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DETERMINANTS FOR PRACTISING EDUCATIONAL METHODS IN ENVIRONMENTAL EDUCATION - A COMPARISON BETWEEN TURKISH AND GERMAN TEACHERS USING THE THEORY OF PLANNED BEHAVIOR.

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Summary
The presented study has three main goals: 1. To find indications for reasons which hinder or foster the use of practical work and excursions in environmental education. 2. To test the applicability and power of a well established social psychological theory in our research field. 3. To compare results from two different countries.
As theoretical background we use Ajzen's Theory of Planned Behavior. This theory postulates that the more favorable the attitude and the subjective norm, and the greater the perceived behavioral control (PCB), the stronger the person's intention to perform the behavior in question should be.
The variables of the Theory of Planned Behavior were measured via a standardized questionnaire. 180 questionnaires were filled out by Turkish teachers (Ankara), and 107 by German teachers (Hesse). For the empirical test the structural equation approach (AMOS) was used.
Our results confirm the utility of using the Theory of Planned Behavior for explaining the teachers' intention to use different methods in environmental education.

We had different findings in the sample of the German teachers for the influence of the three variables (attitude, subjective norm, PCB) on the intention to carry out practical work and excursions in environmental education. PCB showed a very high path coefficient whereas the value for attitude was moderate and the value for subjective norm was low.
This indicates that a succesful way to foster the use of practical work and excursions may be to establish better conditions. As underlying beliefs concerning practical work we found: more laboratory space and equipment; concerning excursions: adequate abilities of the students, fewer discipline problems, lower costs.
In contrast to the German sample, the Turkish sample displayed only low values for the paths from PBC and attitude to intention. However the influence of subjective norm was moderate in the case of practical work and nearly moderate in the case of excursions. The underlying beliefs for practical work are parents' and students' expectations, ministry orders; for excursions we found: adequate abilities of the students, fewer discipline problems (same as in the German sample). From these results it seems to be possible to strengthen the Turkish teachers' intention to use practical work in environmental education by increasing their awareness that important others expect them to do so. Whether this is a useful approach is discussed.

1. Goals of the study

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The first and most important goal of our study is to find factors hindering or fostering the use of practical work (especially experiments) and excursions in environmental education. These two methods are considered to be successful in environmental education. Therefore they should be used more often in this field. (Berck 1999, Eschenhagen, Kattmann & Rodi 1998). It would be possible to improve environmental education if we have more knowledge about the obstacles which hinder the use of the above mentioned methods.
The second goal is to find out whether there are cultural differences in environmental education with regard to practical work and excursions. For this purpose the present study compares a sample of Turkish and German teachers.
As the third goal we want to test the applicability of Ajzen's Theory of Planned Behavior (in the following abbr. as TOPB). This theory is often used in social psychology and marketing, but applications in biology didactics research are rare. Shuman & Ham (1997) view the TOPB as a useful approach in studying determinants of environmental education, but they have not done such research themselves.

2. Description of the Theory of Planned Behavior (see Klee et al. in press)

The TOPB was developed by Ajzen (1991) and is an extension of the Theory of Reasoned Action (Ajzen & Fishbein 1980).
According to the TOPB human social behavior is reasoned, controlled, or planned. Although people's beliefs may be unfounded or biased, their attitudes, subjective norms, and perceptions of behavioral control are assumed to follow reasonably from these beliefs, produce a corresponding behavioral intention, and ultimately result in behavior that is consistent with the overall tenor of the beliefs.
Fig. 1 depicts the model of the TOPB graphically .

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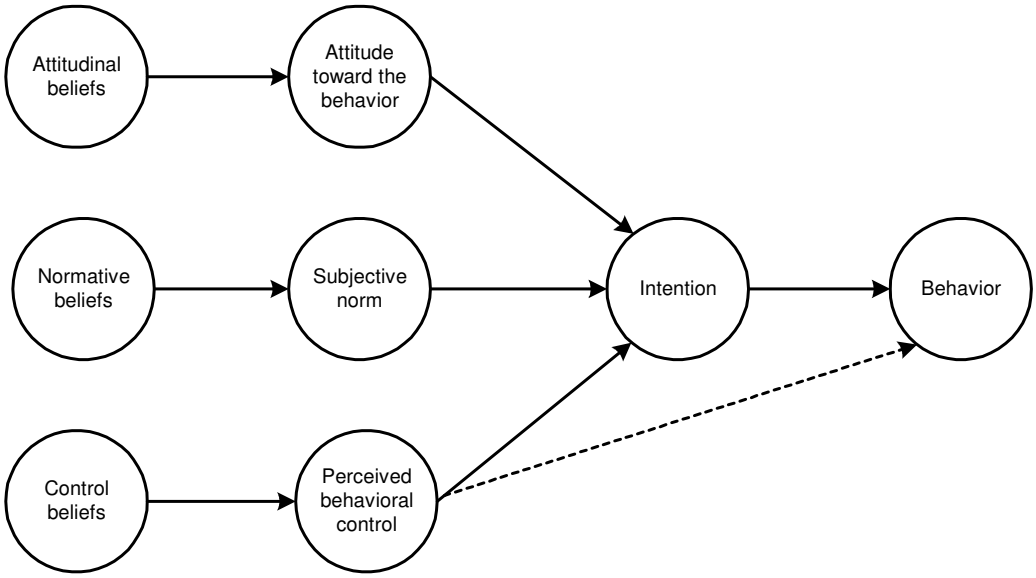
Fig. 1: Model of the theory of planned behavior (AJZEN, 1991)



