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Learning at workstations

Students' satisfaction, attitudes towards cooperative learning and intrinsic motivation

Abstract

194 5th graders participated in an age-appropriate anti-smoking study of a special student-centered learning form called 'learning at workstations – health hazards of smoking'. The educational intervention was implemented in school classroom. The methodical focus was cooperative learning with comparing both factual knowledge and behavioral skills relevant to smoking education. Empirical scores revealed a clear preference for behavioral-based workstations. Students' satisfaction with the knowledge-related workstations was shown to correspond to their attitudes towards cooperative learning and to their interest and perceived choice, whereas the behavioral-based ones did not show any such correspondence.

Keywords

Learning at workstations; Cooperative instruction; Intrinsic motivation; Anti-smoking prevention

Lernen an Stationen

Schülerzufriedenheit, Einstellung zu kooperativem Lernen und intrinsische Motivation

Zusammenfassung

Im Rahmen der Gesundheitserziehung nahmen 194 Fünftklässler an einer Untersuchung zum Thema „Rauchen gefährdet deine Gesundheit“ teil. Der methodische Schwerpunkt der Intervention ist die Einstellung der Schüler zu kooperativem Lernen basierend auf der konzipierten, offenen Unterrichtsform Lernen an Stationen und insbesondere die Unterscheidung von Stationen mit dem

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Schwerpunkt Faktenwissen verglichen zu Verhaltensstationen. Die Schüler waren allgemein sehr positiv gegenüber Gruppenarbeit eingestellt. Sie bewerteten die Stationen zum Verhalten besser als jene zum Faktenwissen. Allerdings korrelierte die Einstellung zu kooperativem Lernen mit intrinsischer Motivation nur bezüglich der Faktenwissenstationen. Hierbei zeigte sich, je höher das individuelle Interesse und die Kompetenz und je geringer der empfundene Druck der Schüler, desto positiver bewerteten die Schüler kooperatives Lernen an Stationen.

Schlagworte

Lernen an Stationen; Kooperative Unterrichtsform; Intrinsische Motivation; Rauchprävention

1. Introduction

Since the 1960s research results have shown that cooperative learning improves students' academic achievement as well as social interaction and behavioral skills when carried out responsibly (Johnson & Johnson, 1975; Sharan, 2010; Slavin, 1995). Cooperative learning emphasizes a positive social environment in the classroom and it directs students towards improving different competences (Hanrahan, 1998; Nichols & Miller, 1994; Wilson et al., 2006). The advantages thereof have been investigated in previous studies (Lazarowitz, 1994; Lord, 1998, 2001), giving further indications of its effectiveness using a variety of contents, in some studies by comparing cooperative learning with traditional classroom teaching (Song & Grabowski, 2006; Sturm & Bogner, 2008; Widaman & Kagan, 1987). Cooperative learning approaches preferentially feature communication skills, decision making and high interactivity (Eilks, 2002; Tobler, 2000).

The aim of the present study was to investigate students' satisfaction for a specific cooperative learning method (learning at workstations) with a different setting of priorities (factual knowledge and behavioral skills). A further aim was to investigate whether their attitudes towards cooperative learning relate to some aspects of intrinsic motivation.

1.1 Intrinsic motivation

Intrinsic motivation is defined as the degree to which an individual chooses to participate in an activity for the pleasure derived from it rather than for any external reward (Gagné & Deci, 2005). Particularly in a cooperative learning setting, intrinsic motivation will very likely be affected and will thus play a crucial role (Hanrahan, 1998; Hänze & Berger, 2007; Nichols & Miller, 1994). Deci and Ryan (1985) proposed an enhancement of individuals' competence, interest and perceived choice, especially when cooperative situations were provided (Black & Deci,

2000; Ryan & Deci, 2000). What concerns us primarily in this study is whether four intrinsic motivation subscales of the 'Intrinsic Motivation Inventory' (IMI): Interest/Enjoyment, Perceived Competence, Pressure/Tension and Perceived Choice (Deci & Ryan, 1985) relate to students' attitudes towards cooperative learning in an anti-smoking intervention.

