Effects of Autonomy Supportive vs. Controlling Teachers' Behavior on Students' Achievements

Natalia Hofferber[1], Alexander Eckes[1] and Matthias Wilde[1*]

[1]*University of Bielefeld, Germany*

[*]E-mail: matthias.wilde@uni-bielefeld.de

Grolnick and Ryan assume that an autonomy supportive environment leads to higher learner engagement and thus to greater achievements and deeper understanding of content. In school, knowledge acquisition (rote learning as well as conceptual learning) are regarded as most important. In this study, we examined the effects of teachers' autonomy supportive vs. controlling behavior on knowledge acquisition as measured by reproduction as well as at higher cognitive levels. The sample consisted of seventh graders ($N = 85$; $M = 12.85$ years; $SD = 1.6$ years). One week in advance to the teaching unit, the students were tested for prior knowledge using two knowledge tests. Test 1 used multiple-choice items to address rote learning and Test 2 used an open response format to address conceptual learning. One week after the teaching unit, the same knowledge tests were used to assess the learning outcome. Analysis of the knowledge tests suggests that the students taught in an autonomy supportive environment develop greater conceptual knowledge than those taught in a controlling environment. Rote learning was not affected.

Keywords: autonomy, control, teacher behavior, rote learning, conceptual learning, knowledge achievement

Introduction

The purpose of high school is to educate the students to be responsible citizens (Scholl, 2009), who can then apply their knowledge to different contexts. PISA studies (e.g. PISA 2012 in OECD 2013) as well as TIMMS studies (e.g. TIMSS 2012 in Bos, Wendt, Köller, & Selter, 2012) indicate that although Germany has already achieved this goal, there is room for improvement in some areas. A long-standing problem in Germany is that content knowledge acquired in school is not applied to out-of-school contexts (Gerstenmaier & Mandl 1995; Renkl, Mandl, & Gruber, 1996). The implication is that the teaching of content knowledge can be improved. The acquisition of knowledge is dependent on many factors, such as the student's socio-economic status, the type of school, and motivational factors (Yarahmadi, 2011). The latter have a strong effect on the students' achievements in school, and can be influenced by the teachers' behavior (Reeve, 1998). Reeve, Bolt, and Cai (1999) argue that a teachers approach to teaching can influence the students' motivational state and their level of achievement. They differentiate between autonomy supporting styles on the one hand, and controlling motivational styles on the other (Reeve, 1998; Ryan & Deci, 2000). Previous studies have suggested the positive effect of autonomy support on students' motivation (Mouratidis, Lens, & Vansteenkiste, 2010; Reeve et al., 1999). The aim of this study was to compare the effects of teachers' autonomy supporting and control-

ling behavior on the students' reproducible as well as conceptual learning achievement in biology classes.

Theoretical Background

The teaching environment can be greatly influenced by the teacher (Grolnick & Ryan, 1987). Teachers who promote autonomy offer their students choices, give them informative feedback, and allow them the space to decide for themselves how they want to learn, and so forth (Reeve, 2002; Reeve et al., 1999; Reeve & Jang, 2006,). Autonomy support facilitates satisfaction of the need for autonomy, considered one of the *basic needs,* along with social relatedness and competence. This satisfaction promotes intrinsic motivation. Furthermore, autonomy support is also crucial to the learning process (Deci & Ryan, 1985). Grolnick and Ryan (1987) posit that an autonomy supportive environment can have a positive effect on the students' interest in taught content, and thus increasing personal relevance for the students. This is thought to lead to higher engagement by the learner (Grolnick & Ryan, 1987), thus enabling more effective learning (Reinmann & Mandl, 2006; Weinert, 1996). Students, who are taught by autonomy supporting teachers develop a deeper understanding of the content (Benware & Deci, 1984; Grolnick & Ryan, 1987), get better grades (Miserando, 1996), learn more and retain the acquired knowledge longer (Bätz, Beck, Kramer, Niestradt, & Wilde, 2009). They also have more endurance while learning (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004) and acquire deeper and more complex knowledge (Müller & Palekčić, 2005) than students, who are taught in controlling environments. Teachers who tend to exhibit more controlling behavior withhold students' control over their own actions. Specific behaviors include providing explicit instructions for how tasks are to be performed (Assor, Kaplan, Kanat-Maymon, & Roth, 2005), proposing solutions, giving students few or no choices, and put them under pressure to perform in prespecified ways (Reeve, 2002; Reeve et al., 1999; Reeve & Jang, 2006). When students are taught by controlling teachers their perception of autonomy can become impaired. As such, a deeper understanding of the content, marked by confident success and persistence, is undermined (Assor et al., 2005; Ryan, 1982). Nevertheless, the requested actions are carried out under threat of punishment (Assor et al., 2005). Because the motivation to learn is extrinsic, incentives couched in the controlling teachers' behavior, e.g. reward or punishment, eventually turn the students' attention away from the central content of teaching. The students focus on "jumping through hoops," so to speak, often choosing the simplest and quickest solution without real regard to learning (Amabile, 1983; Vansteenkiste, Lens, & Deci, 2006). This can lead to superficial ways of carrying out tasks, without ever reflecting on their significance (McGraw & McCullers, 1979; Ryan, 1982). This way of learning supports the acquisition of inert knowledge (Renkl et al., 1996) and impairs learning as a means to reformulating knowledge in the context of the students' life, so as to make it applicable to every-day situations. In view of the importance of knowledge acquisition by students, this study investigated whether rote and conceptual learning could be enhanced by autonomy supporting teaching behaviors.