The theory postulates that only intention and perceived behavior control (abbreviated as PBC below) are the direct determinants of behavior. The intention itself is determined by attitude, subjective norm and PBC. Attitude, subjective norm and PBC themselves are determined by attitudinal, normative and control beliefs. The attitudinal beliefs represent the perceived positive or negative consequences associated with a behavior, normative beliefs represent the perceived expectations of important others (social pressure), and control beliefs represent perceived factors hindering or fostering the performance of a behavior.
As a general rule, the more favourable the attitude and subjective norm, and the greater the perceived control, the stronger the person's intention will be to perform the behavior in question. Finally, given a sufficient degree of actual control over the behavior, people are expected to carry out their intentions when the opportunity arises. If a behavior is not completely under volitional control, that is its performance requests social and environmental support , the TOPB postulates an additional direct effect of PBC on behavior (dotted line in Fig.1).
Compared with models which stress the potential role of personal norms as behavioral determinants (e.g. Schwartz 1977) the TOPB stresses the importance of benefit and cost arguments. The individual is seen mainly as a utility-maximising actor.
Because of time and money constraints actual behavior was not measured in the present study. However meta-analyses show a strong empirical relation between intention and behavior in other behavioral domains (e.g. Conner & Armitage 1998, Van den Putte 1993).

3. Method

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3.1 The questionnaire

The constructs of the TOPB were measured via a standardised questionnaire.
The scales and the items are constructed in accordance with the instructions given by Ajzen & Fishbein (1980); this means correspondence of target, action, context, and time. For more details see Erten (2000).

3.1.1 Measurement of the variables of the core model.
One or two items were used to measure these variables. As an example for the operationalisation of the variables items for practical work are given:
Intention: I intend to conduct practical work during the next school-year while treating environmental issues. (bipolar 7 step scale: very likely - very unlikely)
Attitude: If I let the students do practical work in my class during the next school-year while treating environmental issues I will find this ... (bipolar 7 step scale: very great - very bad)
Subjective Norm: People who are important to me expect me to conduct practical work in my class during the next school-year while treating environmental issues (bipolar 7 step scale: very great - very bad).
PBC: Conducting practical work in my class during the next school-year while treating environmental issues is ... (bipolar 7 step scale: very easy - very difficult).
For the part of the questionnaire concerning excursions, there are corresponding items (in principle the term ”practical work” is replaced by the term ”excursion”).

3.1.2 Measurement of the beliefs

In a pretest (free elicitation method ,Ajzen & Fishbein 1980) the salient attitudinal, normative, and control beliefs of 50 Turkish and 25 German teachers associated with the two educational methods were collected.
Three questions concerned practical work and three concerned excursion. As an example the question used to collect the attitudinal beliefs is given: "What are, from your point of view, important consequences of carrying out practical work with your students while treating environmental issues in the next school-year (for instance testing water, soil, damaged plants)?".
The answers were used to formulate the standardised items to survey the beliefs. The questionnaire contained different numbers of items measuring the attitudinal, normative and control beliefs associated with the two educational methods. In the case of practical work there are 13 items for the attitudinal beliefs, 6 for the normative beliefs and 7 for the control beliefs. As an example for the measuring of the beliefs the question and the first 5 items concerning the attitudinal beliefs for the case of practical work are given (for the complete questionnaire see Erten 2000):
If I have practical work carried out in the next school-year in my class while treating environmental issues, it would have the following effect: 1.The students learn the relevant subject matter better. - 2. The students understand the relevant subject matter better. - 3. The students remember the relevant subject matter better. - 4. The students can better recognise environmental pollution. - 5. The environmental concern of the students is intensified. - 6. It can be better taught to the students that environmental pollution may lead to a catastrophe. - 7. Practical skills are better learnt by the students to protect the environment.

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The subjects give their responses on seven-step scale with the anchor points "very likely" to "very unlikely".
In the empirical part we only concentrate on those beliefs which have a statistically significant effect on the corresponding attitude, subjective norm, and PBC.

3.2 Conducting and analysing the survey

The empirical part of the main study was conducted in 1998/99. A total of 180 questionnaires were filled out by Turkish teachers, 107 questionnaires were obtained from German teachers. All of the teachers (male and female) were involved in teaching environmental education, their subjects were biology or chemistry.
For the empirical test of the TOPB the Structural Equation Approach was used (AMOS, Arbuckle & Wothke 1999).

