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The influence of personalized learning on the development of learning enjoyment

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ABSTRACT

Given the relevance of learning enjoyment, its decrease in secondary school is concerning. Following the stage-environment fit theory, we investigated whether personalized learning in general and its two key features, choice and voice in particular, influence learning enjoyment and its development. We analyzed longitudinal data from 1241 students surveyed in grade 8 (average age: 14.9 years) and one year later in grade 9. Latent change models indicate a decline in learning enjoyment that depends on the initial value. Both the extent of personalization in schools and the students' perception of choice and voice are positively related to learning enjoyment. In addition, a change in students' perception of having a say (voice) affects the development of learning enjoyment. This article emphasizes the importance of voice for the development of learning enjoyment in the context of personalized learning. Because of the very limited student perception of opportunities for voice, there is considerable potential to foster learning enjoyment.

1. Introduction

Various studies have shown that enjoyment of learning decreases during lower secondary school (Buff, 2001; Fend, 1997; Hagenauer, 2011; Vierhaus et al., 2016). This decline is worrying because the enjoyment of learning is a relevant determinant of learning and achievement (Rubach & Lazarides, 2021). In addition to focusing on subject-specific competencies, the curriculum in Switzerland encompasses cross-curricular competencies, including willingness, attitudes, and dispositions (Bildungsdirektion Kanton Zürich, 2017). Hence, enjoyment of learning as a positive emotion toward school learning is also an educational outcome for its own sake. Moreover, a student's positive emotional relationship with the school is a central basis for lifelong learning (Hagenauer & Hascher, 2011), an essential goal of public schooling (EDK, 2011). Due to its importance, knowledge about the factors that influence the enjoyment of learning and its development is crucial. Despite the considerable increase in interest in emotion research in recent years, little is known about how the learning environment influences the development of learning enjoyment (Hascher & Edlinger, 2009; Pekrun & Linnenbrink-Garcia, 2014).

According to the stage-environment fit theory (Eccles et al., 1993), the decline in learning enjoyment can be partially explained by the mismatch between the learning environment and the needs of adolescents. Hence, the internationally widespread concept of personalized learning seems to be very promising for influencing the development of learning enjoyment because it aims to tailor education to the individual needs, interests, and prerequisites of learners, enabling them to learn as autonomously as possible through choice and voice (Stebler et al., 2018; Bray & McClaskey, 2015; DfES, 2004a; Miliband, 2006). The potential of personalized learning is also evident in the context of control-value theory (Pekrun, 2006). Through choice and voice, students can have a say in the content and the demand of learning activities, creating a potentially positive impact on perceived control and subjective value and thus on the enjoyment of learning.

However, the broad discourse on personalized learning contrasts with the thin empirical base of the effectiveness of the concept, especially as measured by emotional outcomes (Stebler et al., 2018; Bernacki et al., 2021). This is also reflected in a systematic review of personalized learning, in which 41 of the 86 educational studies analyzed examined achievement as an outcome, whereas only one study examined emotion as a dependent variable; enjoyment of learning was not considered in any of the educational studies analyzed (Bernacki et al., 2021). Thus, despite its educational relevance, empirical studies that explore the theoretically hypothesized effect on the development of

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learning enjoyment are lacking. This article addresses this research gap by investigating how learning enjoyment develops in schools that are oriented to varying degrees toward personalized learning. To clarify the global effect of personalized learning, the study examines how the degree of personalization, as measured by teachers and school principals, influences the mean development of enjoyment of learning. Because personalized learning is multidimensional, the influence of the relevant features (choice and voice) on the individual's development of enjoyment is also examined. We investigated the development of learning enjoyment using latent change modeling. Students' perceived choice, voice, and learning enjoyment were assessed with an online student questionnaire.

For conceptual clarification and contextualization, enjoyment of learning is defined in Chapter 2 as an emotion (2.1), and its development during adolescence is described (2.2). By relying predominantly on the stage-environment fit theory (Eccles et al., 1993), characteristics of a traditional learning environment that are unfavorable to the development of learning enjoyment are presented (2.3). Then, personalized learning is clarified, and its potential for sustaining learning enjoyment is outlined from a theoretical and empirical perspective (2.4).

2. Literature review and theoretical framework

2.1. Learning enjoyment: conceptualization

In the current literature, enjoyment of learning is conceptualized as an emotion (Buff et al., 2017; Frenzel et al., 2020; Goetz et al., 2020; Hagenauer & Hascher, 2018; Lazarides & Buchholz, 2019; Lei et al., 2018; Pekrun, 2017b; Rubach & Lazarides, 2021). Although there is still a lack of a common understanding of emotion (Hess, 2017), a multi-component approach has become widely accepted (Shuman & Scherer, 2014). Accordingly, enjoyment of learning is understood as a multi-component construct that includes an affective, cognitive, physiological, motivational, and expressive component, whereby the affective component is attributed particular relevance (Frenzel & Stephens, 2017). The multi-component approach makes evident that emotion and motivation overlap and are therefore not independent (Pekrun, 2017a). In this article, however, the focus is clearly on the affective component of learning enjoyment. Enjoyment of learning is categorized as a positive (valence) and activating (activation) emotion and can refer to current situations (states) as well as to habitual (traits) experiences (Frenzel & Stephens, 2017). Following Pekrun's control-value theory (Pekrun, 2006), which specifically explains the emergence and impact of achievement emotions, the two appraisals, "subjective control" and "subjective value", are particularly important for the development of learning enjoyment. Whereby "The term "subjective control" is used here to refer to the perceived causal influence of an agent over actions and outcomes (Skinner, 1996). The term "subjective value" denotes the perceived valences of actions and outcomes" (Pekrun, 2006, p. 317). Against this theoretical background, enjoyment of learning is understood as a multi-component construct, whereby this article focuses on habitual domain-general affective feelings toward learning at school. Therefore, in the following sections, the school context is explicitly included when discussing learning enjoyment.

