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The effectiveness of taste as a catalyst for learning in primary school

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Abstract

This article presents the results of a survey study conducted among 409 students (2nd to 7th grade), who all participated in mathematics and language lessons based on a teaching material titled Subjects With Taste (SWT). The hypothesis behind developing the teaching material is that taste can be regarded as a fundamental sense that supports individual meaning making and learning processes. Hence, taste can be viewed as a catalyst for learning in a broad variety of schools subjects when incorporated appropriately. The purpose of this study is to investigate this hypothesis and to examine the effectiveness of SWT courses in primary school mathematics and language teaching. Cluster analysis is used to analyze the survey data and identify differences between groups of respondents. Overall, the results indicate that incorporating elements of taste into mathematics and language teaching can have positive effects on most students' self-assessed learning outcome and learning prerequisites such as a high level of engagement and happiness and a low level of boredom. The group of students that is most challenged in relation to the randomly selected lessons is also the group of students that responds most positively to the SWT teaching. However, a quarter of the students who perform well in the randomly selected lessons respond negatively to the SWT teaching, especially compared to some of the other groups.

Keywords: Teaching, learning, taste, engagement, boredom, happiness

Introduction

The sense of taste is linked to our memories and cognition. Sensory experiences settle in our body and our mind; they help to substantiate our experiences (Abarca & Colby, 2016). Perception, and not least taste perception, is a universal phenomenon in the sense that all people experience it. At the same time, taste experiences can form an essential foundation for our encounter with the world, and can add meaning to this encounter. From research in food education, it is well known that taste experiences and activating the sense of taste can have significant potential as catalysts for learning processes (Christensen, 2019). However, taste may have even greater potential. Taste For Life (TFL) is a Danish, interdisciplinary, nationwide research and dissemination center which aims to produce and disseminate knowledge about taste. Furthermore, the purpose of TFL is to introduce children, young people, and adults to taste, making it a central element in the enjoyment of life, education, and learning. The center focuses on taste as a resource in learning as well as an interdisciplinary scientific field. TFL is supported by the Nordea Foundation and has partners from a wide range of Danish educational institutions. TFL has developed the concept *Subjects With Taste (SWT)* – a teaching material targeted at primary school, which is thematically based on taste in the teaching of a broad variety of school subjects. Hence, taste is incorporated to support student learning processes – also in non-food subjects. As a teaching material, SWT is used at all primary school grade levels, either interdisciplinarily or in individual subjects including Danish, mathematics, English, home economics, and nature/technology. The teaching material contains specific assignments, recipes, background knowledge, and didactic recommendations for teachers.

This article presents an empirical study of five concrete courses based on SWT teaching materials divided into the subjects Danish, English, and mathematics. The aim of the study is to investigate the effectiveness and potential of SWT courses. This leads to the research question: whether teaching based on Subjects With Taste (SWT) results in increased engagement, happiness, and self-assessed learning outcomes among the participating students, which is the intention behind SWT. Thus, the study's ambition is to investigate whether or not the SWT courses have the intended outcome.

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Theory and existing research

In this section, we will introduce theoretical perspectives on what taste is and why taste can be relevant in a teaching context. We will present taste didactic theory and illustrate how teaching taste is connected with the concepts of engagement, self-assessed learning, critical thinking and reflectivity, boredom, well-being, and happiness. These are the central concepts that we have operationalized in our empirical study.