4. Practical work

4.1 Core model

4.1.1 Results

Figure 2 shows the core model with the path coefficients for practical work. Overall the model fit is sufficient; only the GFI (Goodness of fit index) for "German teachers" is too low. The explained variance (R^2) is very high in the German sample, in the Turkish sample R^2 can be regarded as sufficient.

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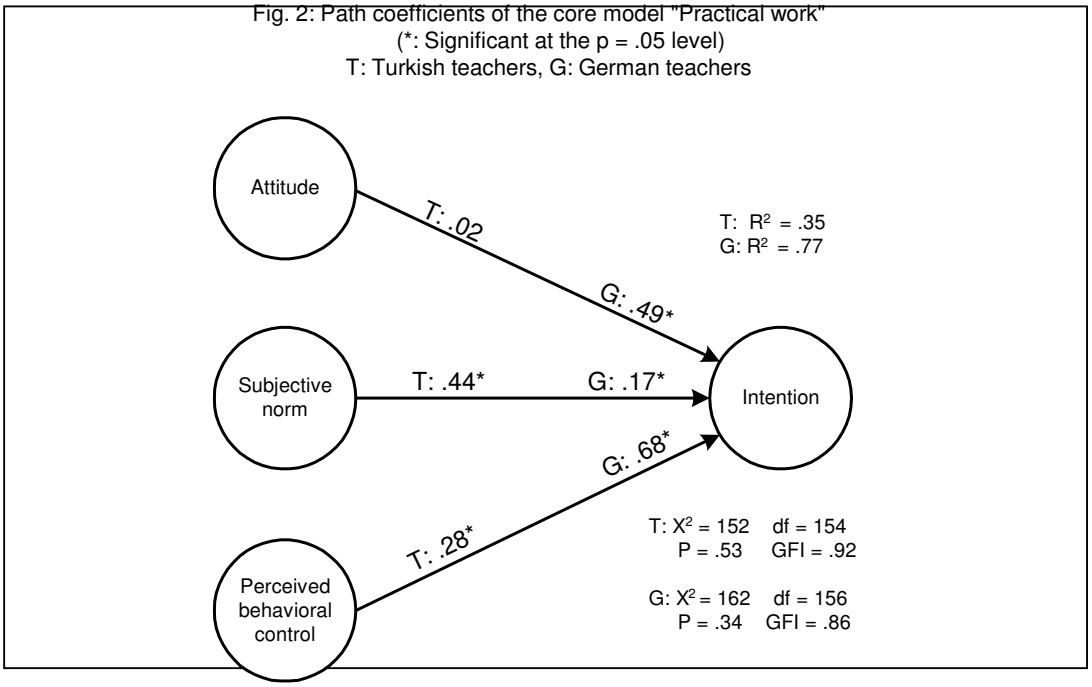
Fig. 2: Path coefficients of the core model "Practical work"
(*: Significant at the p = .05 level)
T: Turkish teachers, G: German teachers



The figure shows considerable differences between the Turkish and the German sample. With a path coefficient of .02 the attitude has no statistically significant effect on the Turkish teachers' intention to carry out practical work with their students, whereas in the German sample the attitude (.49) exerts a rather high effect on the intention. Regarding the influence of the subjective norm on the intention the finding is the opposite: here we find a much higher coefficient in the Turkish sample. In the German sample PBC has the strongest effect on the intention to use practical work in environmental education.

4.1.2 Discussion

First of all we want to stress the explorative nature of our study. As stated above one main goal was to test the empirical applicability of the TOPB in the domain of biology didactics. Our results confirm the usefulness of such an approach. But the results have to be confirmed through further investigations; as a consequence the interpretations are preliminary.
The finding that the attitude of the Turkish teachers has a low influence whereas the subjective norm is high, - and by contrast the results are the opposite in the German sample - can be explained by a statement of Frey et al. (1993). These authors assume that if a person is highly integrated in a group and therefore perceives high social pressure, the attitude will be without relevance for the intention. Personal experiences of persons who are well acquainted with the situation in both countries confirm the assumption that social integration in Turkey is greater than in Germany.
Increasing the awareness of Turkish teachers that important others expect them to use practical work may strengthen the intention of the teachers to do so. But from our point of view this strategy to improve teachers' educational practises alone is problematic. A better

strategy would be to strengthen the impact of the attitude. The German sample shows that this strategy might be more effective.
This assumption is supported by Crawley's (1990) research in the USA concerning the use of investigative methods by teachers of physical science. He showed that attitude was the most important predictor of behavioral intention. However, Koballa's (1986) findings (Austin, Texas) suggest that prospective teachers' attitudes toward science cannot adequately predict or provide a satisfactory explanation of using hands-on activities in science education. Further studies must analyse the relation between intention and behavior more intensively.
A possibility to increase the intention especially of German teachers to use practical work is indicated through the high path coefficient between the PBC and the intention. Thus the next section concentrates on the special salient beliefs underlying attitude, subjective norm and PBC.