1.2 Anti-smoking education

It is clearly shown that an early application of relevant educational anti-smoking programs achieves most promising results, in particular with pre-adolescents (Furr-Holden, Ialongo, Anthony, Petras, & Kellam, 2004; Pederson, Stennett, & Lefcoe, 1981). On average, according to the German Federal Centre for Health Education (2007), pre-adolescents smoke their first cigarette at about the age of eleven to twelve (11.6). Real effective anti-smoking education programs must go beyond the level of simple factual knowledge and simultaneously foster behavioral skills (Botvin, Griffin, Paul, & Macaulay, 2003; Lynagh, Schofield, & Sanson-Fisher, 1997). There is still a necessity for methods which can help to prevent pre-adolescents from starting to smoke, to learn the main hazards caused by tobacco use, to foster health consciousness and to strengthen related competences all in one.

1.3 Learning at workstations

This study will fill this gap by examining satisfaction with an open learning environment called *learning at workstations* where students were able to work autonomously in small groups. Cooperative learning has generally been defined as "small group of learners working together as a team to solve a problem, complete a task, or accomplish a common goal" (Artz & Newman, 1990). In our study, the well-prepared workstations deal on the one hand with factual knowledge realized in knowledge-related workstations and on the other hand were based on a training of assertiveness and refusal skills as well as critical thinking realized in behavioral-based workstations (see the Methods section of this article and Table 1 for details).

1.4 Research questions

School-based programs for smoking prevention have shown that teaching factual knowledge and fostering behavioral skills are the best way to prevent smoking (Botvin et al., 2003; Lynagh et al., 1997). This present study stands in this tradition but with the additional focus of examining students' satisfaction and intrinsic motivation concerning both contents in a cooperative intervention. There is still a lack of short-term educational approaches in the anti-smoking education sector.

The research questions of our study are:

1. Are 5th graders equally satisfied with knowledge-related and behavioral-based workstations in a cooperative learning environment?
2. How is it related to intrinsic motivation, especially Interest/Enjoyment, Perceived Competence, Pressure/Tension and Perceived Choice?
3. It also takes into account a combination of variables (gender, age and group size) each of which may contribute to the effects.

We expected more satisfaction for the behavioral-based workstations than for the knowledge-related ones. Based on the existing literature for the relatedness of cooperative learning with intrinsic motivation we expected significant results for both workstation contents. Probably, the higher the students' interest, the freedom of choice or the competence they felt and the lower the pressure, the more positive might be their attitudes towards cooperative learning. Finally, we expected effects in the combination of the chosen variables because individual factors such as gender and age are important in such school-based interventions and need special attention (Harskamp, Ding, & Suhre, 2008; Waas, 1991).

2. Method

2.1 Participants

The participants of our present study were 194 5th graders from various Bavarian secondary schools ("Gymnasium"). The participation was voluntary and students were informed about the confidentiality of their data. The average age of the sample was 10.41 years ($SD = 0.51$) with 48.5 % girls and 51.5 % boys, representing no significant difference in gender number ($\chi^2 = 0.186$; $p = .667$).

2.2 Student-centered motivational intervention

All the classes received an identical age-appropriate educational intervention in their school classroom called 'learning at workstations – health hazards of smoking'. This anti-smoking intervention was implemented as a block course during school time and lasted for 130 minutes. The classroom teachers were previously instructed to avoid any teaching related to the unit's topic before completion of the intervention. The students were not aware either of the examination details or the study design. The program was pilot-tested before implementation in order to optimize the number of workstations and the age-appropriateness of the content.