2.2. Development of learning enjoyment in early adolescence

In primary school, the enjoyment of learning is estimated to be in the positive range and remains quite stable (Helmke, 1993; Vierhaus et al., 2016). For lower secondary school,[1] on the other hand, various studies from German-speaking countries show an apparent decline in the enjoyment of learning (Eder, 2007; Hagenauer, 2011; Hagenauer & Hascher, 2010; Stecher, 2000; Vierhaus et al., 2016). The study by Fend (1997) illustrates the decline in school enjoyment in Germany between grade 6 and grade 10. The decline is not always linear and is particularly pronounced between grades 6 and 7. Czerwenka et al. (1990), who used student essays from Germany as a data basis, recorded a decline in school enjoyment between grade 4 and grade 13. Grade 7 is also striking, but in contrast to Fend's study, it turns out to be much more positive than expected. The authors explain this finding with the positive connotation of transferring to a secondary school. It is known from other studies that transitions to secondary school can be perceived both as a critical life event and as a challenge with positive connotations, which explains the contrasting developments in the enjoyment of learning after a transition (Meyer & Gläser-Zikuda, 2020). Hagenauer (2011) found a continuous decrease over four measurement points in the enjoyment of learning from grade 6 to grade 7 for Austrian students. In addition, she was able to demonstrate a decrease in the affective factor of pleasure at school. For Switzerland, cross-sectional data show that the enjoyment of learning is rated lower in grade 9 than in grade 7. An exception concerning the development of school enjoyment is the study by Van Ophuysen (2008), in which affective attitudes toward school were investigated from the end of primary school (grade 4) to the beginning of grade 7 in German schools. While the author did not find any significant deterioration in school enjoyment with increasing age, she found an influence of the survey date: school enjoyment was assessed lower before and higher after the summer holidays due to a "recovery effect". Additionally, the change in school level positively affected school enjoyment, which is in line with Czerwenka et al. (1990). When comparing the studies, it must be taken into account that Van Ophuysen (2008, p. 297) examined only the enjoyment of school (e.g., "I think it is good that I can go to school", translated by authors), while Fend (1997, p. 150) surveyed the enjoyment of learning and school (e.g., "I quite like going to school"/"I belong to the group of students who like learning", translated by authors). Therefore, the studies are only comparable to a limited extent.

The decline in the enjoyment of learning is not influenced by gender or level of achievement. Although the absolute level of domain-general learning enjoyment is estimated to be higher for girls than for boys, the downward trend in learning enjoyment is equal across genders (Eder, 2007; Frenzel et al., 2010; Hagenauer, 2011). Regarding achievement, Hagenauer (2011) found that low achievers rated their domain-general enjoyment of learning lower than high achievers, but that achievement did not explain their development. However, achievement correlated only weakly with domain-general learning enjoyment.

2.3. Learning environment and enjoyment of learning

The decline in the enjoyment of learning in lower secondary school occurs during a period of pubertal development in which adaptation to peers, differentiating learning interests, extracurricular areas, and social independence become more important (Fend, 1997, 2005). This development must be considered in the school context. The stage-environment fit theory (Eccles et al., 1993) explicitly addresses this negative development and assumes "that some of the negative psychological changes associated with adolescent development result from a mismatch between the needs of developing adolescents and the opportunities afforded them by their social environments" (Eccles et al., 1993, p. 90). Accordingly, the development of enjoyment in learning can be supported by a learning environment adapted to the developmental level of adolescents. Compared to primary schools, Eccles et al. (1993, pp. 93–94) consider six characteristics of junior high schools to be problematic. First, junior high schools give students *less choice*, which leads to difficulties in fitting against the background of young people's increased need for autonomy. Second, the *poorer teacher-student relationship* is problematic, as young people rely on strong relationships

[1] In Switzerland, students attend the primary level for six years before entering the lower secondary school at 12-13 years old. In Austria and Germany (except Berlin and Brandenburg), primary school lasts only four years, which is why students enter lower secondary school two years earlier.

outside the parental home. Third, *teaching methods* such as "whole-class task organization" or "public evaluation of the correctness of work" take place more frequently, which fosters "*competitiveness*" and "*public forms of evaluation*". Fourth, junior high school *teachers feel less effective* than elementary school teachers, especially with weak students. Fifth, the use of *too few cognitively demanding tasks* in the first year of junior high school is criticized. As the last point, the authors mention the *stricter assessment*, which negatively affects self-efficacy. These characteristics of junior high schools show that the perception of subjective control and valence is made more difficult from a structural point of view.

Acknowledging that the study by Eccles et al. (1993) was conducted in a different geographical and temporal context, *newer empirical studies* in German-speaking countries also revealed unfavorable practices in lower secondary schools compared with primary schools. Thus, a more problematic assessment practice was shown in lower secondary schools, with a stronger orientation toward the social reference norm and stricter assessment practice, which goes along with lower students' competence beliefs (Eder, 2007; Hagenauer, 2011). A study on Austrian students further indicated that learners in grade 7 experience less autonomy and competence than those in grade 6 (Hagenauer, 2011). In addition to the cognitive quality of tasks, autonomy support, as well as goal structures and expectations already considered by Eccles, the motivational quality as well as the feedback and consequences of achievement are also described as emotion-promoting features of the learning environment within the framework of the control-value theory (Pekrun & Perry, 2014).

Although the influence of classroom characteristics on the enjoyment of learning has been confirmed in several studies (e.g., Goetz et al., 2006, 2013; Hagenauer & Hascher, 2010), the influence on change remains largely unexplained. Subject-specific studies of related constructs show inconsistent results: While Lazarides et al. (2022) found an influence of student-oriented teaching on motivation change, Frenzel et al. (2010) did not discover an influence of classroom characteristics on the development of interest.

