the aggregation of data, inter-individual differences are random and thus negligible. A precondition for this approximation is the homogeneity of the treatment group with respect to the variables under analysis. Only in this case will no additional information be lost through aggregation and a better overview is thus guaranteed. However, a homogeneous treatment group is not always realistic and interventions don't always affect all individuals in the same way (Gibson, 2003; Peck, 2005). A simple and common example is the Matthew Effect, commonly found in the area of reading promotion. One instance of this effect is that good readers improve their skills while weaker pupils are overstrained and get even worse (Morgan, Farkas & Hibel, 2008). If the data compiled from a heterogeneous treatment group is aggregated, the resulting effects are biased because the general conclusions derived are not true on the individual level (von Eye & Bogat, 2006). Program evaluation can thus lead to artificial results. The evaluation of a reading training can, for example, detect minor effects while, in reality, good pupils are greatly enhancing their reading skills although the intervention is proving to have no or even negative effects on the weaker children. From a variable-oriented perspective this intervention would, at best, be rated as ineffective, although it is actually highly effective for advanced children. Alternatively, if the intervention is implemented, the weak pupils would be even more disadvantaged than before, particularly in comparison to their more advanced classmates.

To avoid such misinterpretations within program evaluation, and in order to evaluate the effectiveness of an intervention properly, the heterogeneity

of the treatment group has to be taken into account. Therefore, it is essential to conduct analyses for particular individuals or homogeneous subgroups, and thus evaluate the differential effectiveness of the intervention. This is also the line of reasoning behind the person-oriented approach which has been championed in recent years by the group of researchers associated with Magnusson and Bergman as well as Spiel (Bergman & Magnusson, 1997; Magnusson, 2000; Spiel, 1998; q.v. von Eye, Bogat & Rhodes, 2006). The person-oriented approach is based upon the assumption that divergent subgroups may exist and that aggregate-level parameters may contradict parameters estimated for the entire group (von Eye & Bogat, 2006). This approach has been particularly promoted within the domain of developmental psychology, as individuals began to be seen in their integrative entirety and not just as the sum of specific variables. The basic idea is that individuals develop, not variables (Bergman, Magnusson & El-Khoury, 2003). In recent years this approach has also been adopted in other fields of psychology and the social sciences.

The current paper illustrates the advantages offered by person-oriented analyses for the purposes of evaluation. For this reason, the next section presents, in short, the principles of the person-oriented approach in identifying the differential effects of an intervention. Afterwards, both variable-oriented as well as person-oriented analyses are applied, stepwise, in the evaluation of an intervention conducted in an academic context. The results of both approaches are presented and compared with each other.

## Identifying Differential Effects

Often it is not known if a treatment group is heterogeneous and whether homogeneous subgroups exist within it. One possibility for checking the sample for such homogeneous subgroups, and the first step in testing differential effects, is to conduct a type analysis. Here persons are merged into homogeneous groups based on scores assessing specific variables. One benefit of this approach, particularly in program evaluation, is that it is not necessary to define the different types a priori. They can be identified through exploration as well. Should this be the case, interpretations of the types discovered must be based upon a scientifically founded theory, since artificial subgroups can be found in nearly any data set (Chen, 1990; von Eye & Bogat, 2006). Thus it is essential that the selection of the variables upon which the types are based, as well as the interpretation of the results, follow specific theoretical guidelines in order to avoid the identification of artificial types (Bogat, Levendosky & von Eye, 2005).

Two methods of type identification can be distinguished: clustering and categorization (von Eye & Bergman, 2003). Clustering refers to the cluster analysis methodology, which comprises several methods for finding homogeneous subgroups that are as heterogeneous as possible by focusing on specific characteristics of individuals. An exemplary application of cluster analysis within program evaluation is given by Perk (2005). Using categorization, individuals are merged into groups according to specific variable values. For instance, sex can be coded with the first digit (1 for women and 2 for men) and age with the second (1 for young, 2 for middle

aged and 3 for old); thus the number 23 stands for older men. In applying this method several variables can be categorized, and one variable can be broken down into several categories. A specific procedure using this method is the Configural Frequency Analysis (Lienert & Krauth, 1973; q.v. von Eye, Spiel & Wood, 1996), which is used to screen cross-tabulations for cells that contain significantly more cases (types) or fewer cases (anti-types) than expected from a random model. An example for categorization using this method has been published by von Eye, Bogat and Rhodes (2006).

So far few studies have systematically compared the commonly applied variable-oriented approach with the person-oriented approach (Bogat, Levendosky & von Eye, 2005; Spiel, 1998; von Eye, Bogat & Rhodes, 2006). More importantly, there is a conspicuous lack of studies to demonstrate the benefits of additional person-oriented analyses in the context of program evaluation.

In view of this scientific gap, the present paper applies and compares both approaches in the evaluation of a specific intervention—an internet supported program for the promotion of self-regulation in an academic context (Vienna E-lecturing)—in order to open new avenues towards the advancement of the quality of program evaluations. On the one hand, this paper demonstrates the benefits of additional person-oriented analyses in program evaluation, and argues for its application. On the other hand, this paper serves as a manual, since the methodological procedure is described step by step.

