**The Cognitive-emotional Appraisals of 13-year-old Students in the Learning Process**

**Abstract**

The present study adopted the fundamental principles of appraisal theories of emotions in order to investigate students' appraisals based on their perceptions about teaching and communication during the lessons. The cognitive appraisals of students were evaluated in the context of three subject matters: Bulgarian language, history and biology.The data were collected from 202 pupils in 6th grade of Bulgarian comprehensive school. The statistical procedures applied for the analysis of the data demonstrated elevated levels of reliability and validity of the questionnaire. The questionnaire design enables the monitoring of fluctuations in cognitive-emotional appraisals by subject-matter and by phase of the lesson. Two predominant trends emerged in the students' appraisals: the activity and extraversion of their behavior are contingent on the phase of the lesson and the subject-matter; fear has low levels.

*Keywords*: appraisal, learning, subject-matter, emotional, diagnostic

**Introduction:**

The students' self-perception in the learning process turns out to be an important aspect in educational policies, as evidenced by the Council of Europe's focus on the well-being of students in the age of digital education, as outlined in its decisions of 28-29.11.2022. The document introduces definitions of cognitive, physical and psychological well-being. The former pertains to the successful social adaptation through the adoption of different roles; the latter relates to the health status of the individual; and the third is associated with opinions and sensitivity to the personal sphere of life (Hascher & Hagenauer, 2010). This concept has been the focus of research by the aforementioned authors for more than a decade, and the study discusses how the perception of well-being in school influences the positive development of adolescents. Within the context of the school institution, well-being fulfills the following functions:

- Indicative: if students feel good, this reflects the positive assessment of the school environment and the students' readiness to overcome challenges in the processes of social interaction.

- Educational: well-being is the basis for the cognitive and emotional processes associated with successful learning.

It also functions as a preventative measure, as when students are in a positive state, they are better equipped to overcome any difficulties they might encounter at school (Hascher& Hagenauer, 2010).The significance of studying students' cognitive-emotional appraisals in the learning process is underscored by these functions of well-being. Individual experiences of episodes related to the teacher or peers could provide useful information about the quality of social interaction, and hence about the quality of learning. The present study, therefore, focuses on cognitive-emotional sensitivity, which demonstrates the extent to which communication with teachers and peers aligns with personal well-being and the quality of learning.

This understanding is influenced by appraisal theories of emotions, as articulated by Scherer (2009). The author proposes a conceptual model that aims to elucidate the shaping of students' emotional experiences. The external motivating stimuli that provoke the emotional process are viewed as originating from the needs, goals and values of the teacher, which are incorporated into the teaching methods and the student's actions, depending on the content of his/her emotional experience.Scherer's assumption of emotions as a reaction to significant events creates opportunities for establishing the internal structure of the student's emotional experience. This reaction is manifested in the alternatives for action that the student could choose as a result of his appraisal of the event, which can motivate him/her to maintain a positive trend in his actions or make him give up, avoid them.The adaptive nature of emotional appraisal according to Scherer can be described by its four purposes. From the point of view of the leading subject of the study presented here – the student – they are:

- How important is this moment in class for me in this subject matter?

- How would it affect my perceptions of myself? What are the consequences for me of this moment in the lesson?

- Will it affect my personal sense of success now or in future lessons in this subject? How well can I deal with these consequences – on my own or do I need the support of my classmates or my teacher?

- How important is it for me to perceive this moment in class correctly – from my perspective, from the perspective of my classmates, or from the perspective of my teacher?

The cognitive-emotional response to this set of questions during the moment of real assessment is not carried out in such a disjointed manner; rather, it is spontaneously expressed by the student, without effort, in relation to their assessment of what is happening in class. The unit in this complex of thoughts, motives, goals, actions is referred to by Scherer (2009) as 'qualia'. These represent the core of emotional experience in its 'raw' form. The internal feeling of the ongoing emotion is represented by a certain tendency in actions that can be observed or explained. The formation of competence for perceiving this complex unit (qualia) in the analysis of the emotional process is of great importance for improving the quality of learning.

This is explained by the fact that if students direct their perception to their emotional sensitivity, they would strengthen self-control over their actions. The recognition of the onset of a particular emotional sentiment, the manner in which it manifests, and the discernment of its environmental context contribute to the enrichment of one's emotional experience. The development of the questionnaire presented in the article constitutes a precise endeavor in this direction, offering a concise list of emotional adjectives to capture the transient fluctuations in emotional assessment. Its significance lies in its incorporation of the following components: firstly, it identifies the importance of the surrounding environment for well-being in the case of the student; secondly, it helps students become aware of their individual needs, attachments, values, current goals, and beliefs; thirdly, it facilitates the connection between reality (the perceived moment) and the assessment. The following aspects are of particular significance:

- The identification of the importance of the surrounding environment for well-being in the case of the student.

-The facilitation of the connection between reality (the perceived moment) and the assessment.

-The explanation of why different students experience familiar/new learning content differently, have different expectations of their teacher, and behave confidently or fearfully (Moors, Ellsworth, Scherer, Frijda, 2013, 121).

The following characteristics of subject-oriented learning are established by the questionnaire proposed here:

- the perception of the learning environment by students and teacher-student communication;

- their readiness for action (the motivational aspect);

- the sensations of their physiological reactions;

- changes in their expressive and instrumental behavior in the learning process;

- the subjective experience of what happens in the process of classroom interaction (Moors, Ellsworth, Scherer, Frijda, 2013).

The individual scales include adjectives through which 13-year-old students can present their appraisals about episodes in lessons. The questionnaire's structure and its utilization during three distinct school lessons, each focusing on a different subject, enables the discernment of latent mechanisms governing cognitive-emotional appraisals of the stimuli emanating from the teacher and the learning content. Research on the relationship between emotions and learning has demonstrated that positive emotions can stimulate students' creativity and imagination (Hascher, 2010), thereby allowing them to feel at liberty to express themselves and think divergently. Conversely, positive emotions have the potential to negatively impact students' engagement, potentially leading them to perceive learning as an activity that does not necessitate high achievements or individual efforts to meet the standards set by the official authorities in the education system.