2.4. The potential of personalized learning

To better meet students' individual needs, various schools worldwide are moving toward personalized learning. Accordingly, personalized learning is understood by the Department for Education and Skills (DfES) as "the drive to tailor education to individual need, interest and aptitude so as to fulfill every young person's potential" (DfES, 2004a, p. 4). This claim is fueled by global challenges faced by educators, such as managing increasingly heterogeneous classes, teaching basic competencies to all students in inclusive and equal-opportunity classrooms, and identifying new ways of integrating digital media (Stebler et al., 2018; Zhang et al., 2020). Against this backdrop, personalized learning has received international attention in educational policy (DfES, 2004b; U.S. Department of Education, 2016), practice (Bray, 2017; Bray & McClaskey, 2015; Müller, 2014) and research (Bernacki et al., 2021; Gross et al., 2018; Waldrip et al., 2016) for almost two decades. However, a closer look reveals that personalized learning is an inconsistently defined educational buzzword that subsumes various pedagogical ideas (Bernacki et al., 2021; Stebler et al., 2018). The discourse on personalized learning has also increasingly shifted in recent years toward the inclusion of ICT (Information and Communication Technology) to make learning more effective (Shemshack & Spector, 2020). Because this article was written in the context of the perLen-study, its understanding of personalized learning is the guiding definition used in this article. The following five dimensions of personalized learning (Stebler et al., 2021, p. 431, translated by authors), which are based on a social-constructivist understanding of learning and can be found in different configurations in classroom practice were leading principles in the perLen-study.

1. Adaptive teaching offers to learners' and learning groups' personal educational and learning prerequisites
2. Holistically support students in their personalities
3. Enable self-directed learning on one's own pathways
4. Make competency-based learning a personal matter
5. Be formative and supportive as a teacher and learning community

In learning environments guided by the five dimensions, digital media are used as tools for learning and learning path management (Schmid, 2022). In this article, however, technology-supported personalized learning is not a focus. Following the dimensions mentioned above, students should not only receive a tailor-made learning offer (dimension 1) but should also increasingly have control over their learning (dimension 3) and identify with their learning goals (dimension 4). Through the active participation and empowerment of students to take ownership of their learning, personalized learning goes beyond teacher-driven concepts of individualization and differentiation (Bray & McClaskey, 2015). Accordingly, students' active participation is a central conceptual feature of personalized learning and can be found in the literature as the keywords *choice and voice* (e.g., Bray & McClaskey, 2015; Mötteli et al., 2022; OECD, 2006; Schmid & Petko, 2019). Through choice and voice, students should be enabled to actively engage and participate in decision-making and take responsibility for their learning. Given their relevance, this article also examines the impact of the key features of choice and voice in addition to addressing the global impact of personalized learning. Choice and voice are not only key features but are also perceived as some of the biggest challenges for teachers in implementing personalized learning (Gross et al., 2018). However, analyses in the perLen-study have shown that the extent to which a school focuses on personalized learning is positively related to students' perceptions of choice and voice. Thus, choice and voice are also relevant features from an empirical perspective (Mötteli et al., 2022).

Against the background of the stage-environment fit theory (Eccles et al., 1993) and the control-value theory (Pekrun, 2006), personalized learning has the potential to positively affect the enjoyment of learning because students can tailor the learning environment to their personal needs and competencies through choice and voice. The authors are not aware of any *empirical findings* on the effect of choice and voice on the enjoyment of learning and its development in the context of personalized learning. However, some studies have investigated the effect of autonomy-supporting and participatory environments on enjoyment. Thus, the theoretically postulated connection between choice and voice as well as perceived self-determination resp. autonomy was also shown in empirical studies (Hartinger, 2005; Rakoczy, 2006). The extent of perceived self-determination is in turn related to learning enjoyment (Hagenauer & Hascher, 2011; Meyer & Gläser-Zikuda, 2020). In an older study by Fraser and Fisher (1982), the connection between the perception of independence at the class level and enjoyment of science lessons (class mean) was examined. An independence scale was used to measure the extent to which "students are allowed to make decisions and have control over their own learning and behavior" (Fraser & Fisher, 1982, p. 503), which corresponds to the idea of choice. A participation scale was also used; however, the scale was not operationalized in the sense of *voice* but rather in the sense of active versus passive teaching (sample item: "The teacher lectures without students asking or answering questions" (Fraser & Fisher, 1982, p. 503). A small, significant correlation (0.32) with the enjoyment of science was observed using the participation scale but not with the independence scale. In a study by Hagenauer (2011), an autonomy-supporting learning environment - which includes choice and voice - correlated in a cross-sectional design positively with the enjoyment of learning in both grades 6 ($r = 0.40$) and 7 ($r = 0.38$). However, no direct effect of the perceived autonomy-supporting learning environment in grade 6 on the enjoyment of learning in grade 7 was observed. Other studies that investigated the effects of autonomy-supporting environments on the related construct motivation obtained partially contradictory findings (Buff et al., 2011; Evans & Boucher, 2015; Furtak & Kunter, 2012; Katz &

Assor, 2007; Patall et al., 2010). The various results support that the positive effect of autonomy can only develop when the choice is "relevant and meaningful, competence-enhancing, and provided in just the right amount" (Evans & Boucher, 2015, p. 90). In short, if the degree of autonomy is adapted to the individual requirements of learners.

2.5. The present study

The decline in the enjoyment of learning in lower secondary school has been documented by numerous studies (Eder, 2007; Hagenauer, 2011; Hagenauer & Hascher, 2010; Stecher, 2000). Although gender influences the absolute level of learning enjoyment in school, no gender effect on the development of learning enjoyment has been observed (Eder, 2007; Frenzel et al., 2010; Hagenauer, 2011). Against the background of the stage-environment fit theory (Eccles et al., 1993), the decline is also assumed to be due to a learning environment that is not sufficiently oriented toward the needs of the students. The opportunities for participation in decision-making are also increasingly assessed negatively at the lower secondary level (Hagenauer, 2011). Personalized learning claims to meet students' individual needs through choice and voice and thus has the potential to positively impact learning enjoyment and its development. Given that the authors are not aware of any studies to date that examine the enjoyment of learning and its development in schools in the context of personalized learning, the following research questions were raised for this study:

1 How does students' perceived enjoyment of learning develop between grades 8 and 9 in schools that focus on personalized learning concepts, and is a gender effect observed?
2 Does the degree of personalization (teachers' perceptions of how much their school is oriented toward personalized learning) influence the average enjoyment of learning and development?
3 What explanatory value do students' perceived choice and voice and their development have on the individual enjoyment of learning and its development?