In the following section the intervention VEL (Vienna E-Lecturing) will be presented. Afterwards, both methodological approaches will be

specified, applied and their particular results compared with one another. Based upon this comparison, practical implications for the quality assurance of evaluations are discussed.

## Vienna E-Lecturing (VEL)

It is well known, and has been repeatedly demonstrated, that methods and statistics courses are not among those most popular with students majoring in Psychology. In addition, these courses are often associated with the highest levels of anxiety (Blalock, 1987; Gal & Ginsburg, 1994; Onwuegbuzie, 2000). It has been assumed that these circumstances lead to poor performances in these courses, which has negative consequences for competence development and academic progress. To overcome the discrepancy between the importance of methods and statistics on one hand and the low acceptance among students on the other, the internet-based teaching concept Vienna E-Lecturing (VEL) was developed (cp. Schober et. al, 2006). It systematically combines online sessions with face-to-face lessons and imparts the factual content of methods as well as learning competence, teamwork, and E-competence. Concerning learning competence, two areas are promoted: skill and will. While "skill" focuses on cognitive and meta-cognitive learning strategies as well as the competence of how to learn effectively and efficiently, "will" refers to the motivational and emotional components of learning competence. The promotion of the motivational aspect of learning competence is theoretically based on the model of social motivation (Dweck & Leggett, 1988), which, in addition to individual goal orientation (performance vs. competence orientation), also focuses

on self-related cognitions such as the implicit personality theory, in other words, the theory one holds on the flexibility or stability of one's skills and self-efficacy. Based on these variables, Dweck and Leggett (1988) explain how failure can lead either to interest or helplessness. Concretely, VEL should promote a more flexible implicit personality theory and increase competence orientation and self-efficacy so that students also increase interest, reduce helplessness and improve their factual knowledge (cp. Schober et. al, 2006).

As the evaluation of the program focuses on these motivational changes among psychology students with regard to methods and statistics, data regarding the following variables was collected: implicit personality theory, performance orientation, competence orientation, self-efficacy, interest and helplessness. Three different aspects of factual knowledge were tested: reproduction, comprehension and the production of methodological content (cp. Bloom, 1956). The evaluation of the VEL was conducted with a treatment-control-design, whereby the VEL program participants comprised the treatment group, and the control group was formed out of the participants of a reduced program variant (in this reduced variant no supervised tasks, regular group tasks or trainings were conducted). The students decided individually, at the beginning of the academic year, which variant they wished to participate in. Thus far, data from two cohorts (n = 90; 15 males, 75 females) of treatment group participants are available, in addition to data from 375 students (50 males, 325 females) from the control group. Data collection was conducted at the beginning as well as at the end of the intervention. All motivational variables were assessed

using previously published scales consisting of 3-4 items. Reliability was checked and deemed satisfactory. Factual knowledge in statistics and methodology was tested regarding the aspects of reproduction, comprehension and the production of methodological content (cp. Bloom, 1956). Details of the data collection process are available in Lapka et al. (2010) as well as in Appendix A.

## Variable-Oriented Approach

The variable-oriented approach was applied to assess the general effects of the treatment. Therefore, the aggregate values (means) of the treatment group concerning the target variables are compared to those for the control group. To confirm the effects of the VEL, it is necessary that both groups have the same aggregate value levels prior to the intervention. Otherwise, different posttest values could be attributed to differences already existing prior to the intervention. To counter such systematic differences between treatment and control groups, the assignment to treatment and control group is usually randomized. Random assignment to the two versions of VEL

was however impossible, because students were required to submit an application in order to participate in the full context version of the VEL. If only highly motivated students volunteered to apply to the treatment group, estimations of the effectiveness of VEL could be biased by self-selection. Thus, in order to secure a treatment group with the same starting conditions as the control group, the Euclidean-Matching (EuM) procedure (Spiel et al., 2008) was used to match control subjects to treatment students on the most relevant variables, namely *factual knowledge* in statistics, *interest* in the topic of the course, learning process *monitoring*, *organization* of the self-regulated learning process, and *time management* (for details see Spiel et al., 2008). The application of the EuM generated a matched control-group consisting of 84 students with no significant differences [ $F(7, 158) = 1.72, p > .05$ ] in the variables relevant to the VEL-group (also 84 students, in each case 15 males, 69 females) (Spiel et al., 2008). The means and standard deviations are depicted in Table 1.

Table 1  
Comparison of the Treatment Group and the Control Group Regarding the Motivational Variables from the Variable-Oriented Perspective

Scale	Treatment Group		Control Group	
	Pretest <i>M (SD)</i>	Posttest <i>M (SD)</i> <i>n (84)</i>	Pretest <i>M (SD)</i>	Posttest <i>M (SD)</i> <i>n (84)</i>
Implicit personality theory	4.82 (0.75)	5.15 (0.69)	4.89 (0.76)	5.08 (0.74)
Competence orientation	4.59 (0.79)	4.56 (0.78)	4.43 (0.82)	4.33 (0.83)
Performance orientation	3.42 (1.03)	3.56 (1.12)	3.53 (0.93)	3.64 (1.06)
Self-efficacy	4.46 (0.71)	4.80 (0.63)	4.68 (0.71)	4.84 (0.64)
Interest	3.93 (1.07)	4.15 (1.03)	3.90 (0.89)	3.91 (1.00)
Helplessness	2.90 (1.00)	2.35 (0.87)	2.59 (1.09)	2.25 (0.92)

The development of the two groups across the motivational variables is described by the interactions found with two-way ANOVAs (treatment vs. control group; pre- vs. post-test), which are presented in Table 2. These interactions provide information concerning the

progress of the treatment group relative to the control group (intergroup). Small effects regarding self-efficacy and interest were identified, whereas the treatment group showed more development than the control group (see Table 2).