Taste

There is a general perception of the concept of taste as something that needs to be controlled to resist eating unhealthy foods. Taste is often seen as a barrier to the adoption of 'correct' eating habits and not recognized as a source of pleasure or a central way of understanding and approaching the world through the senses (Battjes-Fries, Haveman-Nies, Renes, Meester, & van't Veer, 2015; Dazeley, Houston-Price, & Hill, 2012). Critics have described this approach as "hegemonic nutrition" (Hayes-Conroy & Hayes-Conroy, 2013). From a hegemonic nutritional perspective, there is only one truth about food, nutrition, and health, and because nutrition begins and ends with nutritional guidelines, this truth is universally applicable (Hayes-Conroy & Hayes-Conroy, 2013, p.1). One of its consequences is that little or no space is left for children to reflect on their taste experiences or to engage in sensual pleasures (Rich & Evans, 2015). We recently conducted a literature review in order to investigate how taste is used in contemporary food education (Leer & Wistoft, 2018), and argue that most of the literature on taste education (e.g. Dazeley et al., 2012) demonstrates a reductive understanding of taste and is essentially mistrustful of children's taste. Taste is seen as a barrier to learning "correct" eating habits and is not recognized as an important sense, a source of pleasure, or a central way of sensually understanding, learning, and approaching the world. In this regard, the above studies echo Puisais's (1987) ambition to uphold national taste borders and taste identity; they also share the idea that taste education for children can be used as a tool to improve children's health. In other words, taste education becomes a tool to push children toward "hegemonic nutrition"(Leer & Wistoft, 2018). Moreover, the studies operate within a behavioristic pedagogy that is only interested in behavior modification. Other pedagogical aspects of taste education are not explored in the literature, which leads to a knowledge gap concerning how children's perspectives on or experiences of taste can be meaningfully integrated into educational approaches (Leer & Wistoft, 2018).

Furthermore, scientifically derived perspectives on how taste can be a didactic element that supports learning are sparse, although there is a critical Nordic taste didactic tradition (Wistoft & Qvortrup, 2018). The idea is that taste integrity is something that individuals develop themselves through learning processes. Learning cannot be *enforced* by external actors. On the contrary, it is an internal mental process that can only be *supported* from "the outside." This implies that taste educators can only teach taste indirectly, for example by establishing a supportive teaching and learning environment and by supporting learning processes that lead to both an individual and a collective understanding of taste (Wistoft & Qvortrup, 2018, 2019).

Critical thinking is defined as reflective and reasonable thinking that is focused on deciding what to believe or do (Ennis, 1985) and considered as one of the most important competences children will need in the future. The fact that children actually use what they learn to make informed and good choices is an important purpose of the school, and it is clearly stated by the Danish Ministry of Children and Education in the core curriculum that "the school should help students to be inquisitive and ask questions, develop scientific and critical thinking and act with ethical awareness" (the Danish Ministry of Children and Education, 2021).

When investigating the effectiveness and potential of the SWT courses, our study also focuses on whether the participating students' *engagement*, *boredom/happiness*, and *self-assessed learning outcome* increases, when the teaching in various subjects has taste as the focal point.

Student engagement

Active research in the field of student engagement has primarily occurred in the past 35 years (Mosher & MacGowan, 1985). The Handbook of Research on Student Engagement (Christenson et al., 2012) points out a general consensus regarding a number of facets of engagement theory and

research. Student engagement is considered the primary theoretical model for understanding why students drop out and for promoting school completion (Christenson et al., 2012). Engaged students do not only perform well academically; students' attitudes and engagement strongly affect the desired academic, social, and emotional learning outcomes among students. They make an effort, persist, self-regulate their behavior toward goals, challenge themselves, and enjoy challenges and learning (Klem & Connell, 2004).

In this study, we build the research design on an understanding of student engagement as a multidimensional construct. A concept that requires an understanding of affective connections within the academic (classroom) environment (e.g. positive student-teacher and peer relationships) and active student behavior (e.g. participation, attendance, effort, prosocial behavior). As such, the study includes considerations on the students' interest in the subject, their attitudes toward the teaching experience (e.g. are the students happily involved in the teaching activities), the form and level of engagement (e.g. are the students deeply engaged), and whether the students have a desire to continue with the work after the lesson has ended.