The preventative content of the student-centered approach was divided into sub-sections at different workstations with well-structured materials and guidance provided for the students. Ten individual workstations dealt, on the one hand, with teaching factual knowledge related to smoking issues. On the other hand, the be-

Table 1: Program features of the ten main (A-G factual knowledge, H-J behavioural skills) and three optional (K-M) workstations

	Description	Delivery methods					Outcome				
		Question and answer	Discussion	Information	Pictures	further	Kn	Ref	Ass	Crit	
knowledge	A	'Path of cigarette smoke'	.	.	+	+	cloze	+	.	.	.
	B	'Daily drug – allowed thus harmless?'	+	+	+	.	puzzle	+	.	.	+
	C	'What's inside the fag?'	.	+	+	+	cloze	+	.	.	+
	D	Nicotine: 'Icy hand'	+	+	+	+	cloze	+	.	.	.
	E	Carbon monoxide: 'The Labyrinth'	+	+	+	+	tables	+	.	.	.
	F	Tar: 'Where does all the smoke remain?'	+	+	+	+	cloze	+	.	.	.
	G	'Health hazard of smoking.'	.	+	+	+	tinker	+	.	.	+
skills	H	Learn to say 'NO!'	+	+	.	+	role play	.	+	+	+
	I	Create your own 'No-Smoking-Button'.	.	+	.	+	tinker	.	+	+	+
	J	'I carry my life in my hand!'	+	+	.	.	radio play	.	+	+	+
optional	K	<i>How much money is 'consumed'?</i>	+	+	.	+	.	+	.	.	+
	L	<i>'How does smoking advertising operate?'</i>	+	+	.	+	.	+	.	.	+
	M	<i>'Just why smoking?'</i>	+	+	.	+	+

Note. Kn: knowledge, Ref: refusal skills, Ass: assertiveness skills, Crit: critical thinking; + yes/used, . no/not used.

behavioral skills training dealt with refusal as well as assertiveness skills and critical thinking. Table 1 provides a detailed overview with information about the several workstations, delivery methods and possible feasible outcomes.

The workstations were created in a way that the students must cooperate in order to achieve their learning objectives, e.g., it is required an internal group discussion before the findings, results and reflections could be recorded by the students. Additional material was available when specific support was required to help with the understanding of several questions and exercises. The workstation requiring a role play took place at a distance from the other working groups to avoid possible disturbances. Some workstations were provided twice to serve as buffer workstations. In addition, three workstations (excluded from the analysis) were optional for quickly working groups that they did not disturb the others.

The teachers' role was reduced to that of a facilitating supervisor helping, for instance, with the handling and operation of some workstations or to focus on special problems or individual students' needs.

First of all, students were shortly introduced to the workstations and to an associated colored workbook that was provided containing instructions for the individual workstations. As has been previously shown, the introduction in this specific tool is essential in this context (Sturm & Bogner, 2008). The students could then work in their groups autonomously through the tasks and instructions step by step and had to answer different questions. In the workbooks, they also subsequently ticked off every completely finished workstation on a checklist. For self-control, a workbook with the correct answers was offered at the teacher's desk.

The participants self-assembled their groups as well as selecting the workstations' sequence. All groups opted for single-gender groups; 170 students worked in pairs and 24 students in groups of three. To keep track of the group composition, every group was assigned to an identification number.

2.3 Empirical measures

While working the participants gave satisfaction ratings for each of the workstations in their workbook ranging from 1 = very much enjoyed to 5 = not enjoyed.

To measure individual attitudes towards cooperative working in groups, we used the German version of the standardized questionnaire 'Cooperative Learning' (COOPLRN; e.g., "I learn most if I work together with other students"; PISA 2003, see Ramm et al., 2006). It yielded a Cronbach's alpha of .75.

Students' intrinsic motivation was measured by applying four subscales of the 'Intrinsic Motivation Inventory' (IMI; Deci & Ryan, 1985): *Interest/Enjoyment* (7 items; Cronbach's alpha = .83; e.g., "This activity was fun to do"), *Perceived Competence* (6 items; Cronbach's alpha = .70; e.g., "I am satisfied with my performance in this task"), *Pressure/Tension* (5 items; Cronbach's alpha = .59; e.g., "I was anxious while working on this task") and *Perceived Choice* (7 items; Cronbach's alpha = .77; e.g., "I believe I had some choice about doing the workstations").