Table 2  
Variable-Oriented Results of the Intergroup Effects Between the Treatment and Control Group at Two Points in Time

Scale	<i>F</i>	<i>df</i>	<i>p</i>	<i>d</i>
Implicit personality theory	1.38	1, 165	>.05	.19
Competence orientation	0.51	1, 165	>.05	.09
Performance orientation	0.04	1, 167	>.05	.03
Self-efficacy	4.19	1, 167	<.05	.27
Interest	3.66	1, 167	<.05	.21
Helplessness	2.13	1, 165	<.10	-.22

*Note:* The table contains the results of the interaction of the two-way ANOVA (treatment vs. control group x pre vs. post-test) (*F*, *df*, *p* and the effect-size *d*).

Information concerning the absolute development of the treatment group in comparison to the control group is provided by the second step, the intra-group analyses. To this end the differences between the pre-test and post-test values were analysed separately for each motivational variable with t-tests for both the treatment and control group (see Table 3).

From a variable-oriented perspective, one sees a positive development in both the treatment and the control groups regarding implicit personality theory (increment), self-efficacy and helplessness. The effect sizes for the treatment group are moderate whereas the effect sizes found in the control group are small (see Table 3). Interest increases only in the treatment group with a small effect size.

Table 3  
Variable-Oriented Perspective of the Intra-Group Effects Concerning Pretest and Posttest Measurements

Scale	Treatment Group				Control Group			
	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Implicit personality theory	3.97	82	<.001	.46	2.47	82	<.01	.25
Competence orientation	0.36	82	>.05	-.04	-1.25	82	>.05	-.12
Performance orientation	1.43	83	<.10	.13	1.32	83	<.10	.11
Self-efficacy	5.54	83	<.001	.51	2.75	83	<.01	.24
Interest	2.63	83	<.01	.21	0.08	83	>.05	.01
Helplessness	-5.96	82	<.001	-.59	-2.88	82	<.01	-.34

Note: The table contains the two-tailed *t*-tests (*t*, *df*, *p*) as well as the effect size *d*. The scales range from 1 (= completely disagree) to 6 (= completely agree).

Thirdly, the intergroup effects of the intervention regarding factual knowledge were assessed by conducting a MANOVA, using previous knowledge as the covariate. Factual knowledge at the end of the intervention was tested with regard to three different aspects: reproduction, comprehension, and production.

Results show a multivariate effect [ $F(3, 162) = 3.885, p < .05$ ] that is expressed on the univariate level through differences in productive knowledge [ $F(1, 164) = 7.619, p < .01, d=0.34$ ], where the

treatment group shows higher values ( $M_{\text{treatment}} = 64.21; M_{\text{control}} = 56.58$ ).

To sum up, the variable-oriented approach reveals few benefits for the treatment group in contrast to the control group. Both groups develop a more flexible implicit personality theory, gain in self-efficacy and reduce their helplessness. The treatment group did increase more in self-efficacy and interest than the control group. Although these interactions are significant, their practical relevance (effect sizes) is rather small. The effect size of the significant difference regarding

productive knowledge between the two groups is also low.

## Person-Oriented Approach

In applying the person-oriented approach one assumes that, in the sample presented, different motivational subgroups will prove to exist. In this case, the aggregate values of the variable-oriented approach will not truly represent the different patterns and changes of the individuals and/or specific subgroups. However, these differences may influence the effect of the intervention; for example, the intervention may have a higher effect on motivated students and no effect on disinterested students or vice versa.

In order to obtain information concerning the differential effectiveness of the VEL program, the person-oriented approach was applied in three steps. First, different motivational subgroups were identified through the application of a cluster analysis and interpreted with respect to the theoretical model of the intervention. Second, the distribution of these motivational subgroups in the treatment and control groups was checked for uniformity, to ensure that the treatment and control group shared the same baseline. The third step was to proceed with differential analyses of learning competence (*intergroup* and *intra-group* analyses) and factual knowledge (*intergroup* analyses). Analyses had to be done separately for each motivational type.

In accordance with the theoretical background of the VEL, the central variables of the social motivation model (Dweck & Leggett, 1988; see before) were considered in the cluster analysis: flexible implicit personality theory, competence orientation, performance orientation and

self-efficacy. The cluster analysis was applied in three steps: first using the single linkage method to identify outliers, then using the hierarchical Ward-method and the non-hierarchical *k*-means to optimize cluster assignment (Lapka et al., 2010). Three motivational types could be identified at the beginning of the intervention: *motivationally balanced* students, *competence oriented* students and *students with motivational deficits*. The *motivationally balanced* students showed high values in all four variables. The *competence oriented* students showed the same characteristics as the *motivationally balanced* with the exception of lower values regarding performance orientation. The *students with motivational deficits* had a less flexible implicit personality theory, were less competence oriented, showed poorer values regarding self-efficacy and were thus more helpless and less interested (for more detail see Lapka et al. 2010). In order to avoid artificial subgroups, a close reliance on a theoretical framework was necessary for both variable selections as well as for the interpretation of the different motivational types.