Boredom vs. happiness in teaching activities

Boredom is one of the most commonly experienced emotions of students in schools (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). It is a common view that academic boredom constitutes an underestimated challenge in schools (Gül, 2020). Boredom is seen as an affective state composed of unpleasant feelings and lack of stimulation (Harris, 2000). Thus, boredom is an emotion that is caused by a lack of perceived value in a given situation or activity (Pekrun et al., 2010). Boredom is multidimensional and situation dependent (Acee et al., 2010) and consists of affective, cognitive, physiological, expressive, and motivational components (Pekrun et al., 2010; Scherer, 2000). Boredom has been variously described as a feeling, an emotion, an affect, a state, a drive, or a negative psychological experience (Fahlman, Mercer, Gaskovski, Eastwood, & Eastwood, 2009).

Boredom in classroom settings is common, as demonstrated by several studies. According to Daschmann et al. (2011), 44.3 % of the students in grades 5–10 reported being frequently bored in math class (Daschmann, Goetz, & Stupnisky, 2011). Larson and Richards (1991) found that 5th- and 9th-grade students experienced boredom during 32 % of their classes. According to Pekrun et al. (2010), 42 % of the undergraduate students reported being bored in class. Early studies in students' boredom have found that the consequences of boredom can be distracting or deviant behavior (Wasson, 1981), truancy (Sommer, 1985), and dropping out (Bearden, Spencer, & Moracco, 1989) (Tidwell, 1988). Furthermore, studies indicate that the lack of ability and achievement is related to the boredom experienced by students, and that boredom is related to reduced attention, effort, and performance (Pekrun et al., 2010). A conceptual opposite of boredom is students' happiness, which is characterized by the experience of joy and well-being when participating in teaching activities (Bullough, 2011). The state of happiness can be viewed as a prerequisite for personal growth and learning (Csikszentmihalyi, 2014). When students experience happiness, they are more likely to be receptive to outside stimuli than when they are bored, sad, or distressed. Happiness also makes students more disposed to engage in creative endeavors, which itself is another learning prerequisite (Scoffham & Barnes, 2011).

Research design and analytical strategy

In order to investigate the research questions of this article, we have conducted a questionnaire study. The data was collected among students (n=409) in 2nd to 7th grade in 16 schools spread throughout Denmark. The selection criteria were the greatest possible geographical spread and representation of the various subjects that are included in the SWT material.

With the questionnaire, we have strived to examine the students' experience of: 1) happiness, 2) engagement, and 3) boredom, in order to analyze the correlations of these three factors with a single item measuring the students' self-assessed learning. The three factors have been examined with multiple questions/items, which we have subsequently summed up to construct an index for each factor. Table 1 shows Cronbach's alpha tests for each index:

Table 1.

Cronbach's alpha test for constructed indexes

		Random lesson	SWT lesson
Happiness	(2 items)	0.73	0.70
Engagement	(4 items)	0.74	0.82
Boredom	(2 items)	0.70	0.68

The alpha values in table 1 are acceptable based on general statistical quality criteria which typically recommend that Cronbach's alpha values are between 0.70 and 0.90, but down to 0.50 is useful (Cho & Kim, 2015; Streiner, 2003; Tavakol & Dennick, 2011). The Cronbach alpha values in this study indicate that the indexes are reliable and the internal consistency is acceptable in the analyses we present in this article.

The empirical data was collected in the period October 2019 to February 2020. Immediately after the students participated in a SWT lesson, they were asked to fill out the questionnaire. To establish a basis of comparison, the students were also given a questionnaire immediately after a random lesson in the same subject. The participating teachers have voluntarily signed up for the project, and they have all signed a consent form in connection with the participation. Parents and students have been informed in writing, and the students have also been informed orally prior to their participation.