Both questionnaires were 5-point Likert response scales, ranging from 1 = not at all true to 5 = very true. The students filled it in immediately after the intervention.

All tests were anonymous and students were assured about its confidentiality. Test duration was approximately fifteen minutes. A comparison of two learning settings and an analysis of students based upon their changing attitudes towards their health were analyzed in separate studies (e.g., Geier & Bogner, 2010).

2.4 Statistical analysis

Statistical analysis was carried out with SPSS 16.0. A *p*-value of less than .05 was used as the significance threshold. ANCOVA was used for the analysis of students' satisfaction ratings and their attitudes towards cooperative learning (as response

variables) related to the intrinsic motivation (subscales as covariates). Gender and group size (two or three students in a group) were integrated as fixed factors and students' age as a covariate. Parameter estimation is included for completion. We ensured that the residuals of all the parametric tests approximated a normal distribution (by visually checking normal probability plots and by the Shapiro-Wilk test), and that variances were homogenous (by the Levene test). For a better visualization, scatter plots were generated with Sigma Plot 8.0.

3. Results

3.1 Students' satisfaction with the workstations

83 % of the participants completed all ten main workstations (see Table 1 for content details), 14.4 % all except one, 1.5 % all except two and 1.0 % all except more than two workstations.

Students' satisfaction grades for the 10 main workstations showed a mean of 1.92 (*SD* = 0.60; *n* = 192). Table 2 provides the mean scores and standard deviations of the total sample and broken down by gender. Knowledge-related workstations were accorded a mean score of 2.03 (*SD* = 0.67; *n* = 192), the behavioral-based workstations rated with a mean of 1.61 (*SD* = 0.83; *n* = 186; t-test: *p* ≤ .001). The worst grade was received by the knowledge-related workstation dealing with nicotine (D). Except for this and for the one dealing with carbon monoxide (E), girls consistently gave better grades than boys. Role play (H) was evaluated equally by boys and girls.

Table 2: School grades for and acceptance of the individual workstations (1 = very much enjoyed to 5= not enjoyed; means and standard deviations)

	Total sample (N = 194)			Girls (n = 94)			Boys (n = 100)			
	N (%)	M	SD	n (%)	M	SD	n (%)	M	SD	
knowledge	A	182 (93.8)	1.93	0.91	89 (94.7)	1.84	0.86	93 (93.0)	2.02	0.96
	B	179 (92.3)	1.90	1.16	84 (89.4)	1.74	1.16	95 (95.0)	2.04	1.14
	C	182 (93.8)	1.90	1.12	91 (96.8)	1.71	0.81	91 (91.0)	2.08	1.34
	D	184 (94.9)	2.42	1.15	88 (93.6)	2.44	1.23	96 (96.0)	2.40	1.08
	E	172 (88.7)	1.61	0.88	85 (90.4)	1.66	0.87	87 (87.0)	1.56	0.89
	F	185 (95.4)	2.30	1.15	88 (93.6)	2.20	1.11	97 (97.0)	2.39	1.20
	G	183 (93.9)	2.15	1.25	90 (95.7)	1.80	0.93	93 (93.0)	2.49	1.43
skills	H	149 (76.8)	1.65	0.99	69 (73.4)	1.65	0.95	80 (80.0)	1.65	1.02
	I	126 (65.0)	1.07	0.31	60 (63.8)	1.10	0.35	66 (66.0)	1.05	0.27
	J	168 (86.6)	1.89	1.22	76 (80.9)	1.63	0.91	92 (92.0)	2.10	1.40