Hypotheses

We hypothesized that autonomy supporting biology lessons would have a greater positive effect on students' knowledge acquisition as compared to controlling teacher behaviors. We predicted this to be true for (a) reproducible and (b) conceptual knowledge. A positive effect was operationalized as significant differences in the two testing instruments described below.

Methods

Participants

Participants comprised four seventh grade biology classes at two middle schools (Realschule) ($N = 85$). One class from each school was taught using an autonomy supportive perspective (A-treatment, $N = 44$) and the other inform a controlling perspective (C-treatment, $N = 41$). Details of the operationalization

of both perspectives can be found in Table 1 below. The students' average age was 12.85 years (*SD* = 1.6 years).

Measuring instruments

Two knowledge tests were used. The items in the pre- and post-test were identical. In order to avoid ordering effects, the ranking of the items was changed in the post-test. *Knowledge Test 1* consisted of 27 multiple-choice items mainly addressing rote learning. Cronbach's Alpha was α =. 65. The item difficulty index ranged from .17 to .84. The measured cognitive achievement corresponded to level 1 of the competence area content knowledge (KMK, 2005) and to level 1 as described by Metzger and Nüesch (2004). Both levels include the reproduction of knowledge and reproduction of skills and methods. *Knowledge Test 2* consisted of nine open ended items addressing conceptual knowledge. It required short written answers (Lienert & Raatz, 1998). Correct answers were rewarded with two points, incomplete answers with one, and wrong or missing answers with zero points. A maximum of 18 points could be achieved. Interrater reliability, determined by Cohen's kappa coefficient, was κ = .90. The difficulty index of the items ranged from .31 to .76. Knowledge Test 2 examined students' cognitive achievement, and was classified as at least level 2 of the competence level content knowledge (KMK, 2005). This level contains the processing of familiar issues in a new context. The students were asked to apply their knowledge to a modified context or to describe it with their own words. This approach corresponds to process level 2 as described by Metzger and Nüesch (2004). For example, the students were expected to be able to explain why the Eurasian Harvest Mouse (*Micromys minutus*) could not climb a tree.

Design

This was a quasi-experimental study that used a pre- and post-test design. One week before the teaching unit began both knowledge tests were administered to assess students' prior knowledge. To accurately measure possible knowledge increases, both tests were repeated one week after the teaching unit. Each teaching unit was three-hours long. There were no differences between the treatments in subject content or teaching methods. The students in both treatment groups worked in small groups with Eurasian Harvest Mice (*Micromys minutus*) and both investigated climbing behavior with respect to the habitats of these very small rodents. Only the teacher's behavior differed. In treatment A, the teacher was autonomy supportive whilst in the treatment C, the teacher behaved in a controlling manner. To standardize the autonomy support and the controlling teachers' behavior respectively, the characteristics developed by Reeve (2002) and Reeve and Jang (2006) were analyzed and summarized. The established speeches, feedback and instructions for both treatments were memorized by the teacher before the teaching unit started. The operationalization of the teacher's behavior in each treatment group is described in Table 1. To ensure the correct implementation of the theory-driven teacher's statements between and within the treatment groups, all biology lessons taught were recorded. To ensure that the recorded differences were due to the treatment, and not to individual differences between teachers, all classes were taught by the same teacher.