4.2. Beliefs

For reasons of clarity we have split the complete models into three parts and we only present the probability of the beliefs because they give the most useful information. For the complete models see Erten (2000).

4.2.1 Results

Figures 3 - 5 show for the method "practical work" for each variable of the core model the effects of the underlying beliefs (attitudinal, normative, control) and the indicators which have been proved as the statistically most important ones of these beliefs.
On the left side of the figures one can see the results concerning the Turkish, on the right side the ones concerning the German teachers.

The coefficients of the paths from the attitudinal beliefs to the attitude are not very high but statistically significant (Fig. 3). The salient indicators of the attitudinal beliefs for the Turkish teachers are ”better learning” ”better illustration of subjects”, ”more motivation”. For the German teachers we found ”better remembering”, "better illustration of subject matter” and ”better learning of skills” are the indicators with the greatest explanatory power.
As one can see from figure 4 in the Turkish sample the subjective norm can be explained very well by the corresponding normative beliefs. ”Expectations of the parents”, ”orders of the ministry”, ”expectations of the students” are the most salient indicators of these beliefs. In the German sample there is a moderate effect of the normative beliefs on the subjective norm. The indicators here are ”expectations of colleagues” and ”expectations of parents”.
In the case of the control beliefs (Fig. 5) we found also a great difference between the Turkish and the German sample. Concerning the latter the effect of the control beliefs on the PBC is very high, whereas for Turkish teachers the relation between the control beliefs and PBC is low and negative.

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Fig. 3: The attitudinal beliefs with their indicators in the model "Practical work"
(*: Significant at the p = .05 level)

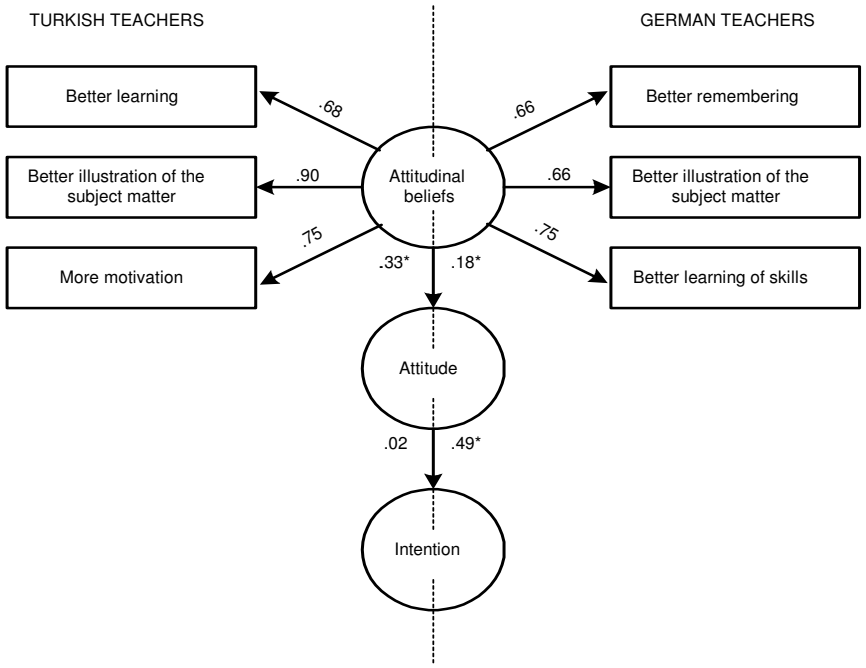

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Fig. 4: The normative beliefs with their indicators in the model "Practical work"
(*: Significant at the p = .05 level)