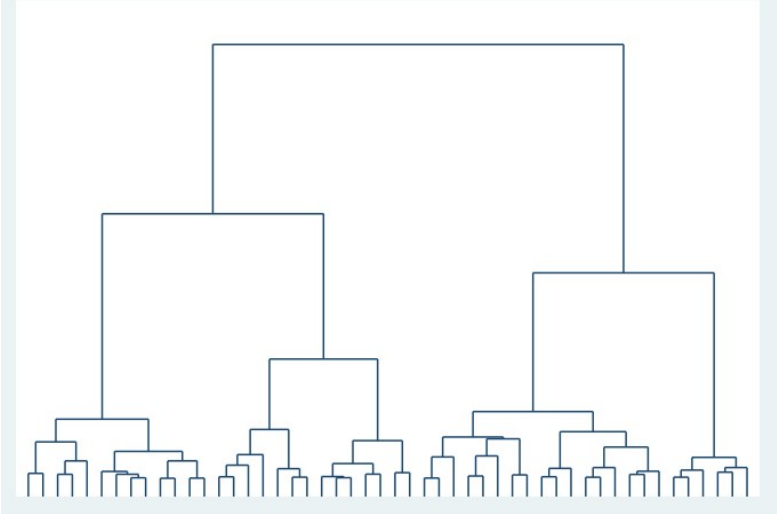
In order to analyze the collected data, we opted for a cluster analysis. There are many methodological variations of cluster analysis (Teo, 2013), but they all have in common that a number of observations/respondents (n) are grouped into clusters (k) based on similarities. That is, respondents grouped in one specific cluster are relatively uniform on a variety of parameters that the researcher selects for the analysis. Implicitly, each cluster will differ from other clusters on the same parameters (Petscher et al, 2013). Each cluster will have special characteristics which make it possible to identify the differences between the groups of respondents (Hancock & Mueller, 2010). The many variations of cluster analysis differ in relation to how the grouping itself takes place, depending on which method and which algorithm is applied (Karlson, 2017). In this article, we have chosen the "Ward's Linkage" approach, which is a hierarchical cluster method, where an algorithm initially calculates which two observations are most similar in the entire data set and groups these in the same cluster, continuing until all observations are grouped into clusters. Then the two clusters are identified that are most similar, and these are grouped in the same cluster, continuing until all the data is reduced to one cluster. By a graphical representation in the form of a dendrogram, it is possible to "go backwards" and see the structure of clusters constructed in the hierarchy, and from there choose how many groupings to use in the further analysis (Chen et al., 2005). Finally, one variable is constructed with the selected number of clusters in order to conduct table analyses in which differences can be observed.

Results

We have constructed the cluster variable of this analysis by grouping respondents according to similarities in their answers to the questions included in the indexes for students' engagement, happiness, and boredom as well as their self-assessed learning outcome. To select the number of clusters in the analysis, we have generated table 2, which is a graphical representation of our cluster variable in the form of a dendrogram.

Table 2.

Dendrogram for cluster analyses



Based on our assessment of the dendrogram, it may be suitable to perform analyses with two, three, four, or seven clusters, respectively. By analyzing all these possibilities, we have iteratively come to the conclusion that four clusters best illustrate the nuances of this data set, which are lost if we settle for two or three clusters. Furthermore, four clusters give a more comprehensible analytical result than is the case with more clusters.

Table 3 is a tabulation of the cluster variable that we have generated by the above approach and the students' self-assessed learning outcome, engagement, boredom, and happiness. The results in table 3 thus show the characteristics of the four clusters, and in this section, we will describe the similarities and differences between the groups of respondents.

Table 3.