3. Methods

3.1. Sample

The data are extracted from the perLen-study (personalized learning in heterogeneous learning groups). The study, funded by the Mercator Foundation Switzerland (2013–2018), longitudinally investigated innovative schools in Switzerland that focus on personalized learning to varying degrees (for more information, see Stebler et al., 2018, 2021). The non-representative overall sample comprises 65 primary and secondary schools in which students of all abilities are taught. This study is based on a subsample that includes all secondary schools in which grade 8 students participated in the survey. Thus, the subsample comprises 35 schools (96 classes) with 1241 students. The number of participating students per school varied widely (min: 7, max: 121) because the sample encompasses both very small schools with few students per class and large schools with several parallel classes. In addition, some of the schools studied no longer held traditional classes but instead taught learning groups of different sizes. The sample includes students with different levels of achievement who were taught together or separately, depending on the school and subject. Students were longitudinally surveyed during class time in spring 2014 (when they were in grade 8) and again in 2015 (when they were in grade 9). In grade 8, 1046 students (47% female) with a mean age of 14.9 years ($SD = 0.6$) completed the questionnaire (participation rate: 84%). One year later, 953 grade 9 students (47% female) completed the questionnaire (participation rate: 77%). The missing data in grade 9 can be partially explained by the fact that some high-performing students changed to a more demanding school type (Gymnasium) after grade 8. This may explain why missing data were slightly systematically related to the enjoyment of learning, which was considered by using full information maximum likelihood (FIML) estimation.

3.2. Measures

The student questionnaire included items from existing scales, adapted items and newly developed items. As the survey was very broad, in some cases, only selected items from an existing scale were included. The validity of the scales was assessed by exploratory and confirmatory factor analyses (for detailed information on scale design, see Mötteli & Schmid, 2022). Enclosed are scale descriptions and reliability coefficients (McDonald's Omega, ω) for the scales. Gender was self-reported by the students. In the sample, all students identified themselves as girls or boys.

3.2.1. Enjoyment of learning

The scale enjoyment of learning captures the domain-general affective attitude toward learning at school through three items (e.g., I find learning at school exciting; 1 = not true at all to 4 = exactly right). The scale consists of one item each from Buff (2013), an item from Hagenauer (2011) and a newly developed item from the perLen research group. The scale's internal consistency is $\omega = 0.76$ (grade 8) and $\omega = 0.73$ (grade 9). As the central independent variable, enjoyment of learning is always modeled latently in the present evaluations, allowing the measurement error component to be controlled.

3.2.2. Choice

We used a scale by Helm (2016, p. 389) to assess how pronounced the student's perception of choice is. The scale includes five items, such as "At school I decide myself with whom I learn" (translated by authors). The items were answered on a four-point Likert scale (1 = never to 4 = frequently). The internal consistency is $\omega = 0.76$ (grade 8) and $\omega = 0.75$ (grade 9). To reduce model complexity, the independent variable choice is modeled as a manifest scale in the present evaluations.

3.2.3. Voice

With the voice scale, we assessed the extent to which students can participate in decision-making (have a say) regarding content and goals. The scale includes three adapted items from the scale "individual target agreement" (e.g., "In the classroom, each student sets personal learning goals together with the teachers") (Rakoczy et al., 2005) and three adapted items from the scale "participation" (e.g., "In class, we decide together with the teachers which topics will be covered") (Ramm et al., 2006), which loaded on the same factor. The items were answered on a four-point Likert scale (1 = never to 4 = frequently). The internal consistency is $\omega = 0.80$ (grade 8) and $\omega = 0.82$ (grade 9). The independent variable voice is modeled as a manifest scale in the present evaluations.

3.2.4. Degree of personalization

Personalized learning is defined and implemented differently in the schools studied. Therefore, the variable "degree of personalization" was created in the perLen research group to classify the schools. The basis of this value is the question "How strongly does your school focus on personalized learning?", which was asked two times at annual intervals in the online teacher questionnaire (2014/2015). The question was answered by teachers and school principals on a four-level scale (1 = not true at all to 4 = exactly right). The degree of personalization was calculated by averaging the two at school level aggregated values (Stebler et al., 2018). The average degree of personalization of the 35 secondary schools is 3.10 ($SD = 0.19$). The intraclass correlation coefficient of type 1 (ICC1), which represents the proportion of variance at the higher level (here the schools) is 30%. The ICC2, on the other side, is a measure of the reliability of the aggregated measures at the higher level. With ICC2 = 74%, the teachers' perception of their school's degree of personalization is considered satisfactorily reliable.

3.3. Statistical analyses

The development of learning enjoyment was examined using latent change score (LCS) models (McArdle, 2009). Because students were nested in learning groups (classes) and schools, clustered data are available. Therefore, the standard errors and $\chi 2$ values were adjusted for the clusters (research questions 1 and 3), or, if the school level was of interest (research question 2), a multilevel model was estimated. Missing data (MAR) were addressed by using the full information maximum likelihood estimator (FIML). The following criteria assessed the goodness of fit: $\chi 2$, comparative fit index (CFI), root mean square error of approximation (RMSEA) and standardized root mean residual (SRMR) (Byrne, 2011). The CFI should be at least 0.95, and RMSEA and SRMR should not exceed 0.06 and 0.08 (SRMR), respectively (Hu & Bentler, 1999). After describing the preliminary analyses, the methodological procedures to address the research questions are explained in more detail. All statistical analyses were conducted using the statistical software Mplus version 8.8 (Muthén & Muthén, 2017).

First, the variances of all manifest level 1 variables were decomposed into within- and between-cluster components (here, school or class). Based on these, intraclass correlation coefficients of type 1 were calculated. For simplicity, they will be referred to simply as "ICC" in the following. Table 1 reports the ICCs and other descriptive statistics. Subsequently, confirmatory factor analyses were conducted for the latent variable enjoyment of learning and examined for measurement invariance across time (grade 8/grade 9), gender (girls/boys) and levels of analysis (student level/school level). Measurement equivalence was tested by setting stepwise invariance restrictions (Kleinke et al., 2017) and subsequent model testing using the Satorra-Bentler scaled $\chi 2$-difference test (Satorra & Bentler, 2001). Strict factorial invariance can be assumed for the enjoyment of learning across time (grade 8/grade 9), metric invariance across gender and configural invariance across levels. The preconditions for the statistical analyses concerning measurement equivalence are thus given. The correlations among the latent construct enjoyment of learning (strict invariance) and the manifest indicators choice and voice are reported in Table 2.