The intricate nature of cognitive-emotional appraisals in the learning process undeniably affects its quality. Concurrently, Praetorius & Gräsel (2021) have observed that previous studies have devoted minimal attention to the individual development of cognitive systems. In this regard, the present questionnaire has been developed to provide teachers with valuable insight into the functioning of students' cognitive-emotional appraisals within each concrete lesson, contingent upon the thorough examination of the psychometric characteristics of the included items. The aforementioned conclusions, derived from the comprehensive theoretical and empirical research conducted by several authors, have reignited interest in the field of adaptive learning.

**Recent research on the procedural nature of learning and teaching**

In the early 1980s, Wang & Walberg (1983:603) developed an experimental programme in which they defined adaptive teaching as follows:

"Adaptive instruction can be defined conceptually as the use of alternative instructional strategies and school resources to provide learning experiences that meet the different needs of individual students".

Wang & Walberg (1983) formulated this broad definition based on the analysis of a large number of previous publications. This definition was formulated in an attempt to justify an innovative approach to teaching that is open to specific learning styles, to individual speed of learning and to different learning outcomes. According to the authors of the concept, the combination of these three elements would lead to an increase in the overall effectiveness of school education. However, in practical terms, a number of difficulties have been identified among them: namely, insufficient time directed at selecting teaching strategies that support learning, as opposed to efforts to implement classroom management strategies. In traditional learning environments, all students are expected to progress through content at a uniform pace and in a predetermined amount of time, and the organizational prerequisites for an individualized approach to learning and teaching are lacking. In the mid-1980s, Doly (1985) examined the effectiveness of different learning concepts, and his findings suggest that the situational use of learning resources and the situational understanding of learning goals and objectives influence effectiveness. Consequently, the efficacy of pedagogical models, such as the discovery learning model or models pertaining to the interaction between learning and teaching, is contingent on the ability of the instructor to adapt these models to the specific context. Recent theoretical and empirical psychological-pedagogical studies on learning and teaching corroborate this assertion.

Recent research on the procedural nature of learning and teaching, Seidel (2014) provides a methodological analysis of the structural and process paradigm for examining learning. This is understood as the provision and utilization of learning resources by the teacher to ensure optimal outcomes for each student. In this sense, the model proposed by Seidel (2014) for combining the two traditional paradigms represents the next stage in the attempts to empirically further develop the idea of adaptive learning. The model under discussion emphasizes not only the cognitive aspect of the teacher-student interaction, but also the affective, social and cultural components in it. The prevailing concern pertains to the optimization of teaching and learning processes, with the objective being to ascertain the extent to which these processes are adequate to attain the desired outcomes from the perspectives of both the subject-matters and the teacher. The structural paradigm is characterized by a step-by-step, standardized course of learning, whereas the procedural paradigm emphasizes the assimilation of knowledge and the facilitation of this process by the teacher, with the provision of suitable opportunities for student activation.

In both models, the provision of prerequisites for optimal learning is of particular importance. In the structural paradigm, this is assessed from the point of view of group achievement, while in the procedural paradigm, it is assessed from the individual perspective. The former paradigm encompasses three structural elements of learning: classroom management, cognitive activation, and cognitive support. In contrast, the latter paradigm places emphasis on cognitive, metacognitive, and affective-motivational processes. A juxtaposition of these two paradigms underscores the significance of current situational indicators in the assessment process, both by the teacher and the student, within the context of the learning process. Such factors include, but are not limited to, the teacher's decision regarding the implementation of specific teaching methods, the student's inclination to participate in the learning process, the temporal constraints, and the emotional ambience of the classroom.

Research on the essence of learning (Vermunt&Donche,2017; Richardson, 2017; Dinsmore, 2017) has confirmed the validity of the concept of learning as a structural and procedural whole, and in interpreting the prerequisites-process-product-model of learning, the term "approach to learning" is introduced. This approach delineates the procedural characteristics of learning as either superficial or deep. The two concepts are continuously expanded by indicators such as the durability of memorization, motivation, and learning strategies employed, as well as self-regulation skills. Consequently, four practical models (patterns) are constructed for comprehending learning: meaning-directed learning, reproduction-directed learning, application-directed learning and undirected learning (Dinsmore, 2017). These variants of learning reflect the traditional understanding of the structure of learning as acquiring knowledge, processing and applying it, rethinking and expanding knowledge. It is evident that the conceptualization of these learning manifestations, and their subsequent definition, are significantly influenced by the principles and tenets of cognitivism.

Evidence for this can be found in the seminal work of Pollock et al. (2002) on cognitive load theory. This theory posits that the external presentation of information and the internal prerequisites for its processing are of significance. In accordance with Seidel's concept, it is imperative to optimize the presentation of information in a manner that prevents an overload of working memory. Long-term memory is conceptualized as an inexhaustible reservoir of resources for acquiring new knowledge, which is organized into a schema.

This perspective underscores the significance of individual differences in learning styles. It is acknowledged that a proportion of students will comprehend and retain a given unit of information, whilst others will comprehend and assimilate the presented information to a lesser extent and in a less profound manner. The necessity for cognitive support from the teacher arises in order to enhance the interactivity of the elements of information. Sweller (1994) argued for the importance of this theory for improving teaching through experimental means. The theory proffers a number of significant strategies to stimulate students' internal flow of thinking, including the comparison of two similar objects presented in different modifications, the explanation of each step of learning, the presentation of role models without a predetermined goal, and the refraining from verbal explanations. As a result of these reflections of yours, the author draws the following conclusion:

"The instructional consequences of extraneous cognitive load may be heavily determined by intrinsic cognitive load caused by element interactivity" (Sweller, 1994:310).

This finding underscores the significance of individual student characteristics in shaping teaching method and the selection of instructional materials by educators in the learning process. The present understanding of the provision and utilization of learning resources for the enhancement of students' knowledge and skills, and consequently for the cultivation of their affective-motivational sensitivity to the learning content, is currently defined as ambivalent (Praetorius & Kleickmann, 2022). While a substantial body of research has conceptualized the generic category of "learning prerequisites/opportunities", the specific content of this category varies (Praetorius & Kleickmann, 2022). The existing literature employs terms such as intensifying the cognitive processes of learning, driving the motivational-affective sphere, and enhancing social interactions. This has resulted in challenges in the practical implementation of the model.