Table 1. Operationalization of autonomy supportive (Treatment A) and controlling (Treatment C) teachers' behavior

A-treatment	C-treatment
Informative feedback, e.g.: "You observed the climbing properties of the mouse well."	Controlling feedback, e.g.: "You did the work just as I wanted you to do it."
Choice, e.g.: The students could choose their group members and the order in which they wanted to work on their tasks.	No choice, e.g.: The teacher chose the group members and the order of the tasks.

Use of unfamiliar presumably less-controlling symbols, e.g.: The teacher corrected the worksheets with a green pen.	Use of familiar controlling symbols, e.g.: The teacher corrected the worksheets with a red pen.
Absence of controlling procedures, e.g.: Students were not given any marks for the unit.	Controlling procedures, e.g.: Students got marks for the unit.
Non-controlling language, e.g.: expressions such as "You could (…)" or "If you want (…)" were used.	Controlling language, e.g.: expressions such as "You must (...)" or "You should (…)" were used.
Non-controlling organisation of the lessons, e.g.: the students could choose how much time they spent on the tasks within a given amount of time.	Controlling organisation of the lessons, e.g.: students had to finish the task when the teacher told them.

Results

We were interested in rote and conceptual learning. The repeated measures ANOVA showed significant learning improvements with an effect size from pre- to post-test in rote learning for both treatment groups ($F1, 84 = 32.270$; $p < 0.001$.; $\eta^2 = 0.278$). Thus, the lessons were successful. However, the main research question of this study was how effective autonomy supportive teaching was in comparison to controlling teacher. In rote learning there were no treatment effects ($F1, 84 = 0.665$; $p = ns$; $\eta^2 = 0.008$; see Figure 1). In order to control for a possible dependence on previous knowledge, we conducted an ANCOVA with previous knowledge as covariate. There was no significant influence of previous knowledge on a possible treatment-dependent learning achievement in the students ($F1, 84 = 0.002$; $p = ns$; $\eta^2 = 0.000$).

Knowledge Test 2 addressed higher cognitive performance levels than Knowledge Test 1. Firstly, we report the effectiveness of the lessons. In both treatment groups, the ANOVA with repeated measures shows a significant and very clear learning advantage from pre- to post-test in Knowledge Test 2 ($F1, 84 = 454.650$; $p < 0.001$; $\eta^2 = 0.844$). There was also a significant time-dependent treatment-effect ($F1, 84 = 35.246$; $p < 0.001$; $\eta^2 = 0.298$; Figure 2). Autonomy supportive teacher behavior seemed to have a significant influence on learning at higher cognitive levels. The possible effect of previous knowledge was again controlled for using ANCOVA, although it revealed no significant influence of previous knowledge ($F1, 84 = 0.216$; $p = ns$; $\eta^2 = 0.003$).
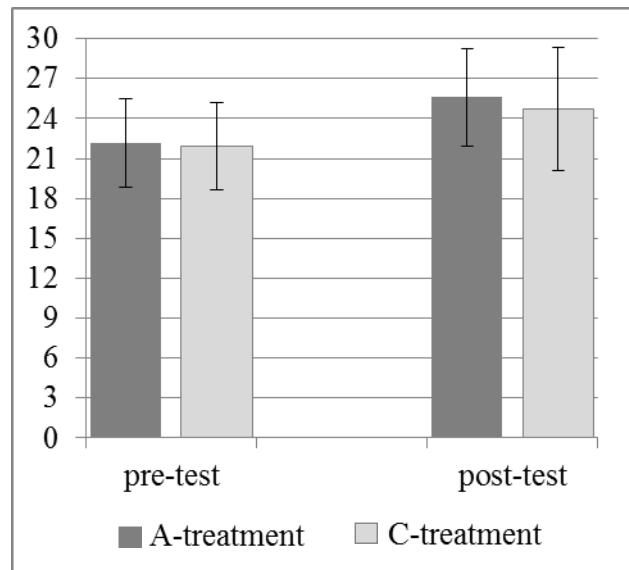
Figure 1. Knowledge achievement (multiple choice items). Average and standard deviation of Test 1 at pre- and post-test. A maximum of 27 points could be achieved.
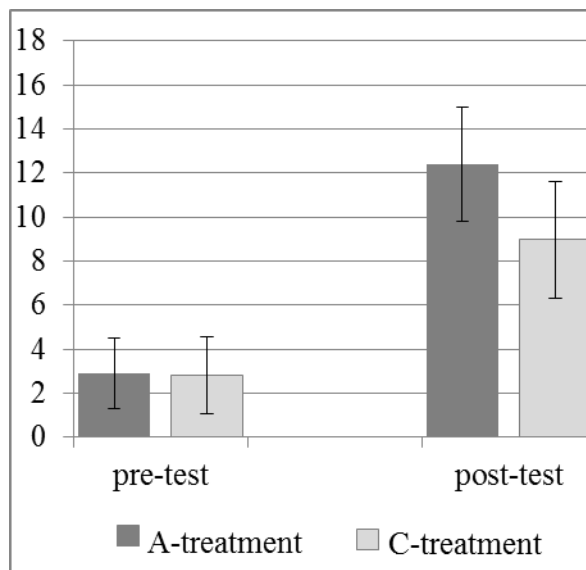