To answer the *first research question*, an LCS model was conducted to represent the intraindividual change in the enjoyment of learning between grade 8 and grade 9. In the second step, gender was included in the model as a predictor. The hierarchical data structure was considered by using the "type is complex" option (cluster variable class), with standard errors and $\chi 2$-test corrected (Kleinke et al., 2017). To examine the influence of the school personalization degree on the mean enjoyment of learning and its development *(second research question),* a multilevel structural equation model (MSEM) was estimated with an LCS for the enjoyment of learning as a criterion and the degree of personalization as a predictor at the school level. Table 1 shows that the manifest indicators of the enjoyment of learning can be explained by 4 to 7% (grade 8) and 3 to 8% (grade 9) by the school, which can be regarded as a small effect (Hox & Maas, 2002). Thus, there is sufficient variation at the school level for evaluation by multilevel analysis (Kleinke et al., 2017). A structural equation model (SEM) was used to investigate the explanatory value of the key features of choice and voice and their development on students' learning enjoyment and development *(third research question)*. Since correlations between the perceived learning environment and the emotional experience are particularly evident at the individual level (Frenzel et al., 2007), a flat model was estimated, whereby standard errors and $\chi 2$-tests were corrected to consider the clustering (class). The LCS and the initial value of learning enjoyment in grade 8 served as criteria. The manifest features choice and voice and LCS of these features were included in the model as predictors.

Table 1
Descriptive statistics of the manifest variables.

	N	M	SD	ICC school	ICC class
Le1 8/9th	1046 / 948	2.63 / 2.50	0.72 / 0.69	0.04 / 0.08	0.04 / 0.06
Le2 8/9th	1046 / 948	2.88 / 2.73	0.81 / 0.86	0.05 / 0.03	0.06 / 0.03
Le3 8/9th	1046 / 948	2.19 / 2.06	0.84 / 0.81	0.07 / 0.07	0.06 / 0.07
Choice 8/9th	1046 / 952	3.22 / 3.20	0.62 / 0.59	0.16 / 0.16	0.15 / 0.15
Voice 8/9th	1046 / 952	2.66 / 2.50	0.66 / 0.66	0.16 / 0.19	0.19 / 0.27

Note. Le1-Le3 are variables of the latent factor enjoyment of learning. The numbers before the slash report descriptive statistics for grade 8, and the numbers after the slash report descriptive statistics for grade 9.

Table 2
Correlations among enjoyment of learning, choice and voice.

	1	2	3	4	5
Enjoyment 8th (1)	—				
Choice 8th (2)	.24***	—			
Voice 8th (3)	.30***	.31***	—		
Enjoyment 9th (4)	.67***	.18***	.17***	—	
Choice 9th (5)	.19***	.46***	.14**	.19***	—
Voice 9th (6)	.21***	.18***	.42***	.27***	.25***

Note. Enjoyment of learning is modeled as a latent construct with strict measurement invariance restrictions across time. Choice and voice are manifest indicators. All correlations were estimated at level 1 with standard errors adjusted for the clusters (class).
***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

4. Results

4.1. Descriptive statistics

Descriptive statistics and the ICCs of the manifest variables are reported in Table 1. Table 2 shows the correlations among the latent construct enjoyment of learning and the manifest variables choice and voice for grade 8 and grade 9. Enjoyment of learning is more stable ($r = 0.67$, $p < 0.001$) from grade 8 to grade 9 than perceptions of the instructional characteristics' choice ($r = 0.46$, $p < 0.001$) and voice ($r = 0.42$, $p < 0.001$). There are positive correlations between the features of personalized learning (choice and voice) as well as between these features and the enjoyment of learning.

4.2. Development of individual enjoyment in learning

A latent change score was formed to investigate the development of enjoyment in learning. The model fits the data well ($\chi 2_{(9)} = 4.925$, $p = 0.841$, CFI = 1.000, RMSEA = 0.000, SRMR = 0.014). As shown in Table 1, all manifest indicators of enjoyment in learning are rated lower in grade 9 than in grade 8. The initial value in students' learning enjoyment in grade 8 is 2.63 ($SD = .54$) and thus above the theoretical mean value of 2.5. The LCS shows that the enjoyment of learning declines on average by −0.12 scale values ($p < 0.001$) and by −0.29 standard deviations. The variances of the enjoyment of learning in grade 8 (0.29) and the change factor (0.19) indicate interindividual differences, which are higher for the initial value. Therefore, the interindividual differences are more evident in students' learning enjoyment in grade 8 than in their development. The correlation between the student's learning enjoyment in grade 8 and the change factor ($r = -0.45$, $p < 0.001$) illustrates the importance of the initial value for the development of learning enjoyment: the higher students in grade 8 rated the enjoyment of learning, the more likely is a negative difference to grade 9. That is, students in grade 8 with higher enjoyment of learning perceive a greater decline.

When gender is included as a predictor in the LCS model ($\chi 2_{(13)} = 31.838$, $p = 0.003$, CFI = 0.987, RMSEA = 0.034, SRMR = 0.026), a significant influence of gender on the enjoyment of learning in grade 8

($\beta = -0.11$, $p = 0.004$) is shown, but not on the development between grade 8 and grade 9 ($\beta = -0.06$, $p = 0.219$). Consequently, girls rate their enjoyment of learning in grade 8 higher than boys. However, the impact is very small. For both genders, the enjoyment of learning decreases to a comparable extent in the following year. Fig. 1 illustrates the latent change score with gender as a predictor.