As was previously mentioned, the students (three motivational subgroups) could voluntarily decide whether or not to attend the VEL program or just participate in the reduced version of VEL (and serve as controls). Therefore in the second step, using a  $X^2$ -Test, we tested for the existence of systematic differences on the basis of self-selection. Results show that the three motivational types are distributed uniformly in the treatment and control groups [ $X^2(2, N = 430) = 3.31, p = .19$ ] (see Table 4).

Although Wilk's Lambda ( $\Lambda=0.160$ ) suggests that each motivational type is relatively homogeneous, each cluster was

checked via MANOVA for initial differences between treatment and control group. Differences were found to exist solely among the *students with motivational deficits* [ $F(7, 138) = 2.52, p < .05$ ]. This was manifested on the

univariate level by differences in interest [ $F(1, 144) = 6.18, p < .05, d=0.47$ ], where students with higher interest were more likely to choose the treatment group (see Table 4).

Table 4  
Comparison of the Treatment Group and the Control Group Regarding the Motivational Variables from the Person-Oriented Perspective

Scale	Treatment Group		Control Group	
	Pretest <i>M</i> ( <i>SD</i> )	Posttest <i>M</i> ( <i>SD</i> )	Pretest <i>M</i> ( <i>SD</i> )	Posttest <i>M</i> ( <i>SD</i> )
Motivational balanced students	<i>n</i> (26)		<i>n</i> (117)	
Implicit personality theory	5.09 (0.52)	5.15 (0.66)	5.17 (0.50)	5.17 (0.67)
Competence orientation	4.79 (0.63)	4.62 (0.91)	4.57 (0.73)	4.31 (0.77)
Performance orientation	4.27 (0.74)	4.23 (1.07)	4.35 (0.65)	4.29 (0.83)
Self-efficacy	4.80 (0.44)	4.99 (0.46)	4.96 (0.45)	4.99 (0.57)
Interest	4.12 (0.80)	4.16 (0.98)	3.86 (0.86)	3.78 (1.05)
Helplessness	2.65 (0.88)	2.31 (0.83)	2.35 (0.87)	2.21 (0.87)
Competence oriented students	<i>n</i> (33)		<i>n</i> (91)	
Implicit personality theory	5.18 (0.59)	5.45 (0.54)	5.28 (0.57)	5.31 (0.63)
Competence orientation	4.83 (0.68)	4.81 (0.67)	4.79 (0.58)	4.53 (0.73)
Performance orientation	2.39 (0.55)	2.81 (0.93)	2.45 (0.56)	3.04 (0.89)
Self-efficacy	4.77 (0.47)	4.97 (0.62)	4.99 (0.57)	5.04 (0.59)
Interest	4.20 (1.07)	4.44 (0.95)	4.12 (0.84)	4.03 (1.01)
Helplessness	2.58 (1.00)	2.01 (0.84)	2.27 (0.89)	2.07 (0.91)
Students with motivational deficits	<i>n</i> (26)		<i>n</i> (109)	
Implicit personality theory	4.06 (0.60)	4.76 (0.74)	3.85 (0.61)	4.35 (0.80)
Competence orientation	4.10 (0.84)	4.20 (0.66)	4.02 (0.66)	3.98 (0.68)
Performance orientation	3.86 (0.71)	3.75 (0.93)	4.03 (0.76)	3.96 (0.93)
Self-efficacy	3.71 (0.68)	4.39 (0.62)	3.91 (0.63)	4.22 (0.58)
Interest	3.38 (1.10)	3.78 (1.09)	2.95 (0.70)	3.23 (0.85)
Helplessness	3.63 (0.79)	2.81 (0.79)	3.86 (0.93)	3.20 (0.95)

*Note:* The table contains means (*M*) and standard deviations (*SD*) of the two groups from the global perspective as well as from the type-specific perspective, using the three motivational types. The data regard the pre-test at the beginning of VEL and at the post-test at the end of the first term. The scales range from 1 (= completely disagree) to 6 (= completely agree).

In the third step, the differential effects of the intervention were assessed. To this end the progress concerning motivational aspects (*intergroup* and *intra-group* analyses) as well as factual knowledge (*intergroup* analysis) was analysed separately for each motivational type.

First the *interactions* between treatment and control-group were computed for each type with a two-way ANOVA (treatment vs. control group; pre- vs. post-test). The results of these

*interactions* are presented in Table 5. The *motivationally balanced students* showed no effect in any motivational variable. Treatment and control groups show the same progress patterns. Medium effects in interest and helplessness were found among the *competence oriented students*, whereas the treatment group showed more positive development than the control group. Also, medium effects favoring the treatment group were found among the *students with motivational deficits* in self-efficacy (see Table 5).