Figure 2. Knowledge achievement (open ended items). Average and standard deviation of Test 2 at pre- and post-test.

Discussion

We were interested in the effects of teacher autonomy supportive and controlling behavior on students with regard to reproducible and conceptual knowledge acquisition. In the study we found significant learning improvements from pre- to post-test in both treatment groups for both types of knowledge. There were no differences in reproducible knowledge between the students who were taught in a controlling context and those taught in an autonomy supportive context. At the higher cognitive level, there

was a meaningful difference between the students who were taught in a controlling context and students who were taught in an autonomy supportive context.

It is a given (e.g. Kroß & Lind, 2001) that students' prior knowledge can have a significantly influence on growth in knowledge acquisition. Therefore the students' prior knowledge was assessed at the beginning of the study to ensure that students of both treatments were of a similar level of knowledge. We found an increase in knowledge from pre- to post-test for both treatment groups. In the reproducible knowledge measure, there were no significant differences between the students of the autonomy supportive group and the students who were treated in a controlling manner. This is in line with results by Grolnick and Ryan (1987). For the higher cognitive level, there was a clear treatment effect in favor of the autonomy supportive students. Similar results were found by Grolnick and Ryan (1987). The laboratory study originally conducted by Grolnick and Ryan (1987) was be reproduced in a much more ecological valid context, namely in the real school context of seventh grade biology lessons. In our study, we found that autonomy supportive biology lessons favored the acquisition of conceptual knowledge. Autonomy support promoted a self-determined commitment to the students' own aims in the unit (Deci & Ryan, 1985 & 2000). Thus, the attention of the learners was much more focused and learning was more active and more effective. This more intense contact with the subject matter is thought to enable deeper, conceptual knowledge (Boggiano, Flink, Shields, Seelbach, & Barrett, 1993). During the controlled treatment group, this level of depth was made difficult because of the interruptions by the teacher (e.g. "Keep the time in mind." or "You have to finish all tasks."), the time pressure and the pressure to perform based for school marks (Grolnick & Ryan, 1987; Reeve & Jang, 2006). Controlling teaching appears to affect knowledge acquisition negatively in students (Vansteenkiste et al., 2004). Our study also found that controlling teachers' behavior appeared to have no negative effect on rote learning while conceptual learning was markedly weaker. In contrast, autonomy support appeared to be equally effective or better than both types of learning. On the whole, autonomy supportive teacher behaviors can be recommended to facilitate deep and effective student learning.

References

Amabile, T. M. (1983). *The social psychology of creativity*. New York: Springer.

Assor, A., Kaplan, H., Kanat-Maymon, Y. & Roth, G. (2005). Directly controlling teachers' behaviors as predictors of poor motivation and engagement in girls and boys: The role of anger and anxiety. *Learning and Instruction*, 15, 397-413.

Benware, C. A . & Deci, E. L. (1984). Quality of learning with an active versus passive motivational set. *American Educational Research Journal,* 21, 755-765.

Bätz, K., Beck, L., Kramer, L., Niestradt, J. & Wilde, M. (2009). Wie beeinflusst Schülermitbestimmung im Biologieunterricht intrinsische Motivation und Wissenserwerb? *Zeitschrift für Didaktik der Naturwissenschaften*, 15, 307–323.

Boggiano, A. K., Flink, C., Shields, A., Seelbach, A. & Barrett, M. (1993). Use of techniques promoting students' selfdetermination: Effects of students' analytic problem-solving skills. *Motivation and Emotion,*17, 319–336.

Bos, W., Wendt, H., Köller, O. & Selter, C. (Hrsg.) (2012). *TIMSS 2011. Mathematische und naturwissenschaftliche Kompetenzen von Grundschulkindern in Deutschland im internationalen Vergleich*. Münster: Waxmann.

Deci, E. L. & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum Publishing Co.

Deci, E. L. & Ryan, R. M. (2000). The „What" and „Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, 11(4), 227-268.