ANCOVA revealed that Interest/Enjoyment ($F = 11.828$; $p = .001$; $B = -0.329$) and Perceived Competence ($F = 6.647$; $p = .011$; $B = -0.241$) had a significant effect on the mean satisfaction score of factual knowledge. No significant effect was found for Pressure/Tension ($F = 0.115$; $p = .694$) and Perceived Choice ($F = 0.993$; $p = .320$). Concerning the behavioral-based workstations, Perceived Competence ($F = 0.072$; $p = .789$), Pressure/Tension ($F = 0.081$; $p = .777$) and Perceived Choice ($F = 1.533$; $p = .217$) showed no relation to the mean satisfaction score, but there is a tendency of Interest/Enjoyment ($F = 3.335$; $p = .070$; $B = -0.227$). Gender, age and group size including all interactions in-between had no effect ($p > .10$).

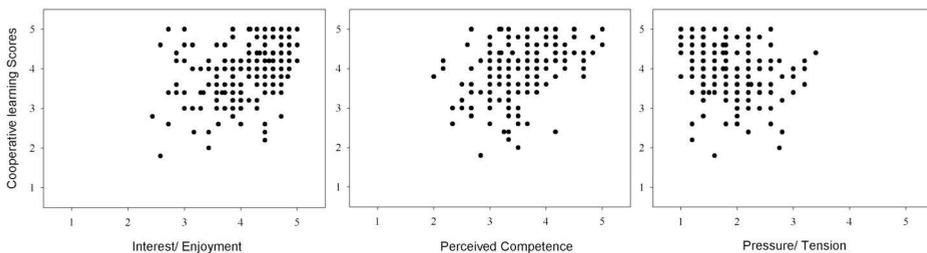
3.2 Cooperative learning and intrinsic motivation

In general, the IMI subscales Interest/Enjoyment ($M = 4.022$; $SD = 0.703$), Perceived Competence ($M = 3.463$; $SD = 0.591$) and Perceived Choice ($M = 3.858$; $SD = 0.769$) scored above the median, whereas the Pressure/Tension subscale scored below ($M = 1.920$; $SD = 0.615$). No gender differences occurred ($T = -0.168$; $df = 1$; $p = 0.867$).

Interest/Enjoyment (variables and interactions; $F = 7.843$; $p = .006$; $B = 0.258$), Perceived Competence ($F = 6.829$; $p = .010$; $B = 0.245$) and Pressure/Tension ($F = 4.256$; $p = .041$; $B = -0.183$) showed positive (respectively negative) relations to the cooperative learning attitudes (see Figure 1), whereas Perceived Choice did not ($F = 1.195$; $p = .276$). More precisely, the higher the students' Interest/Enjoyment and Perceived Competence scores, the higher were those of their cooperative learning attitudes. The lower the students' Pressure/Tension scores, the higher were their attitudes towards cooperative learning.

No gender, age or group size effects were found and also no interaction between them ($p > .10$).

Figure 1: Students' attitudes towards cooperative learning in an anti-smoking intervention correlated with three IMI subscales: Interest/Enjoyment, Perceived Competence and Pressure/Tension (1 = not at all true to 5 = very true; $N = 194$).



4. Discussion

The present study monitored a specific method of group instruction (learning at workstations) by focusing on students' satisfaction and attitudes towards cooperative learning and students' intrinsic motivation in an anti-smoking intervention. The positive feedback and acceptance assumed that the intervention was well received. This satisfaction grading is quite in line with previous studies showing that cooperative learning approaches in a classroom increase satisfaction (Lord, 1997; Widaman & Kagan, 1987).

The main findings of the present paper are that students were more satisfied with behavioral-based content compared to knowledge-based. However, only satisfaction with knowledge-based workstations relates to positive attitudes towards cooperative learning, whereas the behavioral-based workstations do not. In the following the results will be discussed more precisely.

The suitability of available time (130 minutes) was reflected in the high proportion of students who completed the program. Often students did not assume short breaks offered. This supports that they were very busy in their work. The students did not disturb each other due to the buffer workstations and the continuously rotating system functioned throughout.