Consequently, an integrated model of supply and utilization of resources is proposed. In this model, students and teachers are regarded as jointly responsible for the implementation of training, given their active participation in its execution in accordance with the distinctive characteristics of the learning content. The influence of external factors is divided between the educational system, the school, the class and the subject-matter. The prerequisites/opportunities for learning are specified through the following categories: students' natural predispositions, presupposing cognitive activation through relevant tasks, active learning time, the degree of self-regulation of learning and the participation of students in the construction of the learning process.

Social cues, prior knowledge, interests, and self-concept are also relevant to learning. Irrespective of the specific research design, the crux of the matter is the combination of the student's innate potential for learning and its utilization by the teacher through the provision of suitable forms of activity. The idea of the increasing role of the student in the learning process is present in the research of the last twenty years related to the definition of cognitive activation. A detailed analysis of Wemmer-Rogh, Praetorius, Schreyer&Herbert (2024) on the development of the concepts of cognitive activation reveals several facts that substantiate the significance of the research presented here. Insofar as it generally represents the stimulation of students to cooperate with the teacher by showing a higher degree of emotional and intellectual engagement with the learning content, the following is important for modern diagnostics:

- to expand scientific knowledge about how emotional processes affect the acquisition of educational content;

- to trace the subjective views of students on the influence of emotional processes on the perception of events in the lesson and thus assess the influence of constructivist concepts on teaching;

- to establish what the "affective quality" of the lessons is.

Conducting research on the functioning of cognitive-emotional processes in real conditions would concretize scientific ideas about the deep structures of learning and hence discover innovative alternatives for increasing the quality of teacher-student interaction (Wemmer-Rogh, Praetorius at al.,2024). The students' emotional appraisals given spontaneously allow for the establishment of their positioning in the organization and conduct of the lesson.

Although the category of cognitive activation is generic in nature, specific notions of it depending on the subject-matter are also of great importance. In their analysis, Keller, Steffensky, Winkler et al. (2024) emphasise the importance of three factors for the concrete-content definition of cognitive activation: learning objectives, leading theories of learning and typical methods of knowledge extraction. Empirical studies (mainly studies in the German-speaking region) are already yielding the first results. The utilization of the questionnaire proposed in this study facilitates the expansion of analyses and the comparison of the functioning of emotional appraisals in the classroom in subject-matters such as mathematics, the native language, history and biology.

In contemporary literature, the study of individualized instructions also occupies an important place. (Tetzlaff, Hartmann, Dumont&Brod, 2022). The authors analyze a wide range of research that treats the implementation of individual decisions in teaching. The objective is to align with the unique needs of each student to facilitate progress tailored to their individual needs. However, the absence of a systematic distinction between the socially desirable and the objectively didactic hinders the realization of this objective in educational practice. A notable finding is the frequent divergence between ratings from students and experts. This divergence arises from the fact that students evaluate the adequacy of instruction, while experts assess the content of the resources offered.

Another challenge pertains to the use of disparate terminology to describe teacher actions, including "individualized instruction", "differentiated instruction", and "personalized instruction" (Tetzlaff et al., 2022). When students evaluate their teachers, the objectivity of the evaluation is often compromised by the perception of the popularity of the teacher, rather than an evaluation of the difficulty of the task, the approach to teaching and the nature of the tasks assigned to them (Tetzlaff et al., 2022). Conversely, when teachers engage in self-evaluation, they frequently present an image of themselves that aligns with their desired self-perception, resulting in substantial deviations from actual practice (Tetzlaff et al., 2022). The research conducted by the authors yielded a salient conclusion:

"By focusing on surface-level processes during lessons, we were only able to register the presence or absence of specific behaviour, without any information on the quality or adequacy" (Tetzlaff et al., 2022).

An earlier publication (Klieme, 2011) found that the category of "individual support" is not clearly defined, despite its long historical tradition. The author attempts to systematize understandings of individual support and distinguishes three concepts: support as a compensatory offer of pedagogical measures; facilitation as offering diverse learning paths within open learning and facilitation as internal differentiation within adaptive learning. However, the question of the teacher's decision-making process regarding the selection of one strategy over another in teaching remains unresolved. The text highlights the challenges faced by teachers in personalizing the management of time and adapting the learning environment, resources, and task difficulty to the individual needs of students. Additionally, the question of whether the student is interested in the subject matter or the activity being offered is raised.

The subject of research in modern literature is also the question of the influence of students' personal assessment of their abilities in the learning process. It has been demonstrated that these assessments influence the motivation to learn and the experience of one or another situation as successful or unsuccessful (Karlen, Hirt&Stebner, 2021). In order to feel sufficiently independent in their learning, students are willing to evaluate the adequacy of their behaviour and the level of their cognitive processes in relation to the goals they have set for themselves in the learning process (Karlen,Hirt,Stebner, 2021). Furthermore, it has been demonstrated that students possess metacognition skills, which enable them to overcome certain challenges encountered during the learning process. However, there is a paucity of research concerning the content of students' "hidden" theories about their learning abilities. Concurrently, these theories exert a substantial influence on the perception of learning actions as either successful or unsuccessful. Another salient aspect pertains to the students' perception of teaching quality. The statistical analyses conducted by the authors demonstrate a direct relationship between students' internal sense of coping with learning and patterns of response to school challenges, behaviour, and academic achievement.

The theories described in this section of the article represent the most significant trends in the current understanding of adaptive learning, and the theoretical ideas about it need empirical evidence and expansion of the possibilities for its diagnosis.