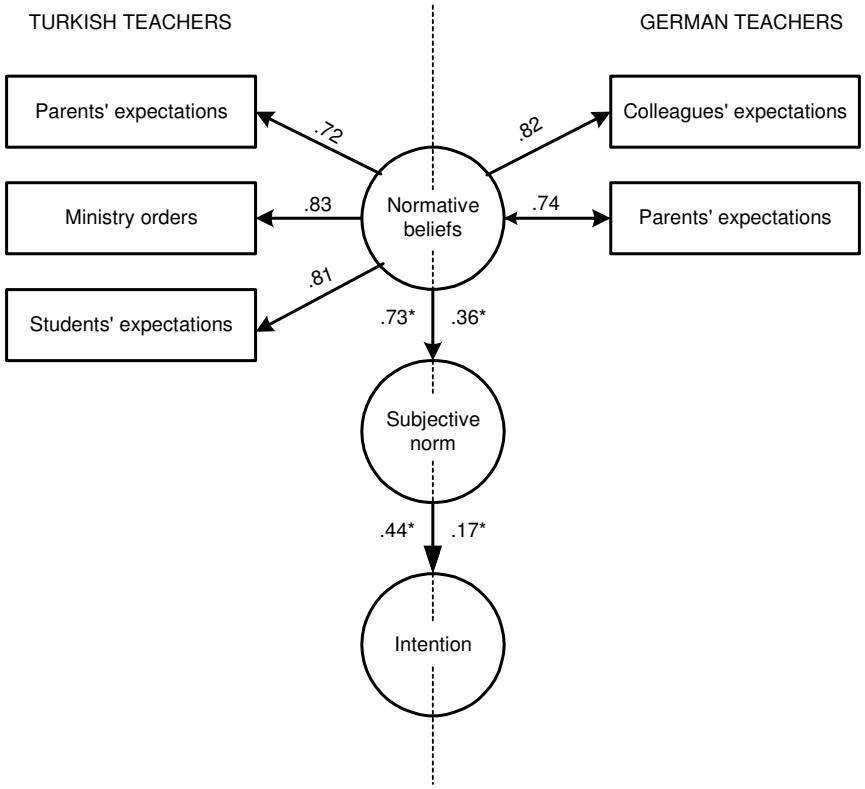

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Fig. 5: The control beliefs with their indicators in the model "Practical work"
(*: Significant at the p = .05 level)

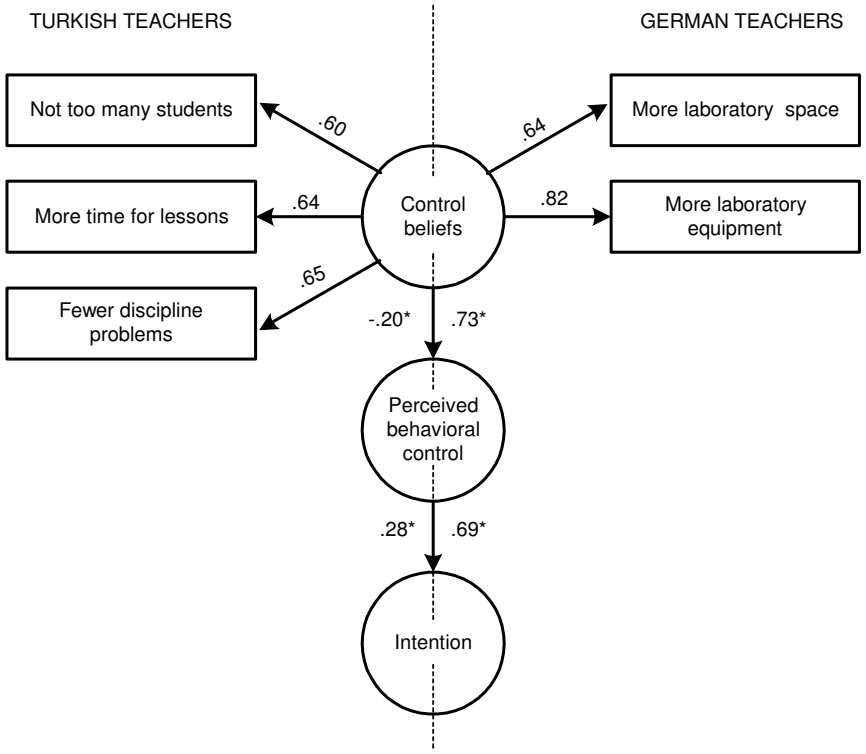

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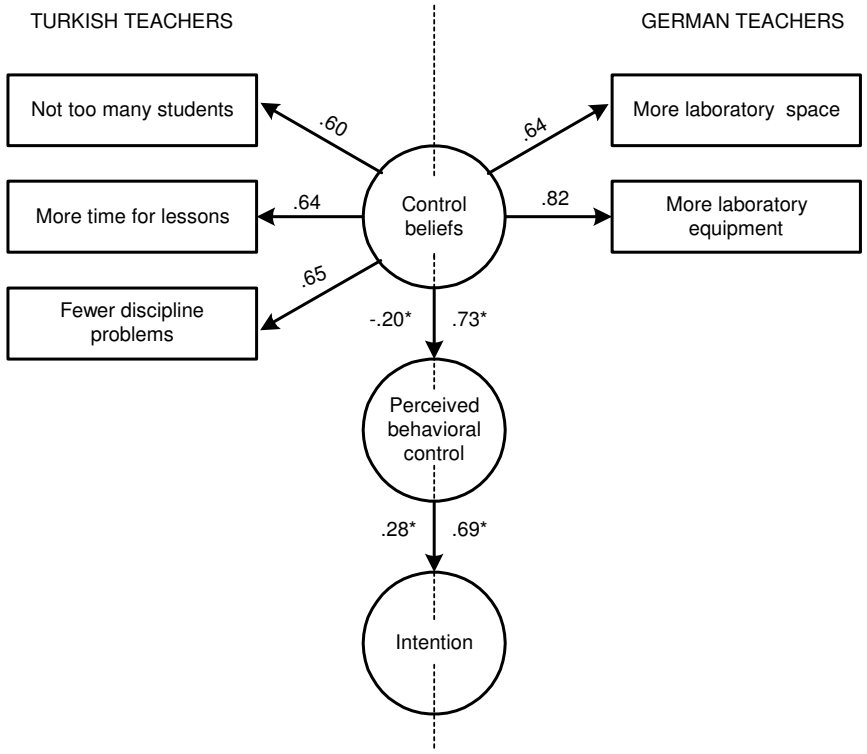
Fig. 5: The control beliefs with their indicators in the model "Practical work"
(*: Significant at the p = .05 level)