Students' satisfaction with both workstation types was high, though, as expected, the participants were even more satisfied with the workstations focusing on behavioral skills.

Regarding gender girls gave better grades in almost all cases. This is in line with other studies within this context which showed gender-dependent preferences regarding content and tasks (e.g. Wilson et al., 2006). However, girls rated the workstation dealing with carbon monoxide (E) lower, presumably because of its competitive character, generally a preferred environment for boys (Conti, Collens, & Picariello, 2001; Harskamp et al., 2008). Some girls did not like to be involved with the shocking lung cancer pictures at all (tar workstation F). The confronting role play was rated equally really good when participating.

To enhance intrinsic motivation, a positive learning environment, accompanied by autonomy and a less controlled atmosphere might be helpful (Koka & Hein, 2003; Lord, 2001; Nichols, 2006). Consequently, the higher the students' interest and the competence they felt during the learning at workstations, the better they were satisfied with the knowledge-based workstations. Surprisingly, the satisfaction with the behavioral-based workstations did not relate to intrinsic motivation. In contrast, Wilson et al. (2006) suggest that behavioral skills must be interactive for the participants to increase their intrinsic motivation. Thus, motivation is hardly a unitary phenomenon because people have different kinds of motivation; it concerns in general the 'why do an activity' (Ryan & Deci, 2000). So, pleasure with an activity might not be rooted in the interactivity exclusively. It is possible that the students were more extrinsically motivated concerning the behavioral-based workstations; however, this was not measured in this context.

Intrinsic motivation was positively valued as evidenced by previous interventions with learning at workstations (e.g., Sturm & Bogner, 2008). In general, the participants felt competent, free and less pressured. The more they were interested, the more competent and the less pressured they felt the more positive were their attitudes towards cooperative learning. This provides further evidence that a cooperative learning setting relates to students' intrinsic motivation (Hanrahan, 1998; Hänze & Berger, 2007; Nichols & Miller, 1994). Only their perceived choice did not affect their attitudes towards cooperative learning.

The lack of any group size effect demonstrates that it is irrelevant whether students work in groups of two or three. It would be interesting to group the students randomly or in a controlled way (Song & Grabowski, 2006). The potential effects of friendships or a sense of being left out could be excluded and interaction with new class mates will be fostered (Wilson et al., 2006). However, to group students in a controlled way is not conducive for their free choice and could influence their intrinsic motivation negatively. Another limitation of the study should be mentioned: We could not obtain any measures of the long-term effectiveness of cooperative learning (longer than six weeks; Lynagh et al., 1997).

In the future, it will be of interest to ask whether behavioral skills training in a cooperative learning form may be related to intrinsic motivation at all, and what other variables might have an influence here. One question concerns the motivation to value and to self-regulate such activities, without external pressure (Ryan & Deci, 2000).

All in all, this study provides insights in students' satisfaction with a cooperative learning approach via a thorough examination of content and its relationships to intrinsic motivation. It supplies an example for formative evaluation and may help to refine short-term interventions by classroom teachers in order to implement anti-smoking lessons effectively despite the tight time frames at school. Smoking prevention through learning at workstations may be taught in science classes as well as in interdisciplinary lessons. This approach is an adjustable kind of lesson design due to its flexibility concerning class sizes and available space. Nevertheless, the learning environment (such as density and social distance) has strong influences (Tanner, 2000) and little is known about the impacts of the classroom atmosphere on the cooperative learning situation (Anderson, Hamilton, & Hattie, 2004). The teachers themselves accord even more importance to what affected students' motivational beliefs in the classroom. Further research is needed to investigate which other variables may influence students' satisfaction, especially with regard to behavioral skills training.

First and foremost, in the case of smoking prevention, the main goal should always be to awaken health consciousness and to promote healthy behavior, optimally in the younger age groups. Undeniably, such cooperative learning forms could offer an appropriate basis for this in the future.

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