Table 5  
Person-Oriented Results of the Intergroup Effects Between the Treatment and Control Group at Two Points in Time for each Motivational Type

Scale	<i>F</i>	<i>df</i>	<i>p</i>	<i>d</i>
Motivationally balanced students				
Implicit personality theory	0.040	1, 130	.842	0.107
Competence orientation	0.140	1, 130	.709	0.104
Performance orientation	0.089	1, 130	.766	0.027
Self-efficacy	2.307	1, 130	.131	0.344
Interest	0.401	1, 130	.528	0.144
Helplessness	0.963	1, 130	.328	-0.241
Competence oriented students				
Implicit personality theory	3.548	1, 107	.062	0.417
Competence orientation	3.491	1, 107	.064	0.356
Performance orientation	0.998	1, 107	.320	-0.225
Self-efficacy	1.758	1, 107	.188	0.280
Interest	6.332	1, 107	.013	0.345
Helplessness	5.637	1, 107	.019	-0.402
Students with motivational deficits				
Implicit personality theory	1.826	1, 122	.179	0.294
Competence orientation	0.875	1, 122	.351	0.190

Scale	<i>F</i>	<i>df</i>	<i>p</i>	<i>d</i>
Performance orientation	0.006	1, 122	.938	-0.034
Self-efficacy	9.230	1, 122	.003	0.588
Interest	0.987	1, 122	.322	0.134
Helplessness	0.631	1, 121	.429	-0.175

Note: The table contains the results of the interaction of the two-way ANOVA (treatment vs. control group x pre vs. post-test) (*F*, *df*, *p* and the effect-size *d*).

Again, these *interactions* only provide information concerning the progress of the treatment group relative to the control group (*intergroup*). In order to obtain information concerning the absolute development of the treatment in contrast to the control group, *intra-group* analyses were performed for each motivational type. Their results confirm differences in progress among the three motivational types (see Table 6).

During the intervention, the *motivationally balanced* students in the treatment group showed moderately positive effects in gaining self-efficacy and reduced helplessness. In contrast to these positive effects, the control group became less competence orientated after the intervention. More positive development can be found among the *competence oriented* students. The students in the treatment group show positive changes

with medium effect sizes in all variables. Concretely, they acquired a more flexible implicit personality theory, increased their performance orientation and reduced their helplessness. In contrast, the students in the control group had fewer positive developments. They reduced their competence orientation and increased their performance orientation. The controls also reduced their helplessness, but the effect size was much lower. The most positive changes linked with the highest effect sizes were found among the *students with motivational deficits*. Members of both the control and treatment groups obtained a more flexible implicit personality theory, gained in self-efficacy and interest, and reduced their helplessness. The effect sizes in the treatment group were, with the exception of interest, much higher than those for the control group.

Table 6  
Type-Specific Perspective of the Intra-Group Effects

Scale	Treatment Group				Control Group			
	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Motivationally balanced students								
Implicit personality theory	-0.451	25	.656	0.108	-0.430	105	.668	0.001
Competence orientation	1.142	25	.264	-0.229	3.301	105	.001	-0.346

Scale	Treatment Group				Control Group			
	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>	<i>t</i>	<i>df</i>	<i>p</i>	<i>d</i>
Performance orientation	0.207	25	.838	-0.038	1.142	105	.256	-0.078
Self-efficacy	-3.004	25	.006	0.429	-0.397	105	.692	0.051
Interest	-0.304	25	.764	-0.054	0.807	105	.421	-0.090
Helplessness	2.169	25	.040	-0.405	1.482	105	.141	-0.158
Competence oriented students								
Implicit personality theory	-2.398	32	.022	0.483	-0.565	75	.574	0.051
Competence orientation	0.178	32	.860	-0.030	3.496	75	.001	-0.391
Performance orientation	-2.782	32	.009	0.554	-6.051	75	<.001	0.796
Self-efficacy	-1.896	32	.067	0.364	-0.836	75	.406	0.071
Interest	-1.914	32	.065	0.239	1.803	75	.075	-0.100
Helplessness	3.871	32	.001	-0.612	2.127	75	.037	-0.223
students with motivational deficits								
Implicit personality theory	-4.301	24	<.001	1.039	-6.416	98	<.001	0.688
Competence orientation	-0.857	24	.400	0.129	0.499	98	.619	-0.056
Performance orientation	0.387	24	.702	-0.128	1.031	98	.305	-0.092
Self-efficacy	-5.481	24	<.001	1.041	-5.186	98	<.001	0.510
Interest	-2.386	24	.025	0.370	-3.014	98	.003	0.357
Helplessness	4.588	24	<.001	-1.032	5.609	97	<.001	-0.703

Note: The table contains the two-tailed t-tests (*t*, *df*, *p*) as well as the effect size *D*. The scales range from 1 (= completely disagree) to 6 (= completely agree).

Finally, the *intergroup* effects of the intervention regarding factual knowledge were verified with a MANOVA, using previous knowledge as a covariate, for each of the three motivational types. There were no differences in factual knowledge between the treatment and the control groups among the *motivationally balanced* students [ $F(3, 138) = 1.524, p > .05$ ] and the *competence oriented* students [ $F(3, 119) = 0.549, p > .05$ ]. However, among the *students with motivational deficits*, there were multivariate differences between the

treatment and control groups after the intervention [ $F(3, 138) = 3.776, p < .05$ ], and they are expressed on the univariate level through differences in productive knowledge [ $F(1, 132) = 9.747, p < .01, d = 0.786$ ]. The treatment group shows higher percentage values ( $M_{\text{treatment}} = 69.87; M_{\text{control}} = 54.10$ ).