Tabulation of clusters and students' self-assessed learning outcome, engagement, boredom, and happiness

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Random lesson				
Self-assessed learning	0.60	0.25	0.06	-0.78
Engagement	0.92	0.32	0.01	-1.27
Boredom	-1.06	-0.45	0.15	0.61
Happiness	0.81	0.46	-0.25	-0.80
SWT lesson				
Self-assessed learning	0.69	-0.99	0.38	0.03
Engagement	0.90	-0.84	0.44	-0.49
Boredom	-0.82	0.63	-0.52	0.60
Happiness	0.65	-0.90	0.37	-0.16

n	42	61	85	46
%	18.0 %	26.0 %	36.3 %	19.7 %

N= 234 p = 0.000

Cluster 1 consists of 42 students, which corresponds to 18 % of the total number of respondents. This group is characterized by representing the students who give their learning outcomes the highest rating compared to the other three clusters. This group also indicates the highest degree of engagement and the lowest degree of boredom. Furthermore, this group expresses the highest degree of happiness regarding the teaching. In cluster 1, these characteristics apply both to the randomly selected lessons and to the SWT lessons. From this, we assume that the SWT lessons and the random lessons have a similar effect on the students who do best academically, are most engaged, get least bored, and generally find the greatest happiness in the teaching.

Cluster 2 consists of 61 students, which corresponds to 26 % of the total number of respondents. This group is characterized by representing the students who, in terms of the random lessons, give their own learning outcomes the second highest rating. They also indicate the second highest degree of engagement, the second lowest degree of boredom, and the second highest degree of happiness. For this group of students, these characteristics change when they assess the SWT lessons. Compared to the other clusters, they give their learning outcomes, engagement, and happiness the lowest rating, while at the same time expressing the highest degree of boredom. Hence, this is a group of students who seem to be comfortable and perform relatively well in their normal lessons. But they have negative experiences and assessments of the SWT teaching, which differs greatly from their perception of the normal teaching.

Cluster 3 consists of 85 students, which corresponds to 36.3 % of the total number of respondents. This group is characterized by representing the students who, in connection with the random lessons, give their own learning outcomes the second lowest rating compared to the other three clusters. The students in this cluster also show the second lowest degree of engagement and happiness in the random lessons and the second highest degree of boredom. These characteristics change when the students evaluate the SWT teaching. Here, they give their learning outcomes, engagement, and happiness the second highest rating, while at the same time expressing the second lowest level of boredom. In our interpretation, this group of students can be described as the second most challenged group in connection with the normal teaching with regard to the factors that this study focuses on. At the same time, however, this group of students can also be described as the group that responds more positively to SWT teaching than they respond to their normal teaching.

Cluster 4 consists of 46 students, which corresponds to 19.7 % of the total number of respondents. This group is characterized by representing the students who, in terms of the random lessons, assess their learning outcomes, engagement, happiness, and boredom most negatively. But also here, the characteristics of the group change when they assess the SWT teaching. Compared to the other clusters, they have the second most negative assessment of the four factors examined. However, what is particularly remarkable for this cluster is that we find the greatest positive change in the coefficients when we compare random lessons to SWT lessons. The result thus indicates that SWT teaching can have a certain potential for those students who are most challenged in connection with the normal teaching.

Background variables

In this section, we will present how the respondents in the survey are distributed in relation to the background variables *grade level*, *subject*, and *class*, and which SWT course they have participated in.

Grade level

Table 4.

Overall grade level distribution in the study

	Frequency	%
2nd grade	90	22.0
3rd grade	107	26.2
4th grade	72	17.6
5th grade	40	9.8
6th grade	55	13.4
7th grade	45	11.0
Total	409	100 %

In table 4, it can be observed that 409 students from 2nd to 7th grade participated in the study. The three lowest grade levels are overrepresented compared to the three highest grade levels. For example, 107 3rd-grade students participated, which corresponds to 26.2 % of the total number of respondents. Meanwhile, 40 5th-grade students participated, which corresponds to 9.8 % of the total number of respondents. Table 5 shows how the cluster variable is distributed by grade level. For the sake of simplicity, we have grouped 2nd and 3rd grade, 4th and 5th grade, and 6th and 7th grade.

Table 5.