4.3. Influence of the school personalization degree on the enjoyment of learning

The influence of the school's degree of personalization on the enjoyment of learning and its development was investigated using an MSEM (Fig. 2). The level of personalization was included in the model as a manifest variable at the school level (level 2). The level of personalization is based on assessments by teachers and head teachers, while the enjoyment of learning is based on students' perceptions. Despite acceptable fit ($\chi2_{(25)} = 36.679$, $p = 0.062$, CFI = 0.994, RMSEA = 0.019, $SRMR_{within} = 0.015$, $SRMR_{between} = 0.087$), the level-specific SRMR value shows that the model fits better at the individual level. At the school level, the degree of personalization does not directly influence the mean development of learning enjoyment ($\beta = 0.02$, $p = 0.933$). On the other hand, the significant path coefficient ($\beta = 0.48$, $p = 0.006$) indicates a moderate relation between the degree of personalization and the mean perceived enjoyment of learning in grade 8. That is, approximately 23% of the school differences in mean enjoyment of learning in grade 8 can be explained by the degree of personalization.

4.4. Influence of choice and voice on the enjoyment of learning

A flat structural equation model was used to investigate the explanatory value of the features choice and voice and their development on the students' learning enjoyment and development (Fig. 3). The standard errors and $\chi2$ values were adjusted for the clusters (class). The SEM fits the data well ($\chi2_{(31)} = 64.578$ $p < 0.001$, CFI = 0.984, RMSEA = 0.030, SRMR = 0.030). The results reveal that enjoyment of learning in grade 8 is related to the students' perceived features choice ($\beta = 0.15$, $p < 0.001$) and voice ($\beta = 0.26$, $p < 0.001$) in grade 8. However, the state of the two features of personalized learning in grade 8 cannot explain the decline in the enjoyment change. On the other hand, there is a positive influence of the latent change score of voice: the greater the perception of codetermination changes from grade 8 to grade 9, the greater the enjoyment of learning changes in the same direction. Gender, being uncorrelated to voice and choice and its development, exerts - as already shown in Fig. 1 - only a very small influence on the enjoyment of learning in grade 8 but not on its development.

5. Discussion

The present study aimed to investigate the influence of personalized learning on the enjoyment of learning and its development from grades 8 to 9. The article thus complements existing studies on the development of learning enjoyment in lower secondary schools with longitudinal data from Switzerland. Given that the development of learning motivation is culture-dependent (Fend, 2005), studies from different countries are essential. Furthermore, our study extends previous findings on the effectiveness of personalized learning concerning affective variables. Given the relevance of the learning enjoyment as a targeted outcome and predictor of learning and achievement as well as knowing that it decreases during lower secondary education, findings on the development and influencing factors of learning enjoyment are of major importance for theory and practice.

To address the *first research question,* the development of learning enjoyment between grades 8 and 9 was analyzed using a latent-change model at the student level. Consistent with findings from previous studies (e.g., Fend, 1997; Hagenauer, 2011), the results (see 4.2) indicate a significant decrease in the enjoyment of learning for both genders. The initial value of learning enjoyment proved to be a central predictor of development but with an unexpected sign: The decrease is stronger among students with a high level of learning enjoyment. A possible explanation for this finding is that grade 9 is the last compulsory school year. Students who do not have a positive attitude toward learning at school may assess the learning content in the final year as being relevant or more relevant to their choice of further education (e.g., vocational training). According to control-value theory (Pekrun, 2006), higher individual value attribution positively affects the enjoyment of learning. This may mitigate the decline among learners with a low enjoyment of learning. Additionally, control beliefs as a cognitive appraisal may be relevant in the context of transition. It is conceivable that students with a high enjoyment of learning have their self-efficacy put under more pressure by new (future) demands, manifesting itself in greater changes in the enjoyment of learning. A negative correlation between the initial enjoyment of learning and its change was also found in Buff's (2014) study of elementary school students. Although the study was conducted on grade 6 students, the considerations for explaining the finding go in a similar direction to ours since grade 6 students also face a transition to secondary school. However, according to the author, further studies are needed to interpret this finding (Buff, 2014). We agree with this conclusion also because the explanation of this finding by a methodological artifact (regression-to-the-mean) is unlikely since no ceiling effect was shown for the enjoyment of learning, and the measurement errors in the latent factor were most likely symmetrically distributed and controlled for.

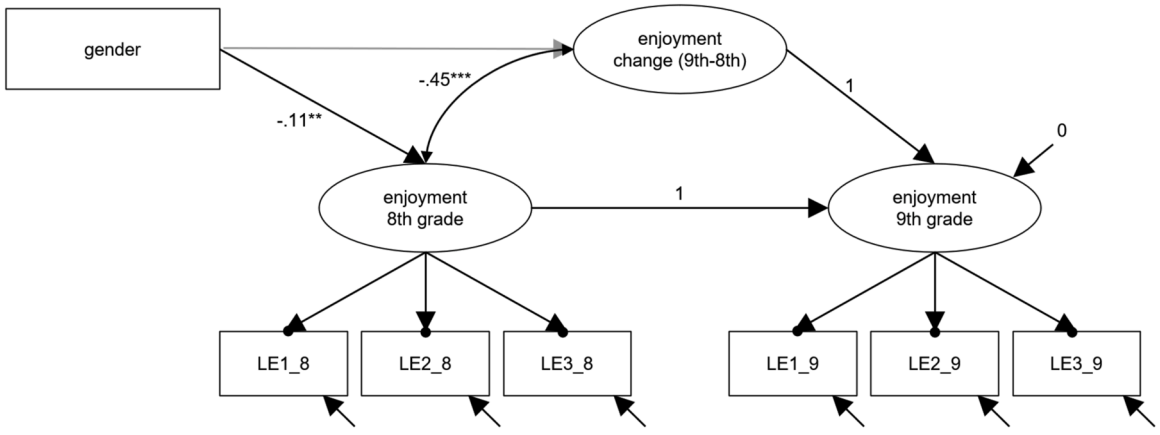


Fig. 1. Latent change score model with gender as a predictor. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$. Significant paths are illustrated in black, nonsignificant paths in gray.