**Study design, sampling and instrumentation**

The objective of the research presented here is to respond to the need for a straightforward, user-friendly instrument for the diagnosis of students' self-assessment in the learning process. Concurrently, the objective is to delineate the cognitive-emotional sensitivity of each student during the lesson as a component of the self-assessment, facilitating the creation of resources that teachers can approach individually to each student. To this end, a special questionnaire was created to determine the cognitive-emotional appraisals of students. The items were selected from the corresponding scales in the Janke & Debus (1978) questionnaire. The questionnaire comprises seven scales, each with two items, namely: activity (eager, creative); concentration (interested, attentive); tiredness (passive, tired); extraversion (affable, pleasant); introversion (quiet, insecure); fear (uneasy, defenseless); and self-confidence (self-confident, tranquil). The items are determined on a three-point scale, with the following options: "Completely no", "Neither yes, nor no", and "Completely yes". The selection of scales is determined by the procedural nature of learning, as evidenced by the following factors:

- changes in students' approaches to learning over time;

- changes in students' approach to learning depending on the subject matter;

- changes in the level at which learning functions, with higher versus lower activity; higher versus lower concentration; higher vs. lower tiredness and so on;

- changes in the perception of the environment by students, as corresponding or as inconsistent with their attitude, which is manifested in extroverted or introverted behaviour;

- changes in the evaluation of their performance in learning, which is projected in their self-confidence;

- changes in the feeling of coping with learning situations, which could be established by the assessment of the experience of fear in learning.

The tracking of fluctuations in student appraisals would facilitate the modulation of the teacher's response through the implementation of suitable actions. This, in turn, would engender a higher degree of autonomy in the teacher's actions and for the manifestation of creativity in his/her professional behaviour. The students' appraisals would serve to moderate the teacher's expression of extreme authoritarianism, thereby establishing a benchmark for the quality of teaching. The correlation between the quality of teaching and students' academic performance is a salient factor in this context.

While research has been conducted on various aspects of students' academic behaviour (Betz, Andresen, 2014), there remains a paucity of knowledge regarding their subjective feelings concerning the teaching and learning process in the classroom (Jones, 2019). The present study proposes a questionnaire to address this research gap. In terms of content, the questionnaire follows the logic of the vertical and horizontal structure described by Rosch (Scherer, 2009). The vertical structure of the questionnaire is characterized by the definition of scales related to activity, concentration, tiredness, extroversion, introversion, anger, and self-confidence. Horizontal selection involves the designation of two adjectives that, in the opinion of the researcher, reveal important characteristics of the cognitive-emotional appraisal. These include "eager" and "creative" on the activity scale, and "passive" and "tired" on the tiredness scale. The remaining fourteen adjectives are designed to describe the emotional feelings of the students at a given moment, with the understanding that actions are stored in memory through their sensory effects and subsequently influence the planning of subsequent steps, as perceived by the individual (Eder, 2023). The activity and concentration scales are intended to capture the students' feelings related to the processing of learning content. The second scale incorporates the adjective interested, which illuminates the motivational aspect of learning, while the third scale describes, in a sense, the opposite of the first two – the feeling of passivity.

The extroversion and introversion scales are the subsequent two scales, which reflect opposite feelings of inclusion/exclusion from interaction in the lesson. The adjective pairs affable – pleasant and quiet – shy are employed. The anger and self-confidence scales also describe two opposite feelings. The adjectives "uneasy" and "self-confident" are used to describe the inner feelings experienced when coping with the challenges posed by the lesson, while "defenseless" and "tranquil" are used to describe how the student feels during the learning process.

The study was conducted in accordance with the requirements of the Declaration of Helsinki of the World Medical Association of 1964, as amended in 2024. The study was conducted in accordance with the ethical principles stated therein, with a focus on preserving the health, well-being, and rights of the subjects. Following the expression of interest and consent to participate by the students and teachers, they were informed verbally of the objectives of the study. The study was conducted only after clear consent to participate was expressed.

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**Research stages and measurements**

In the pilot study, five experts in the field of pedagogy and pedagogical psychology evaluated the proposed seven scales using the following degrees: "does not correspond", "corresponds somewhat", and "completely corresponds". The reliability of the constructed instrument was measured through Kendall's W coefficient. The results of the assessment are presented in Table 1.

**Table 1**

*Kendall 's W coefficient of concordance for scales in the questionnaire for measuring the procedural student's appraisals*

|  |  |
| --- | --- |
| Scale | Kendall's W |
| Activity | .583 |
| Concentration | .833 |
| Tiredness | .417 |
| Extaversion | .625 |
| Introversion | .800 |
| Fear | .576 |
| Self-confidence | .583 |

The data contained within the table demonstrate that two of the scales, namely concentration and introversion, exhibit a high degree of agreement between raters. For extraversion, the coefficient demonstrates good agreement, while for all others, the coefficient falls between 0.41 and 0.60, indicating moderate agreement. These coefficient values demonstrate the instrument's efficacy in conducting research.

The present study involved 202 sixth-grade students from a Bulgarian comprehensive school, whose relative age (in relation to the age at which they were expected to begin schooling) was 13 years. The schools are located in medium and small towns in the southern part of Bulgaria, and a total of eight classes participated in the study. The measurements were taken immediately during lessons in Bulgarian language, history, and biology. These measurements were taken on three occasions, with an interval of 12 minutes between each repetition, and it was estimated that each response took approximately one minute. Following the conduction of the research, the collected data were subjected to statistical processing, thus enabling the drawing of relevant conclusions about the reliability and validity of the instrument. The preliminary statistical hypothesis of the study posits the following: students' cognitive-emotional appraisals show no variability in subject-oriented learning.

In order to assess the psychometric properties of the questionnaire, a series of statistical procedures were employed, including the following: the calculation of descriptive statistics for each item; the assessment of scale reliability using the McDonald's coefficient; the comparison of subject-matters and phases of the lesson through a General Linear Model (Repeated Measures); the calculation of Pearson's correlation coefficients; and the determination of the strength of relationships between dependent and independent variables in the scales through Factor Analysis and Confirmatory Factor Analysis.

As illustrated in Table 2, the mean and standard deviation for one item of each scale are presented for the three phases of the lesson. It is evident that the means for each phase are similar, as are the standard deviations. This suggests that there are no statistically significant differences in cognitive-emotional appraisals when they are considered outside the context of the subject-matters.