Grade level distribution in the cluster variable

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
2nd-3rd grade	59.5 %	34.4 %	24.7 %	15.2 %
4-5th grade	28.6 %	34.4 %	51.8 %	45.7 %
6-7th grade	11.9 %	31.2 %	23.5 %	39.1 %
Total %	100 %	100 %	100 %	100 %
Total n	42	61	85	46

P= 0.00 n= 234

Table 5 partly reflects that fewer students from the highest grade levels participated in the study. However, we also find it worth noting that in cluster 1, there is a clear over-representation of 2nd- and 3rd-grade students. Cluster 2 is the only group where the students responded more negatively to the SWT teaching compared to the random lesson, and here the students are more or less equally distributed between the different grade levels. Thus, it is not the students' grade level/age that is the reason for the negative assessments. Cluster 3 is characterized by having a higher representation of 4th and 5th grade than the other three clusters. Cluster 4 has the lowest representation of the youngest students compared to the other three clusters.

Subjects and courses

Tables 6 and 7, respectively, show which subjects and which SWT courses the students have participated in.

Table 6.

Overall distribution of subjects that the students have been taught

Subjects	Frequency	%
Mathematics	200	48.9 %
Danish (language)	190	46.5 %
English (language)	19	4.7 %
Total	409	100 %

Table 7.

Overall distribution of courses that the students have been taught

SWT courses	Frequency	%
The difficult phonemes	19	4.6 %
Combinatorics	200	48.9 %
Taste the sayings	145	35.4 %
Cannibals and imagery	26	6.4 %
Speaking with and about foods	19	4.7 %
Total	409	100 %

There is a concurrence of the numbers in the two tables above, because each course is also targeted at a specific subject. For instance, this is why there are exactly 200 respondents who participated in a mathematics lesson, and exactly 200 respondents who participated in the course "Combinatorics". The reader should be aware that the final data of the study is largely based on the subjects mathematics and Danish as well as the courses "Combinatorics" and "Taste the sayings". Tables 8 and 9 show the distribution of subjects and SWT courses in the different clusters of the analysis.

Table 8.

Distribution of subjects in the cluster variable

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Mathematics	45.2 %	42.6 %	23.5 %	37.0 %
Danish (language)	54.8 %	50.8 %	71.8 %	45.6 %
English (language)	0.0 %	6.6 %	4.7 %	17.4 %
Total %	100 %	100 %	100 %	100 %
Total n	42	61	85	46

P= 0.002 n= 234

Table 9.

Distribution of courses in the cluster variable

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
The difficult phonemes	14.3 %	3.3 %	4.7 %	0.0 %
Combinatorics	45.3 %	42.6 %	23.6 %	37.0 %
Taste the sayings	40.4 %	47.5 %	67.0 %	45.6 %
Cannibals and imagery	0.0 %	0.0 %	0.0 %	0.0 %
Speaking with and about foods	0.0 %	6.6 %	4.7 %	17.4 %
Total %	100 %	100 %	100 %	100 %
Total n	42	61	85	46

P= 0.000 n= 234

There are some classes from which we have not received both questionnaires, and they have all completed mathematics courses. Therefore, the skewed distribution appears in table 9, which shows that despite the fact that most students have participated in mathematics courses, most students in all four clusters have received Danish language teaching. There is only one class that has received English language teaching in the course "Speaking with and about foods", and the majority of these students are grouped in cluster 4. Hence, we cannot conclude much about this course and the English subject due to the very low number of respondents in this group. The same applies to the courses "The difficult phonemes" and "Cannibals and imagery". However, we find it interesting to see the distributions in the four clusters in connection with the courses "Combinatorics" and "Taste the sayings". In clusters 1, 2 and 4, there are relatively small differences in the distributions of the students in relation to these two courses. This indicates that for these three clusters, it has not made any difference whether the students have participated in "Combinatorics" or "Taste the sayings". Cluster 3 consists of 67 % students who have participated in the course "Taste the sayings". This indicates that the characteristics of cluster 3 can partly be attributed to this course.