Gerstenmaier, J. & Mandl, H. (1995). Wissenserwerb unter konstruktivistischer Perspektive. *Zeitschrift für Pädagogik,* 41(6), 867-888.

Grolnick, W. S. & Ryan, R. M. (1987). Autonomy in Children's Learning: An Experimental and Individual Difference Investigation. *Journal of Personality and Social Psychology,* 52(5), 890-898.

Kroß, A. & Lind, G. (2001). Einfluss des Vorwissens auf Intensität und Qualität des Selbsterklärens beim Lernen mit biologischen Beispielaufgaben. *Unterrichtswissenschaft,* 29(1), 5-25.

Kultusministerkonferenz (KMK) der Länder der Bundesrepublik Deutschland (2005). *Bildungsstandards im Fach Biologie für den Mittleren Schulabschluss.* Beschluss vom 16.12.2004. München, Neuwied: Wolters Kluwer Deutschland GmbH.

Lienert, G. A. & Raatz, U. (1998). *Testaufbau und Testanalyse.* Weinheim: Beltz Psychologie Verlags Union.

McGraw, K. O. & McCullers, J. C. (1979). Evidence of a detrimental effect of extrinsic incentives on breaking a mental set. *Journal of Experimental Social Psychology,* 15, 285-294.

Metzger, C. & Nüesch, C. (2004). Fair prüfen. Ein Qualitätsleitfaden für Prüfende an Hochschulen. In D. Euler, & C. Metzger (Eds.), *Hochschuldidaktische Schriften.* Bd. 6. St. Gallen: Universität St. Gallen.

Miserando, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88*, 203-214.

Mouratidis, A., Lens, W. & Vansteenkiste (2010). How You Provide Corrective Feedback Makes a Difference: The Motivating Role of Communicating in an Autonomy-Supporting Way. *Journal of Sport & Exercise Psychology,* 32, 619-637.

Müller, F. H. & Palekčić, M. (2005). Bedingungen und Auswirkungen selbstbestimmt motivierten Lernens bei kroatischen Hochschulstudenten. *Empirische Pädagogik*, 19 (2), 134-165.

OECD (2013). *PISA 2012. Ergebnisse im Fokus. Was 15-Jährige wissen und wie sie dieses Wissen einsetzen können.* Available at: http://bildungsklick.de/datei-archiv/md/279/pisa-2012-highlights-deutsch.pdf [downloaded at: 25.04.2014].

Reeve, J. (1998). Autonomy Support as an Interpersonal Motivating Style: Is It Teachable? *Contemporary Educational Psychology, 23*, 312-330.

Reeve, J. (2002). Self-determination theory applied to educational setting. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 183–203). Rochester, NY: University of Rochester Press.

Reeve, J., Bolt, E. & Cai, Y. (1999). Autonomy-Supportive Teachers: How They Teach and Motivate Students. *Journal of Educational Psychology,* 91(3), 537-548.

Reeve, J. & Jang, H. (2006). What teachers say and do to support students' autonomy during learning activities. *Journal of Educational Psychology,* 98, 209-218.

Reinmann, G. & Mandl, H. (2006). Unterrichten und Lernumgebungen gestalten. In A. Krapp & B. Weidenmann (Eds.), *Pädagogische Psychologie* (pp. 613-658). Weinheim: Beltz.

Renkl, A., Mandl, H. & Gruber, H. (1996). Inert Knowledge: Analyses and remedies. *Educational Psychologist,* 31(2), 115–121.

Ryan, R. M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory. *Journal of Personality and Social Psychology, 43*, 450–461.

Ryan, R. M. & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology,* 25, 54-67.

Scholl, D. (2009). *Sind die traditionellen Lehrpläne überflüssig? Zur lehrplantheoretischen Problematik von Bildungsstandards und Kernlehrplänen.* Wiesbaden: Verlag für Sozialwissenschaften.

Vansteenkiste, M., Lens, W. & Deci, E. L. (2006). Intrinsic versus extrinsic goal-contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist,* 41, 19-31.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M. & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic role of intrinsic goals and autonommy-support. *Journal of Personality and Social Psychology,* 87, 246-260.

Weinert, F. E. (1996). *Psychologie des Lernens und der Instruktion (Enzyklopädie der Psychologie, Band 2)*. Göttingen: Hogrefe.

Yarahmadi, Y. (2011). Student's school performance on the basis of explanation of internal motivational factors with structured functional model. *Contemporary Educational Researches Journal,* 1, 1-10.