4.2.2 Discussion

One problem of the present study consists in the low empirical relation between the attitudinal beliefs and the attitude. Thus we cannot explain yet the factor underlying the influence of the attitude towards practical work. But it can be pointed out that in the model of the Turkish sample the "practical skills" have no influence; in the German sample the corresponding case is "more motivation". If these findings are replicated in further studies these aspects have to be emphasised in pre-service and in-service teacher education.
Because of the high influence of subjective norm on intention (Fig. 4) in the Turkish sample the normative beliefs underlying the subjective norm are of special interest in this sample. They indicate the persons or institutions whose expectations are important for the teachers. According to our results the parents are important in both Turkey and in Germany.
To foster the intensity of practical work in environmental education it seems to be a possible and successful way to let the teachers know such demands through parents.
In Turkey orders of the ministry would possibly have the strongest effect; however here we have to take into account the above mentioned relation between subjective norm and attitude.
The very high relations between the control beliefs, the PBC and the intention in the German teachers sample (Fig. 5) indicate that trying to influence these factors might be a good way of fostering the intention to use practical work in environmental education. Because the two

control beliefs "more laboratory space" and "more laboratory equipment" are of special importance these two aspects have to be improved.
In the context of the present study we cannot explain the low relation between the control beliefs and the PBC found in the Turkish sample.

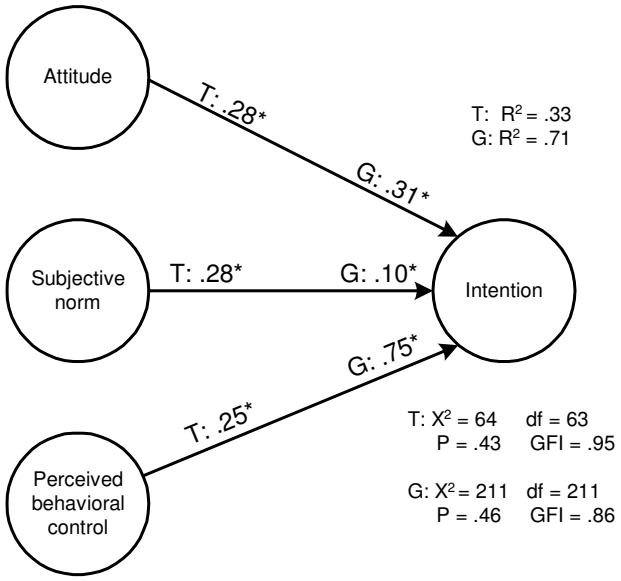
5. Excursions

5.1 Core model

5.1.1 Results

Figure 6 shows the core model for excursions. The fit of this model is as good as the fit of the model practical work. The explained variance (R^2) is also very high in the German sample, the corresponding figure of the Turkish sample can be regarded as sufficient.

Fig. 6: Path coefficients of the core model "Excursion"
(*: Significant at the p = .05 level)
T: Turkish teachers, G: German teachers



As one can see in figure 6 the path coefficients of the Turkish sample tend to have the same value. They are all low but significant. In contrast the German teachers show remarkable differences: the attitude has a moderate, the subjective norm a very low and the PBC a very high influence upon the intention.

5.1.2 Discussion

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In the German sample the results of the TOPB core model for excursions are quite similar to those reported for the model practical work: The subjective norm has the lowest effect on intention and PBC the strongest. This means that the intention of the German teachers can hardly be affected by persons or institutions. In contrast the great effect of PBC indicates a good chance to foster the intention to carry out excursions in environmental education.
From the finding that the effects from attitude, subjective norm and PBC on intention are in the same magnitude a hypothesis can be deduced: Subjective norm (that is the influence of important others) is of no importance for the intention of German teachers at all; whereas the PBC (that is for instance equipment and rooms) has generally a great influence. We hope to prove this hypothesis by further investigations.

Comparing the two methods - practical work and excursions - in the Turkish sample one can observe a change: For excursions the relative importance of subjective norm is considerably lower, whereas the importance of attitude is much higher. This matches the statement in section 4.1.2 that a strong effect of subjective norm hinders the influence of attitude. Because the effect of the subjective norm on the intention is low here, the attitude can have an influence upon the intention.
The reasons for the relatively low effects of the attitude in both the German and the Turkish samples has to be analysed in further studies.