Class

Table 10 shows that the survey includes questionnaire responses from 19 different classes. The smallest class consists of 15 students, while the largest class consists of 28 students. Each class makes up between 3.7 % and 6.9 % of the total number of respondents in the survey.

Table 10.

Class distribution for the cluster variable

		f	%
Class number	1	26	6.4 %
	2	22	5.4 %
	3	23	5.6 %
	4	22	5.4 %
	5	28	6.9 %
	6	26	6.4 %
	7	19	4.7 %
	8	15	3.7 %
	9	19	4.7 %
	10	20	4.9 %

11	25	6.1 %
12	19	4.7 %
13	24	5.9 %
14	18	4.4 %
15	20	4.9 %
16	16	3.9 %
17	25	6.1 %
18	23	5.6 %
19	19	4.7 %
Total	409	100 %

To investigate how each class in the study is distributed in each of the four clusters, we have carried out a cross tabulation analysis as shown in table 11.

Table 11.

Percentage distribution of students in each class in the cluster variable

	Class number													
	2	5	7	8	9	10	11	12	13	14	15	16	17	19
Cluster 1	50	8	11	15	50	14	14	7	7	29	6	62	10	0
Cluster 2	35	4	16	8	25	29	24	40	53	36	28	31	30	17
Cluster 3	15	75	37	38	25	21	62	27	33	21	61	8	20	33
Cluster 4	0	13	37	38	0	36	0	27	7	14	6	0	40	50
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

P= 0.000 n= 234

It can be observed that class numbers 1, 3, 4, 6, and 18 are not represented in the cluster variable. The reason for this is that we have only received one of the two questionnaires from each of these classes, and they are therefore not included. This is also the reason why there is a total of 409 respondents in the survey, but only 234 respondents are included in the cluster analysis. Table 11 shows that 50 % of the students in class number 2 are grouped in cluster 1, while 35 % of the students are grouped in cluster 2 and 15 % in cluster 3, while 0 % of the students are grouped in cluster 4. What we find interesting about table 11 is that there are very few classes where the students are evenly distributed among the four clusters. In five of the classes, there are clusters with 0 % of the students. In half of the classes (7 out of 14), 50 % or more of the students are grouped in the same cluster. Table 11 thus indicates that the class in which the student participates has a significant impact on the effectiveness of SWT teaching. The exact reason for this can be difficult to pinpoint unambiguously, as there are presumably a variety of factors that influence this matter. For example, classes differ in terms of socioeconomic composition, students' academic level, school resources, and so on. However, international educational research shows that teachers' expertise in terms of knowledge and competences is the most important single factor in explaining students' benefits from teaching (Darling-Hammond & Bransford, 2012; Darling-Hammond et al., 2017; Parsons et al., 2018; Schonert-Reichl, 2017). We would like to point out that in the different classes in the study, there are, of course, also different teachers. This is certainly not the only explanatory factor, but it is presumably a significant factor in the effectiveness of the teaching.

Conclusion and suggestions

The results presented in this article indicate that SWT teaching has a positive effect on approximately three out of four students. The group of students that is most challenged with regard to the randomly selected lessons is also the group of students that responds most positively to SWT teaching. The students who belong to the quarter of students who do best academically, are most engaged, get least bored, and find the greatest happiness in the teaching also have these characteristics in the SWT teaching. However, it is important to be aware that a quarter of the students who do quite well in the randomly selected courses respond negatively to SWT teaching, especially compared to other groups of students. Regarding gender, age/grade level, subjects, and SWT courses, we find a similar effectiveness of SWT teaching. The results also show that the classes may have a significant impact on the effectiveness of SWT. Overall, the results of this study indicate positive results of SWT teaching. Furthermore it is suggested to incorporate elements of taste into general teaching in mathematics and language. This is because taste may have positive effects on most students' self-assessed learning outcome and learning prerequisites such as a high level of engagement, happiness and a low level of boredom.

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