**Table 2**

*Descriptive statistics for items in the three phases of the lesson (202 students)*

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Phase | Mean | Stand.Dev. |
| Eager | 1 | 2.2 | .68 |
|  | 2 | 2.17 | .70 |
|  | 3 | 2.18 | .72 |
| Attentive | 1 | 2.5 | .64 |
|  | 2 | 2.45 | .69 |
|  | 3 | 2.36 | .72 |
| Tired | 1 | 1.6 | .81 |
|  | 2 | 1.7 | .80 |
|  | 3 | 1.7 | .81 |
| Affiable | 1 | 2.31 | .71 |
|  | 2 | 2.2 | .75 |
|  | 3 | 2.2 | .78 |
| Quiet | 1 | 1.9 | .79 |
|  | 2 | 1.96 | .80 |
|  | 3 | 1.9 | .81 |
| Uneasy | 1 | 1.48 | .72 |
|  | 2 | 1.33 | .57 |
|  | 3 | 1.3 | .59 |
| Self-confident | 1 | 2.26 | .75 |
|  | 2 | 2.3 | .74 |
|  | 3 | 2.37 | .71 |

The second step in statistical measurements is the calculation of McDonald's coefficient. The results are presented in Table 3, after computing the values of the three measures.

**Table 3**

*McDonald's coefficient for scales in the questionnaire (202 students)*

|  |  |
| --- | --- |
| Scale | McDonald's coefficient |
| Activation | 0.648 |
| Concentration | 0.734 |
| Tiredness | 0.523 |
| Fear | 0.433 |
| Extraversion | 0.381 |
| Introversion | 0.530 |
| Self-confidence | 0.437 |

It is evident from the table that only introversion has a coefficient below 0.40. All other scales demonstrate a high or moderately high coefficient, suggesting the presence of relative scale stability. Concurrently, it can be assumed that the impact of individual fluctuations could give us new information about students' cognitive-emotional perceptions in the lesson. This assumption can be illustrated with Graph 1, which presents the correlations (t-test) between the three measurements of the activity in the Bulgarian language lesson for one of the classes.

**Graph 1**

*Intraindividual correlation in the three measures in the Bulgarian language class*



As demonstrated in Graph 1, there is considerable variation in the ratings provided by some students for the eager and creative items across the three phases of the lesson. Conversely, a notable degree of consistency in appraisal is evident among students, particularly during the second and third phases of the class, with items designated as creative (а2\_2, а2\_3). Conversely, the initial and secondary phases (a2, a1) exhibit heightened variability in eagerness. However, as the omega coefficient is widely acknowledged as being particularly sensitive to the internal consistency of the scales (Dunn, Baguley&Brunsden, 2014), it can be deduced that, despite intra-individual fluctuations, the items in the scales adequately reflect the characteristics of learning that are the focus of the study. The reliability and validity of the scale are further supported by the finding that the students' self-perception appraisals are realistic.

The statistical procedure General Liner Model (repeated measures) was employed to compare the mean values for the responses in the scales. A comparison of subjects revealed disparities in the cases are presented in Table 4.

**Table 4**

*Statistically significant differences between subject-matters (202 students)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subject Matter | Scale | Mean Difference | Std.Error | Sig. |
| Biology - History | Activation | .497 | .112 | .000 |
| Bulgarian Language- History | Activation | .379 | .100 | .000 |
| Bulgarian Language- History | Concentration | .220 | .109 | .045 |
| Biology - History | Extraversion | .256 | .102 | .013 |
| Bulgarian Language- History | Extraversion | .216 | .092 | .020 |
| History- Bulgarian Language | Introversion | .364 | .104 | .001 |
| Biology- Bulgarian Language | Introversion | .444 | .080 | .000 |
| History - Biology | Fear | .269 | .085 | .002 |
| History- Bulgarian Language | Fear | .248 | .076 | .001 |

The table illustrates the dynamics of cognitive-emotional appraisals within the framework of subject-matter's learning, with the selection of these subjects during the implementation of the study predicated on the differences in the educational content and in the status of the educational subject in the minds of the students. The Bulgarian language is considered a priority, while biology and history are regarded as subjects of lower rank. In the Bulgarian language classroom, grammatical rules are assimilated within a familiar linguistic context, whereas in the biology classroom, students encounter scientific concepts that are not yet part of their existing linguistic repertoire. In the history classroom, new facts are interpreted by employing familiar language constructions. It is evident that the students' focus and level of concentration are oriented towards the Bulgarian language and biology, and in the same subjects, students exhibit a higher degree of extraversion. Conversely, students exhibit a higher degree of introversion in biology and history compared to Bulgarian. Furthermore, anger manifests itself to a greater degree in history than in other subjects.

A further interesting finding emerges from a comparison of the phases of the lesson, which provides valuable insights into the dynamics of cognitive-emotional appraisals (Table 5 for a comprehensive overview of the findings).

**Table 5**

*Statistically significant differences between the phases of the lessons (202 students)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | Scale | Mean Difference | Std. Error | Sig. |
| First - Second | Activation | .092 | .039 | .020 |
| First - Third | Activation | .107 | .045 | .018 |
| First - Third | Concentration | .105 | .052 | .046 |
| Second - Third | Concentration | .089 | .041 | .033 |
| First - Second | Extraversion | .104 | .042 | .014 |
| First - Third | Extraversion | .100 | .047 | .035 |
| First - Second | Fear | .098 | .036 | .007 |
| First - Third | Fear | .117 | .037 | .002 |

\*The mean difference is significant at the .05 level.

Statistically, activation levels are found to be significantly higher during the initial phase of the lesson in comparison to the subsequent phases. A significant shift in concentration is observed in the third phase of the lesson, which can be attributed to the assumption of mobilising attention through testing in the first phase (a typical feature of the lesson structure in Bulgarian schools) and goal setting of learning in the second phase. In the third phase, concentration is associated with the initial testing of the new learning content. A notable observation is the parallel manifestation of extraversion and fear during the course of the lesson. These traits initially decline, subsequently rising in the latter two phases.This phenomenon can be attributed to the students' expectations, which are initially heightened by their interest in the new learning content and subsequently by their anxiety regarding the upcoming test.