To sum up, the person-oriented approach reveals that one group of students does not benefit from the VEL program at all: the *motivationally balanced students*. These are highly

motivated learners who, in addition to a high competence orientation, also display high performance orientation. For these students there was nearly no difference between those who participated in the VEL or the control group. The most relevant differences in progress between the treatment and control groups were found among the *competence oriented students*, who were also highly motivated but not very performance oriented. Students of this type found in the treatment group raised their interest levels and reduced their feelings of helplessness concerning research methods more than the corresponding controls. *Students with motivational deficits* benefitted most. They had the highest backlog concerning motivational variables at the beginning of the intervention. Both the treatment and control group members show large positive changes regarding implicit personality theory, self-efficacy, interest and helplessness. Nevertheless, the students in the treatment group show an even greater development during the VEL program, particularly with respect to self-efficacy. Additionally, the treatment group showed a higher factual knowledge of research methods concerning productive content after the intervention. Thus, the person-oriented approach revealed that the intervention had a differentiated impact. While one group of students benefitted immensely, another group amassed few if any advantages.

In order to make the program more efficient, one must consider omitting *motivationally balanced* students from the VEL, since the control condition provided these students with equivalent benefits. Additionally, the intervention should either (1) focus on only the *competence oriented* students, which leads to high overall benefits, as *students with motivational deficits* also benefit

significantly from the reduced version, or (2) be used only in terms of a secondary prevention for *students with motivational deficits*, which will accordingly boost the motivational aspects of their learning competence. A combination of these two alternatives can also be considered.

## Summary and Outlook

The goal of this paper was to demonstrate the benefits of person-oriented analyses in program evaluation. For the purposes of demonstration both approaches—the variable-oriented and person-oriented approach—were applied for the evaluation of the Vienna E-Lecturing program. From the variable-oriented perspective, the effects of the intervention could be confirmed even though the practical relevance was rather low. Based on the theoretical frame of the intervention, and using the person-oriented perspective, three different motivational types were identified within the heterogeneous sample. The program showed a differential impact with respect to these three types. Concretely speaking, the VEL shows a major practical relevance regarding training goals among competence oriented students as well as students with motivational deficits—the effect sizes for these two types, as measured by changes after participating in the VEL, are moderate to high. Motivationally balanced students, on the other hand, didn't benefit from the VEL at all.

These results illustrate how changing the perspective in data analyses—namely from the common variable-oriented perspective to a focus on the individual—leads to more precise conclusions concerning the evaluated intervention. In particular, it reveals possible differential

effects. This translates into an enhancement of the quality of the evaluation as well as its utility for stakeholders (Patton, 1996). Based on these findings, the target group of the intervention can be confined to those students most likely to benefit, which in turns results in a higher efficiency of the intervention.

However, the usability of person-oriented findings is linked to preconditions, which may be a drawback for the evaluation practice. Even disregarding the complications associated with more comprehensive data collection—including a bigger sample as well as additional variables—the application of the person-oriented approach requires expertise on the part of the evaluator regarding both person-oriented methodology (Sterba & Bauer, 2010) and the theoretical aspects of the subject (cp. Von Eye & Spiel, 2010), as shown by the present study. The types identified could only be interpreted based on solid theoretical knowledge. Without such a theoretical knowledge, results might be artificial (Bogat, Levendosky & von Eye, 2005; von Eye & Bogat, 2006). According to von Eye and Bogat (2006), to ensure external validity of the subpopulations identified by applying person-oriented research, their existence has to be established via variables that have not been used to identify the groupings and via an independent sample. They also point out the necessity of interpreting such groups based on substantive theory. In other words, the person-oriented approach demands more theoretical background on the part of the evaluator than the variable-oriented approach (von Eye & Spiel, 2010).

In order to facilitate useful person-oriented analyses in program evaluation, person-oriented expertise from the fields

of developmental psychology and in particular psychopathology can be used (Bergman, Magnusson & El-Khoury, 2003). These fields are quasi the roots of person orientation. They thus best illustrate in which contexts person-oriented analyses may be beneficial in program evaluation in addition to variable-oriented analyses. Concretely speaking, person-oriented analyses work best in cases concerning the evaluation of interventions that focus on the change of behavior, which can in fact vary between individuals. Examples of successfully adding person-oriented approaches to variable-oriented in evaluation practice involve learning programs, for instance fostering self-regulation, (Schmidt, Perels & Schmitz, 2010) as well as social welfare programs (Peck, 2005).