5.2 Beliefs

5.2.1 Results

Here we proceeded in the same way as described in section 4.2. Accordingly figures 7 - 9 show each of the part of the core model and in addition the salient indicators for the method "excursion". On the left side of the figures one can see the results concerning the Turkish, on the right side the ones concerning the German teachers.

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Fig. 7: The attitudinal beliefs with their indicators in the model "Excursion"
(*: Significant at the p = .05 level)

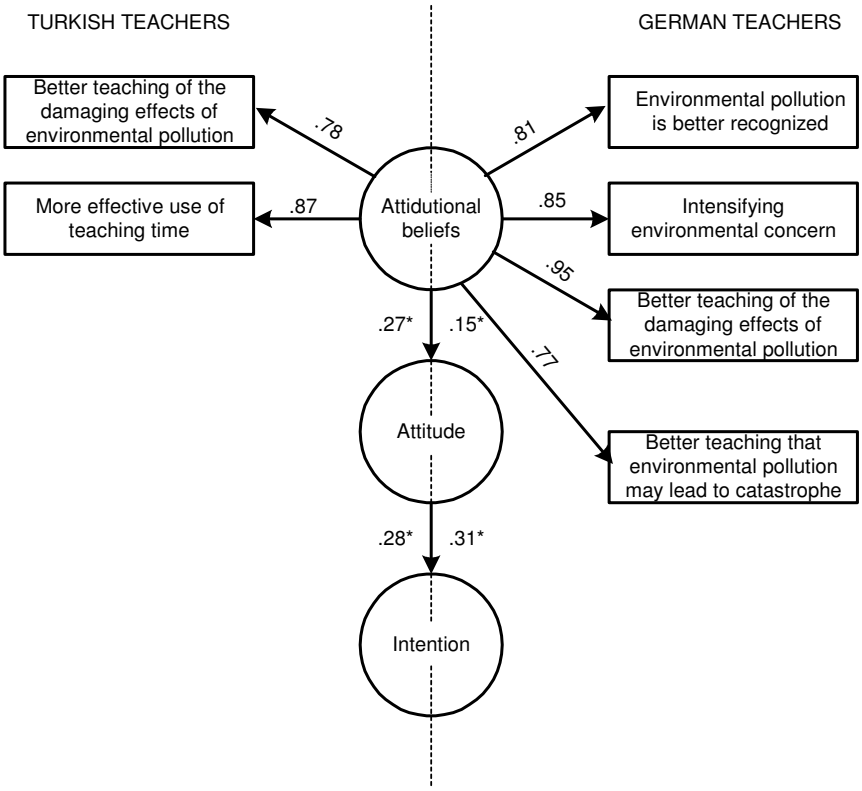

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Fig. 8: The normative beliefs with their indicators in the model "Excursion"
(*: Significant at the p = .05 level)