Pearson correlations are shown in Table 6, with the calculations made after cumulative transformation of the items.

**Table 6**

*Pearson’s correlations between items in the seven scales of the questionnaire (202 students)*

|  |  |
| --- | --- |
| Scale | Index |
| Activity | .479 |
| Concentration | .580 |
| Tiredness | .354 |
| Extroversion | .276 |
| Introversion | .235 |
| Anger | .360 |
| Self  confidence | \*.280 |

\*Correlation is significant at the 0.01 level (2-tailed).

It can be seen that the correlation between interested and attentive in the concentration scale is high. The correlation between eager and creative in the activity scale is borderline high, and medium or low high in the other five scales. These data demonstrate that the selected items are in line with the main idea of the study, which is to determine as best as possible the process characteristics of emotional appraisals in learning. It is recommended that the concentration and activity scales be revised by incorporating adjectives such as "vigorous" and "alert" to more accurately reflect the physical state of the learner during the learning process. Alternatively, the pairs of adjectives included in both scales symmetrically reflect motivation and the quality of thought processes.This prompts the question of what the primary diagnostic task of the analysed instrument is and why the initially proposed adjectives could be retained.

Factor analysis (Principal component factor analysis) was the next procedure through which the research data was examined. The correlation matrix indicates that the inter-item correlations range from weak to medium - 0.10 to 0.39; from 0.40 to 0.69 (Schober, Boer& Schwarte, 2018). For instance, the correlation between 'eager' and 'interested' is 0.54, while for 'interested' and 'passive' it is -0.50; 'creative' and 'friendly' is 0.20; and 'defenseless' and 'tired' is 0.35.The Kaiser-Meyer-Olkin measure for all items is 0.742, and a Bartlett's test of sphericity is significant (.000). These measures allow for the interpretation of the assumption of three latent factors in the established data for the fourteen items, explaining 49.7% of the total variance. The varimax rotation method with Kaiser normalization reveals the content of the factors shown in Table 7.

**Table 7**

*Grouping of items after Principal component factor analysis (202 students)*

|  |  |  |
| --- | --- | --- |
| Items | Scales | Factor Loads |
| Factor 1 |  |  |
| Eager | Activity | .798 |
| Attentive | Concentration | .773 |
| Interested | Concentration | .717 |
| Passive | Tiredness | -.589 |
| Affordable | Extraversion | .585 |
| Creative | Activity | .536 |
| Pleasant | Extraversion | .529 |
| Self - confident | Self-confidence | .389 |
| Factor 2 |  |  |
| Uneasy | Anger | .773 |
| Shy | Introversion | .668 |
| Tired | Tiredness | .585 |
| Defenseless | Anger | .562 |
| Factor 3 |  |  |
| Quiet | Introversion | .795 |
| Tranquil | Self-confidence | .504 |

The new factor structure shows a clear distinction between willingness to act, refraining from active action and refraining from verbal participation in the process of interaction between teacher and students in the lessons. The factor loads, which reflect the correlations between observed and unobserved variables, are relatively high, with the exception of self-confidence. All other factor loads are above +.50, suggesting that the originally defined seven scales can be transformed into three: readiness to act; abstention from action; verbal intensity. The scales defined in this way would also provide teachers with practical information about the students' self-assessment of their cognitive-emotional state in each of the phases of the lesson. Changes in the first scale could indicate an increase in concentration and a desire to participate in the lesson; in the second - fluctuations in the physical aspects of the emotional state; in the third - the students' reluctance to engage in educational communication.

The subsequent phase of the statistical analysis involves confirmatory factor analysis, of the data for 202 students. Its results are presented in Table 8.

**Table 8**

*Confirmatory factor analysis for the scales following Principal component factor analysis (202 students)*

|  |  |  |
| --- | --- | --- |
| Fit measures | Readiness for action | Abstention from action |
| Chi-square | 38.463/df =16 | 37.571/df =6 |
| |  |  | | --- | --- | | Root mean square error of approximation (RMSEA) |  | | 0.08 | 0.16 |
| Goodness of fit index (GFI) | 0.99 | 0.99 |
| Tucker-Lewis Index (TLI) | 0.89 | 0.58 |

The results in Table 8

The results in Table 8 demonstrate that the construct validity of the questionnaire is consistent with the empirical statistical limits. For both scales, the Chi-square statistic rejects the null hypothesis at cut-off values, such as: 32/df=16 for the scale Readiness for action and 16.812/df =6 for the scale Abstention from action (p ≤0.001). The Root Mean Square Error of Approximation confirms the acceptability of the scientific model used to construct the Readiness for Action scale, with a cut-off value of 0.08 (Hooper, Coughlan, Mullen, 2008, 54). However, for the second scale – Abstention from action – the RMSEA value exceeds the accepted cut-off point of 0.10. However, the exclusion of the item 'tranquil' from the self-confidence scale, in contrast to the other items belonging to the anger, introversion and tiredness scales, results in a shift towards acceptable values for the indices of abstention from action: RMSEA = 0.084; GFI = 0.99; TLI = 0.85. This finding lends credence to the proposition of enhancing the structure of the resulting scale, a course of action that would be informed by conducting a principal component factor analysis and a thorough analysis of the parameter estimates.

**Discussion**

The research carried out provides interesting information about students' cognitive-emotional appraisals during lessons. The data prove the influence of time and learning content on the cognitive-emotional feelings of the students. The utilization of the omega ratio (McDonald's omega) facilitated the determination of the quality of the scales with a high degree of certainty, with moderately high values indicating the influence of complex social factors. The calculations demonstrate the dynamics in the content of the evaluations across the three phases of the lesson.

Despite the negligible disparities in the mean values for activity, they were statistically significant and exhibited a modest decline from the initial to the concluding phase (mean values 2.24 - 2.13). Concentration levels also exhibited fluctuations between the initiation, the midpoint, and the culmination of the lesson, reaching its zenith at the commencement and then undergoing a slight decrease (mean values 2.4 - 2.4 - 2.3). The manifestation of tiredness among the students was minimal, as evidenced by the tendency of the means to approach the null value. No statistically significant differences were observed between the phases of the lesson.