The example presented in this paper also shows that person-oriented analyses in program evaluation are beneficial in evaluating interventions that take place in real settings. In these contexts, it is rare to encounter optimal conditions when implementing an evaluation (Fagan & Mihalic, 2003; Greene, Benjamin & Goodyear, 2001; Lucke, Donald, Dower & Raphael, 2001). The effects of the intervention are thus more difficult to determine than they would be under controlled laboratory conditions. Therefore, the limited possibilities available to evaluators, in the form of sub-optimal basic conditions, have to be compensated for by insuring methodological strengths. An example of such compensation is the mixed-methods approach (Chen, 2006; q.v. Spiel, Strohmeier & Atria, 2008)—the systematic combination of qualitative and quantitative methods. Another example is the Euclidean distance-based matching procedure (Spiel et al., 2008), which adjusts between-group comparisons for

pre-existing differences if randomization is difficult or impossible to achieve. Also, this paper offers potential for methodological compensation in real life settings, particularly when the evaluator cannot influence the general set-up. As shown in this paper, the person-oriented perspective is an efficient and reliable way to obtain results which are both more precise and more useful than those achieved under the standard variable-oriented approach.

## References

- Bergman, L. R., & Magnusson, D., (1997). A person-oriented approach in research on developmental psychopathology. *Development and Psychopathology*, 9, 291-319.
- Bergman, L. R., Magnusson, D., & El-Khoury, B. M., (2003). *Studying individual development in an interindividual context. A person-oriented approach*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Blalock, H. M. Jr., (1987). Some general goals in teaching statistics. *Teaching Sociology*, 15, 164-172.
- Bloom, B. S., & Krathwohl, D. R., (1956). *Taxonomy of educational objectives: The classification of educational goals*. Handbook 1: Cognitive domain. New York, Longmans.
- Bogat, G. A., Levendosky, A. A., & von Eye, A., (2005). The future of research on intimate partner violence – person-oriented and variable-oriented perspectives. *American Journal of Community Psychology*, 36, 49-70.
- Breitkopf, L. (1985). Die Hilflosigkeitsskala. *Diagnostica*, 31, 221-233.
- Chen, H. (1990). *Theory-driven evaluations*. Newbury Park, CA: Sage.
- Chen, H. (2006). A theory-driven evaluation perspective on mixed methods research. *Research in the Schools*, 13, 75-83.
- Dweck, C. S., Chiu, C., & Hong, Y. (1995). Implicit theories and their role in judgements and reactions: A world from two perspectives. *Psychological Inquiry*, 6, 267-285.
- Dweck, C. S., & Henderson, V. L., (1988). *Theories of intelligence: Background and measures*. Unpublished manuscript, University of Illinois.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256-273.
- Fagan, A., & Mihalic, S. (2003). Strategies for enhancing the adoption of school-based prevention programs – lessons learned from the blueprints for violence prevention replications of the life skills training program. *Journal of Community Psychology*, 31, 235-253.
- Gal, I., & Ginsburg, L. (1994). The role of beliefs and attitudes in learning statistics: Towards an assessment framework. *Journal of Statistics Education*, 2, 1-54.
- Gibson, C. M. (2003). Privileging the participant: The importance of subgroup analysis in social welfare evaluations. *American Journal of Evaluation*, 24, 443-469.
- Greene, J., Benjamin, L., & Goodyear, L. (2001). The merits of mixing methods in evaluation. *Evaluation*, 7, 25-44.
- Jerusalem, M., & Satow, L. (1999). *Schulbezogene Selbstwirksamkeitserwartung (WIRKSCHUL)*. In R. Schwarzer & M. Jerusalem (Ed.), *Skalen zur Erfassung von Lehrer- und Schülermerkmalen*. Berlin: FU.
- Joint Committee on Standards for Educational Evaluation. (1994). *The*

- program evaluation standards* (2nd ed.). Thousand Oaks, CA: Sage.
- Lapka, D., Wagner, P., Schober, B., Gradinger, P., & Spiel, C. (2010). Methodenlehre: Alptraum oder Herausforderung für Psychologiestudierende? Eine Typologie auf Basis des sozialkognitiven Motivationsmodells von Dweck, [Methodology classes: Nightmare or a challenge for Psychology students? A typology based on Dweck's social-cognitive approach to motivation]. *Psychologie in Erziehung und Unterricht*, 57(3).
- Lienert, G. A., & Krauth, J. (1973). *KFA. Die Konfigurationsfrequenzanalyse und ihre Anwendung in Psychologie und Medizin*, [The Configural Frequency Analysis and its application in Psychology and Medicine]. Freiburg: Alber.
- Lucke, J., Donald, M., Dower, J., & Raphael, B. (2001). Considerations in the design of a mixed-method cluster. *Evaluation*, 7, 110-131.
- Magnusson, D. (2000). The individual as the organizing principle in psychological inquiry: A holistic approach. In: L.R. Bergman, R.B. Cairns, L.G. Nilsson & L. Nystedt (eds.), *Developmental science and the holistic approach*. Mahwah, NJ: Erlbaum, pp.33-47.
- Morgan, P. L., Farkas, G., & Hibell, J. (2008). Matthew effects for whom? *Learning Disability Quarterly*, 31, 187-198
- Onwuegbuzie, A. J. (2000). Statistics anxiety and the role of self-perceptions. *The Journal of Educational Research*, 93, 323-330.
- Patton, M.Q. (1996). *Utilization-focused Evaluation* (3<sup>rd</sup> ed.). Thousand Oaks, CA: Sage.
- Peck, L. R. (2005). Using cluster analysis in program evaluation. *Evaluation Review*, 29, 178-196
- Schiefele, U., Krapp, A., Wild, K.-P., & Winteler, A. (1993). Der "Fragebogen zum Studieninteresse" (FSI). *Diagnostica*, 39(4), 335-351.
- Schober, B. (2002). *Entwicklung und Evaluation des Münchner Motivationstrainings (MMT)* (Theorie und Forschung Bd. 763). Regensburg: Roderer.
- Schober, B., Wagner, P., Reimann, R., Atria, M., & Spiel, C. (2006). Teaching research methods in an internet-based blended-learning setting. *Methodology*, 2, 73-82.
- Schmidt, M., Perels, F., & Schmitz, B. (2010). How to perform idiographic and a combination of idiographic and nomothetic approaches. *Journal of Psychology*, 218, 166-174.
- Spiel, C. (1998). Four methodological approaches for the study of stability and change in development. *Methods of Psychological Research - online* 3 (2), <http://www.ppm.ipn.uni-kiel.de/mpr/issue5/art2/article.html> (accessed November 12, 2001).
- Spiel, C., Strohmeier, D., & Atria, M. (2008). Von der notwendigen Verschränkung quantitativer und qualitativer Methoden in der Programmevaluation am Beispiel des WiSK - Soziales Kompetenztraining für Schülerinnen und Schüler. In: F. Hofmann, C. Schreiner and J. Thonhauser eds. 2008. *Zur Komplementarität von qualitativen und quantitativen Aspekten in der erziehungswissenschaftlichen Forschung*, [On the need to offset quantitative and qualitative methods in program evaluation using WiSK as an example - Social competence