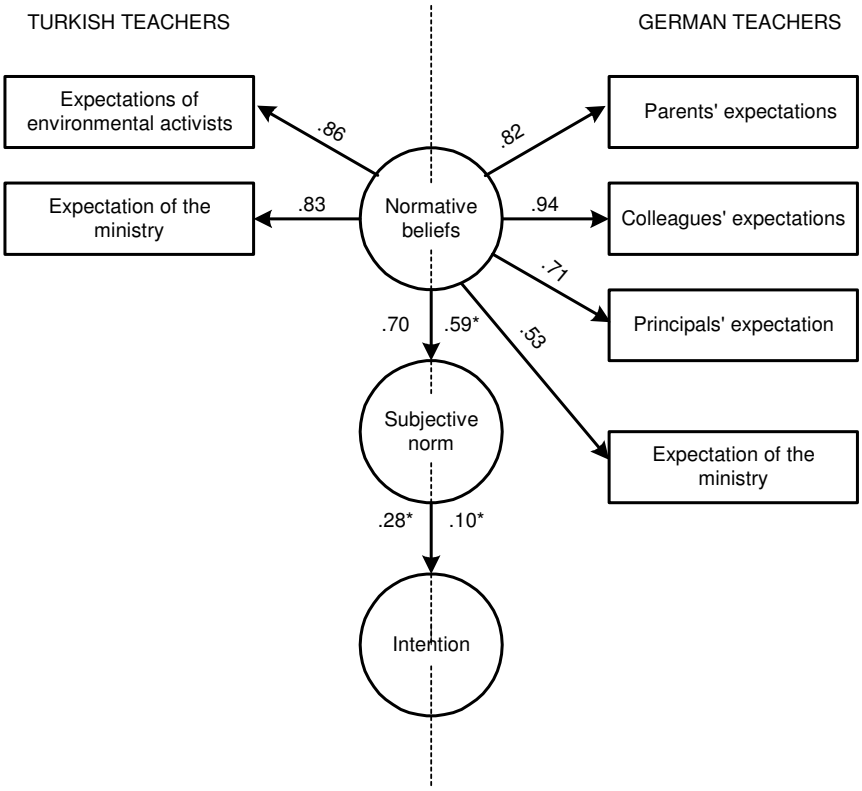

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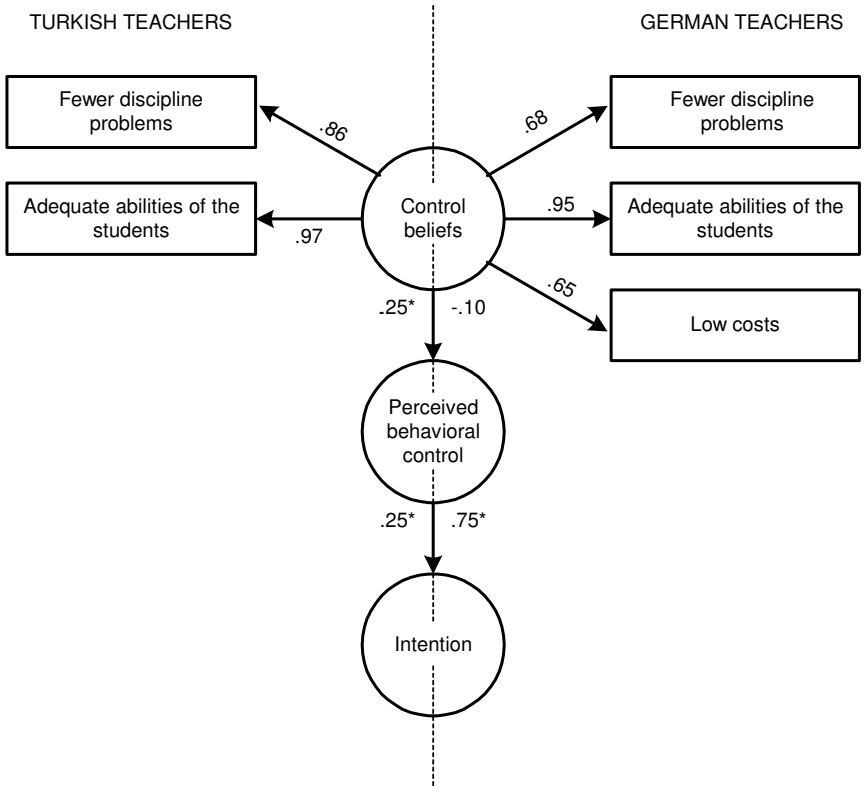
Fig. 9: The control beliefs with their indicators in the model "Excursion"
(*: Significant at the p = .05 level)



Concerning the attitude (Fig. 7) the effect of the attitudinal beliefs is not very high, but statistically significant. The model of the Turkish sample contains two, the model of the German sample contains four salient indicators. Most of them refer to the fact that excursions facilitate better teaching of special objectives concerning environmental education. In addition as a result of making excursions the Turkish teachers expect a more effective use of teaching time, whereas the German teachers expect an increase in students environmental concern. The effects of the normative beliefs on the subjective norm (Fig. 8) are high but only in the case of the Turkish teachers there is a noticeable influence by the subjective norm on the intention. According to the salient indicators the perceived expectations of ministry and environmental activists are of special importance.
Figure 9 shows that only in the Turkish sample do the control beliefs have a low but significant effect on PBC. In the German sample this path coefficient is statistically not significant. Two indicators are present in the Turkish as well as in the German sample: fewer discipline problems and more adequate abilities of the students.

5.2.2 Discussion

For the method ”excursion” the effects from the attitudinal beliefs on the attitude (Fig. 7) are similar to the findings reported for practical work (Fig. 3). Thus the same conclusions can be drawn. Because there are only two indicators in the model of the Turkish sample it seems to be necessary to impart to the teachers that there are more objectives which can be realised in

environmental education through excursions. A little bit astonishing is the effect of the belief ”effective use of teaching time” because this is an argument often used in the opposite way. If one wants to foster the intention to carry out excursions in environmental education by social pressure, a possible way in both countries may be by orders of the ministry (Fig. 8). However the highest effect would be achieved in Germany through colleagues and parents (the disadvantages of such an approach have already been discussed).
In figure 9 the low relations between the control belief and the PBC in the German sample cannot be explained. To foster the intention of the Turkish teachers to use excursions in environmental education, their skills must be trained in managing discipline problems. The indicator ”adequate abilities of the students” has very high coefficients in both the Turkish and in the German sample. But the meaning of this finding is not clear to understand. It may be supposed that the students should know how to behave during an excursion and that they should be able to comprehend the demonstrated (perhaps complicated) facts.
Because in the Turkish sample only two attitudinal beliefs exert a significant effect on attitude, one practical conclusion may be that teachers have to be convinced that excursions have much more useful consequences for environmental education.

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