Conversely, extraversion manifested in varied forms across the three phases, with students predominantly perceiving themselves as amiable and affable. The students' self-perception as reserved and introverted was, as expected, met with disapproval. Their assessment remained consistently negative throughout the lesson, with an average rating of 1.8. The items "uneasy" and "defenseless", which are included in the anger scale, underwent a change in the three phases of the lesson, with higher scores at the beginning and a decrease in the subsequent phases. The differences between the means were statistically significant (means 1.39 - 1.29 - 1.27), yet the students did not feel threatened by their teacher's actions. The students' self-perception of confidence and their readiness to follow the teacher's instructions remained consistent throughout the lesson, with a mean score of around 2.4.

The influence of the social context on students' appraisal of their cognitive and emotional sensitivity is also manifested in the conditions of subject-oriented learning. Statistically significant differences in activity were observed among the students in history, Bulgarian Language and biology lessons. Students reported the highest levels of engagement in biology lessons (mean 2.4). This is not reflected in the assessment of concentration, which is characterised by interest and attention.On this scale, a statistically significant difference is observed between the classes of Bulgarian language and history (mean values 2.4 and 2.2, respectively).With regard to tiredness, no distinction was made by the students between the study conditions in the three subjects. This may be indicative of a shift in extroversion, manifesting in a different manner in the subjects of biology and history, and in Bulgarian Language and History, where a high degree of openness to others and a propensity for interaction is evident. Students self-appraisals manifest themselves as most introverted in biology (mean 1.98) and least distant and introverted in Bulgarian Language (mean 1.5). The degree of anger in all three subjects tends to be negative, but with corresponding fluctuations, respectively in history, biology and Bulgarian Language (mean values 1.5 - 1.2 - 1.4 respectively). Self-confidence does not manifest itself in a specific way in the lessons of the three subjects - it has the highest positive degree in Biology (average value 2.5).

Factor analysis contributed to a new perspective on the structure of the instrument. The factor loadings that were established revealed a novel method of categorising the items, primarily into two new scales. One scale pertains to the self-assessment of students' proactive behaviour, while the other scale concerns the potential disruption of communication in the classroom due to different forms of worries. The implementation of confirmatory factor analysis demonstrates relatively good construct validity on the questionnaire for the "readiness to act" and "abstention from acting" scales. The third scale, "verbal intensity", could be transformed. Further statistical analyses are required to ascertain how changes in the sample size would affect the chi-square statistic.

The findings demonstrate that the proposed questionnaire for procedural diagnostics of students' cognitive-emotional sensitivity has the potential to assist teachers in implementing adaptive learning. The tracking of parameters of learning behaviour, such as diligence, creativity, interest, increased attention, desire to interact with others, and the pleasure of doing so, would support the choice of strategies for collective, group, or individual activities in class. The phases of tiredness, distancing, and defensiveness would also give the teacher the opportunity to initiate learning actions that would help to overcome the emotional barriers in communication. Maintaining self-confidence is also of great pedagogical importance, as it is the psychological prerequisite for the formation of the student's autonomous behaviour, which in turn would promote his capacity for self-regulated learning.

Diagnosing the dynamics in the process of students' perception of the cognitive and emotional dimensions of their own behaviour is an important and necessary step in the research effort to validate the model for the provision and use of learning resources. Insofar as students' subjective appraisals are a reliable source of information about the flow of learning communication, it is important to take them into account when selecting goals and objectives. This is also confirmed by Sweller, Van Merrienboer&Paas in their detailed analysis of the problems of learning research in the context of cognitive load theory, as early as the 1990s. They write as follows:

"Subjective techniques are based on the assumption that people are able to introspect their cognitive processes and report the amount of mental effort they are expending." (Sweller, Van Merrienboer and Easter 1998:267)

The application of the situational approach to the manifestations of cognitive-emotional appraisals about communication in the classroom is also important from the point of view of the current discussion about indicators of quality in teaching. As Praetorius, Herrmann, Gerlach et al. (2020) have indicated, alongside the necessity for generative indicators of educational quality, subject-specific indicators are also required. The development of diagnostic tools, such as those proposed in this article, would assist in identifying the specific dimensions of educational quality in accordance with students' perceptions of their well-being. This would facilitate the realization of the concept of adaptive education in everyday pedagogical practice.

The data from the present study support the aforementioned points and once again prove the reliability of students' appraisals of the subject-matter learning process. They demonstrate a conscious and logical approach to describing their own perceptions of when they are active and when they are passive; of the need for interaction with others; and of the negative influence of 'closing in' on the learning process. The findings of the study also demonstrate that students do not experience feelings of tiredness or perceive their teachers as a threat when carrying out instructions. The analysis provides a clear demonstration that the development of such diagnostic tools is imperative for the assessment of emotional processes that occur in the educational environment. Although not all data are statistically significant, the influence of different factors on emotional perceptions becomes evident, including time and subject-matter. It can be posited with a high degree of confidence that individual differences among students, diverse teaching styles, and the structure and general dynamics of classroom relationships influence students' perceptions and their cognitive-emotional judgments. This is evident from the complex fluctuations in the correlated assessments of a subject within the same class.

Further analyses of data from this and other samples would provide further insights into the impact of teaching on students' self-confidence. The study of this component in process diagnostics is of great importance for self-regulated learning and for the affirmation of the concept of transformative learning, as described by Khine (2024) and Schild. Undoubtedly, at the current stage of the development of pedagogical practice, efforts are needed to penetrate the diagnostics into the "hidden mechanisms" of the perception of learning. The act of recording the process of self-reflection by students will provide researchers and teachers with invaluable knowledge, which will in turn inform the implementation of innovative strategies for the organization and delivery of learning in the classroom. The brevity of the scales is advantageous in that it provides reliable and accurate information regarding the cognitive and emotional aspects of teacher-student interaction.