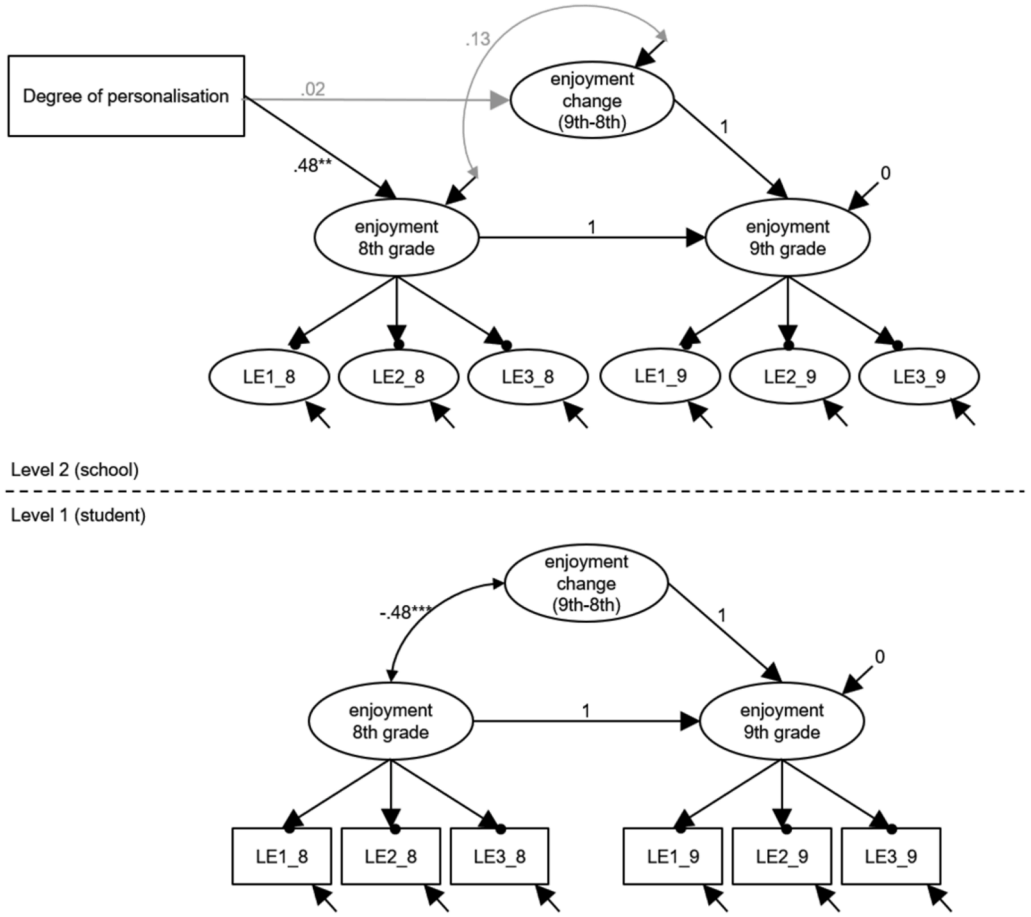


Fig. 2. MSEM: Influence of the degree of personalization on the enjoyment of learning and its development (LCS). ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; Significant paths are illustrated in black, nonsignificant paths in gray.

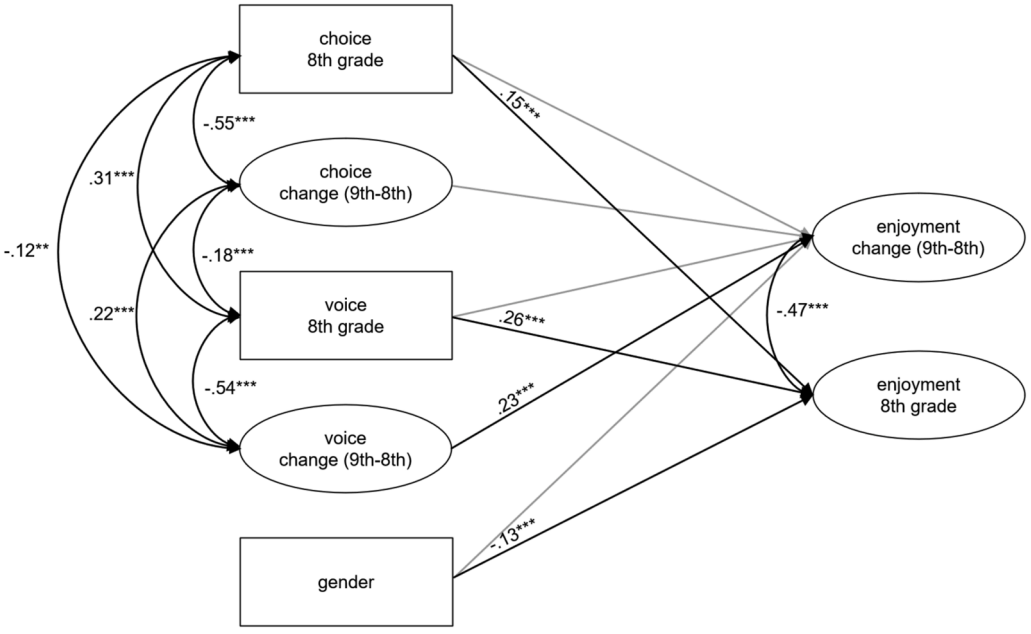


Fig. 3. SEM: Influence of choice and voice and its development (LCS) on the enjoyment of learning and its development (LCS). ***p <0.001, **p <0.01, *p <0.05; Significant paths are illustrated in black, nonsignificant paths in gray. For clarity, the manifest indicators of learning enjoyment are not shown.

The *second research question* investigated whether the degree of personalization determines the average enjoyment of learning and its development. The multilevel structural equation model presented in the results section (see 4.3) shows that the degree of personalization does not influence the average development of learning enjoyment. However, a positive relationship was observed between the degree of personalization and the mean enjoyment of learning within the school. The results thus indicate that a school's decision to pursue personalized learning positively affects students' affective attitudes; this information is important for guiding policy and practice.

The *third question* examined the influence of voice and choice and their development on learning enjoyment and its development. Voice and choice - as central features of personalized learning - refer to the students' perceived degree of having a say and options from which to choose. The results presented in Chapter 4.4 reveal that choice and voice are associated with the enjoyment of learning but do not influence its development, which is in line with Hagenauer (2011). Furthermore, it was investigated whether changes in perceived choice and voice are associated with changes in enjoyment of learning. The results show that a change in the perception of voice positively affects the development of learning enjoyment. However, given that perceived voice is rated lower in grade 9, the more the perceived voice decreases, the more the enjoyment of learning decreases. The findings emphasize the relevance of voice, which should be considered in future research. On the one hand, in various studies, autonomy is operationalized only through choice, which has already been criticized by Katz and Assor (2007). Therefore, it is recommended that further studies pay more attention to voice. On the other hand, studies that can identify properties of the learning environment that lead to a positive assessment of adolescents' voices are required.