- training for male and female pupils].  
Münster: Waxmann, pp.263-280.
- Spiel, C., Lapka, D., Gradingner, P.,  
Zodlhofer, E. M., Reimann, R.,  
Schober, B., Wagner, P., & von Eye, A.  
(2008). A euclidean distance-based  
matching procedure for non-  
randomized comparison studies.  
*European Psychologist, 13*(3), 180-  
187.
- Sterba, S. K., & Bauer, D. J. (2010).  
Matching method with theor in  
person-oriented developmental  
psychopathology research.  
*Development and Psychopathology,*  
*22,* 239-254.
- von Eye, A., & Bogat, G. A. (2006).  
Person-oriented and variable-oriented  
research: Concepts, results, and  
development. *Merrill-Palmer*  
*Quarterly, 52,* 390-420.
- von Eye, A., & Bergman, L. R. (2003).  
Research strategies in developmental  
psychopathology: Dimensional  
identity and the person-oriented  
approach. *Development and*  
*Psychopathology, 15,* 553-580.
- von Eye, A., Bogat, G. A., & Rhodes, J. E.  
(2006). Variable-oriented and person-  
oriented perspectives of analysis: The  
example of alcohol consumption in  
adolescence. *Journal of Adolescence,*  
*29,* 981-1004.
- von Eye, A., & Spiel, C. (2010).  
Conducting person-oriented research.  
*Journal of Psychology, 218,* 151-154.
- von Eye, A., Spiel, C., & Wood, P.K.  
(1996). CFA models, tests,  
interpretation, and alternatives—a  
rejoinder. *Applied Psychology, 45,*  
345-352.

## Appendix A

All motivational variables were assessed using previously published scales. The items were rephrased in terms of the domain of methodology and ranged from 1 (= completely disagree) to 6 (= completely agree). Details are also published in Lapka et al. (2010).

1. Implicit personality theory—increment: consisting of 4 items according to the instrument of Dweck and colleagues (Dweck, Chiu & Hong, 1995; Dweck & Henderson, 1988) (internal consistency:  $\alpha = .70$ ). Item example: “I’m not very talented in Methodology – and I can’t change anything about that.” A high value of this scale indicates a flexible implicit personality theory.
2. Competence orientation: consisting of 4 items according to Schober (2002) (internal consistency:  $\alpha = .82$ ). Item example: “In Methodology my primary goal is to enhance my skills.”
3. Performance orientation: consisting of 4 items according to Schober (2002) (internal consistency:  $\alpha = .81$ ). Item example: “In Methodology my primary goal is to pass the exams.”
4. Self-efficacy: consisting of 4 items according to Jerusalem and Satow (1999) (internal consistency:  $\alpha = .74$ ). Item example: “I find it easy to comprehend new content in Methodology.”
5. Interest: consisting of 4 items according to (Schiefele et al., 1993) (internal consistency:  $\alpha = .87$ ). Item example: “Knowing much in

the field of methodology means a lot to me.”

6. Helplessness: consisting of 3 items according to Breikopf (1985) (internal consistency:  $\alpha = .84$ ). Item example: “I often feel overstrained regarding Methodology.”

Factual knowledge was tested via a pre-test and the exam at the end of the intervention regarding three different aspects with increasing degrees of complexity: reproduction, comprehension and production of methodological content (cp. Bloom, 1956). Reproduction refers to the memorized content and was assessed via items like: “Give a definition of Evaluation”. Comprehension refers to explaining and applying the learned content, for example: “Calculate on the basis of the given data the inter-rater agreement of rater A and B using Cohen’s kappa coefficient”. Production refers to critical thinking, transferring the learned content into another context and finding solutions for problems where there isn’t only one correct answer, for example: “A new anti-stress training for manager was developed. Outline briefly a possible evaluation design”.