Choice and voice are central features of personalized learning and were found to be important for the enjoyment of learning. However, due to the multidimensional understanding of personalized learning, the explanatory contribution of other features remains unknown. Given the apparent relationship between the degree of personalization and the enjoyment of learning, further aspects of personalized learning should be investigated in future research. In particular, teacher's instructional and emotional support, another crucial characteristic of personalized learning, may have explanatory power in this regard. It is also possible that learning support conditions the more substantial effect of voice: While voice is always coconstructive, teachers can moderate the degree of codetermination in a situational and adaptive way. On the other hand, choice runs the risk of not being optimally adapted to the learners' prerequisites, thus inhibiting its positive effect. For future studies, it remains to be clarified to what extent the effectiveness of voice can be attributed to a better fit of autonomy opportunities to learners' prerequisites.

5.1. Limitations

In this study, several limitations must be taken into account when interpreting the results:

First, the present study was conducted within the framework of a practice-based research project. Common to the participating schools was that their learning environments deviate in many respects significantly from the "grammar of schooling" (Tyack & Tobin, 1994), a circumstance that leads to various methodological challenges (Reusser et al., 2015). These refer, e.g., to a broad variety of implementations of personalized learning, for example, with regard to the composition of learning groups: Depending on the school, learning and instruction took place in more or less traditionally composed classes, which could be grade specific, grade-mixed, achievement-heterogeneous or achievement-homogeneous. Some schools primarily taught in flexibly composed learning groups of different sizes. This has two significant consequences for the present research. First, it eliminates the traditional level of class analysis (Reusser et al., 2015). Second, the collected school marks could not be used as covariates to control for achievement due to the mix of levels. However, Hagenauer found only a marginal correlation between school marks and the domain-general enjoyment of learning, which was not significant for all time points (Hagenauer, 2011).

Second, the study lacks a comparative sample with traditional schools. Since all schools studied are oriented toward personalized learning concepts to varying degrees and therefore enabled students' choice and voice to a potentially above-average degree, there is only a small variance in this respect. Including control schools would increase the variability for implementing choice and voice, which could affect the impact of choice and voice on the enjoyment of learning and its development. This should be considered in further studies. In the present study, with its inherently limited variance, it is reasonable to assume that the association between the constructs examined was underestimated rather than overestimated.

Third, the perception of choice and voice was only surveyed from the student's perspective. Considering the individual student perspective is undoubtedly central since it is rather the subjective interpretation of the environment and less objective characteristics that have proven to affect behavior (Baumert et al., 2004; Gruehn, 2000; Lüdtke et al., 2009). Furthermore, Müller-Kuhn's (2021) findings showed that voice was the only feature of participation that was rated similarly by teachers and students. Nevertheless, the question arises whether the student's perceived decline in codetermination can be explained by adolescents' increased need for autonomy or by a change in classroom practice (Fend, 1997; Hagenauer, 2011). Therefore, there is a need for further research in this area, with a differentiated examination of the conditions under which voice and its development are perceived positively.

Fourth, the enjoyment of learning was only examined over two school years. Since the development of learning enjoyment is not always linear (Fend, 1997; Helmke, 1993), more comprehensive data over several school years and measurement points would be beneficial. It should also be considered that students were in grade 9 at the end of their compulsory schooling. The upcoming transition to further education will likely impact the level and development of learning enjoyment. Nevertheless, the study of the enjoyment of learning in grade 9 is central, as it shows the affective attitude toward institutional learning of school leavers, which is significant in the context of lifelong learning. For future studies, surveying the enjoyment of learning over several school years is advisable.

Fifth, short scales were used to ensure that students could easily manage the size of the questionnaire. Even though a more comprehensive scale could have captured the construct of learning enjoyment in more detail, a study by Gogol et al. (2014) showed that the use of alternative three-item measures to assess motivational-affective constructs can be a suitable alternative.

Sixth, according to control-value theory (Pekrun, 2006), valence and control cognitions are central to developing achievement emotions. Following this theory, various studies have found indirect effects via cognitive appraisals in addition to direct effects of environmental variables (e.g., Goetz et al., 2006; Hagenauer, 2011). Taking indirect effects into account, the influence of choice and voice is likely to be accentuated.

Despite the limitations to be considered, the present study contributes to clarifying the development of learning enjoyment in lower secondary education and the influence of choice and voice in the context of personalized learning. In particular, it highlights the relevance of voice (codetermination) in terms of affective teaching perceptions.

5.2. Conclusion and implications

The present study examined the impact of personalized learning on habitual enjoyment of learning and its development. In the context of a social-constructivist understanding of learning, personalized learning is understood as a concept that focuses on the individual needs of learners

who are empowered to take responsibility and actively participate in decision-making. Despite the multidimensional understanding of personalized learning, comparisons with other work are possible with the explicit reference to a learning theory and the in-depth investigation of the elucidated features of voice and choice. Thus, this article contributes to the clarification of the concept of personalized learning and its effectiveness on the learning enjoyment in lower secondary school.

In summary, this study shows a positive relationship between the degree of personalization as well as its features choice and voice with the enjoyment of learning in grade 8. The change in the student's perception of their participation in decision-making (voice) also affects the development of learning enjoyment. Therefore, in educational practice, enabling students to have a say and ensuring that students perceive this offer as such is particularly crucial. Because of the relevance of the positive perception of voice, future research should identify the properties of the learning environment that lead to these perceptions. Another central finding is the importance of the initial level of learning enjoyment: the higher the students' perceived enjoyment of learning in grade 8, the greater its decline. A practical implication of this finding is that attention should also be paid to students with high levels of learning enjoyment to minimize their decline. Overall, our results indicate that a student-centered school culture, in which students are actively involved and have a say (voice), positively affects the expression and development of learning enjoyment.

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Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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