**Conclusion**

The process diagnostics of the cognitive-emotional appraisals of the students is an important condition for the realization of the learning and instruction in the context of the efforts for a higher degree of their individualization by offering a greater number of alternatives in the practice. Students' appraisals of their activity, concentration, tiredness, extroversion, anger are an important source of information for not only learning but also for teacher decision-making. The content of these appraisals serves as a mediating component between teachers' intentions and students' final learning outcomes, which are a crucial aspect of educational quality and effectiveness. However, operationalizing the categories of activation, concentration, tiredness, extroversion, introversion, and anger for the purpose of procedural diagnostics encountered some difficulties. Despite the acceptable McDonalds coefficient, it was deemed acceptable to combine the categories into two factors. The subsequent Confirmatory Factor Analysis confirmed the rationality of this regrouping.

The application of the questionnaire also demonstrates the attitudes of 13-year-old students for an adequate assessment of their emotional state and cognitive activity during lessons. The responses obtained serve to illuminate their conceptualizations concerning the relationships between extroversion, introversion, anger, activity, concentration, and tiredness. It is also important that students feel confident in the engagement process. This is of particular importance for competence-oriented education, for which the feeling of autonomy of actions is a basic prerequisite.

The critical perception of the various stimuli present in the social environment gives rise to the dynamics in the appraisals of academic subject-matters in all three phases of the lesson.This phenomenon is of particular interest from the perspective of age-related development of the capacity to recognize emotions and cognitive processes. The establishment of this capacity would facilitate the expansion of indicators for evaluating optimal and quality education in comprehensive schools. In future research, it would be beneficial to ascertain the impact of specific pedagogical practices on the cognitive-emotional appraisals of students. Such practices may include open learning, tightly controlled teaching in clearly defined steps or grouping by ability, by the time of the learning task, and by its complexity. A further significant area for research could be the influence of the general socio-psychological climate of the school on cognitive-emotional feelings, for example, whether a school that works purposefully for the well-being of students compared to one that implements routine practices for organising activities is better.These perspectives underscore the efficacy of the endeavors undertaken to develop and evaluate the questionnaire outlined in the article.

**References**

Betz, T., Andresen, S. (2014). Child Well-being. Potenzial und Grenzen eines Konzept. *Zeitschrift für Pädagogik*, 60, 4, 499-504.

Council conclusions on supporting well-being in digital education. In: [[st14982-en22.pdf (europa.eu)](https://www.consilium.europa.eu/media/60391/st14982-en22.pdf)] [https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX: 52022XG1209(01)/](https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:%2052022XG1209(01)/) Accessed 12 December 2022

Dinsmore, D.L. (2017). Toward a dynamic, multidimensional research framework for strategic processing. *Educational Psychology Review*, 29 (2), 235-268. [https://doi.org/10.1007/s10648-017-9407-5](https://psycnet.apa.org/doi/10.1007/s10648-017-9407-5)

Doyle, W. (1985). Effective Teaching and the Concept of Master Teacher. *The Elementary School Journal*, 86, (1),27-33. [https://doi.org/10.1086/461433](https://psycnet.apa.org/doi/10.1086/461433)

Dunn, T.J., Baguley, Th. &Brunsden, V. (2014). “From Alpha (α) to omega: A practical solution to the pervasive problem of internal consistency estimation”, *The British Journal of Psychology*, 105(3), 399-412. DOI: [10.1111/bjop.12046](https://doi.org/10.1111/bjop.12046)

Eder, A.B. (2023). A perceptual control theory of emotion action. *Cognition and Emotion,* 37(7), 1167-1184. doi.org/10.1080/02699931.2023.2265234

Hascher, T. (2010). Learning and emotion: perspectives for theory and research. *European Educational Research Journal*, 9(1),13-28. http://dx.doi.org/10.2304/eerj.2010.9.1.13

Hascher, T., Hagenauer, G. (2010). Schulisches Wohlbefinden im Jugendalter – Verläufe und Einflussfaktoren. Inttel et al.(Hrsg.) *Jahrbuch Jugendforschung* ( S.15-45). Wiesbaden GmbH: VS Verlaf für Sozialwissenschaften, Springer Fachmedien.

Hooper, D., Coughlan, J., Mullen, M. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *The Electronic Journal of Business Research Methods,* 6 (1), 53 – 60.

Janke, W., Debus, G. (1978). *Die Eigenschaftswörterliste (EWL) Eine mehrdimensionale Methode zur Beschreibung von Aspekten des Befindens*. Göttingen, Toronto, Zürich:Verlag für Psychologie - Dr. C,J, Hogrefe.

Karlen, Yv., Hirt, C., Stebner, F. (2021). Fähigkeitstheorien zum selbstregulierten Lernen: Die Bedeutung von impliziten Theorien und Fähigkeitsselbstkonzept für das Lernen und die akademische Leistung. *Unterrichtswissenschaft*,49(4), 503-524. <https://doi.org/10.1007/s42010-021-00131-w>

Keller, St., Steffensky, M., Winkler, I., Lindmeier, A. u.a.(2024). Kognitive Aktivierung in den Fachdidaktiken: ein fachübergreifendes, fachspezifisches und lerngegenstandsorientiertes Konstrukt. In An.-K. Praetorius, Wemmer-Rogh, W., Schreyer, P., Brinkmann, M.(Hrsg.) *Kognitive Aktivierung unter der Lupe. Bestandsaufnahme und Möglichkeiten der Weiterentwicklung eines prominenten Konstrukts*. (S. 233-247). Münster, New York: Waxmann. https://doi.org./10.31244/9783830999010.

Khine, M.S. (2024). Self-regulated Learning. In: Khine, M.S. (eds) *Motivation Science*. Springer, Singapore. <https://doi.org/10.1007/978-981-97-9247-4_4>

Klieme, Eckh., Rakoczy, K. (2008). Empirische Unterrichtsforschung und Fachdidaktik. *Zeitschrift für Pädagogik,*54 (2), 222-27.

Moors, A., Ellsworth, Ph., Scherer, Kl., Frijda, N. (2013). Appraisal theories of emotion: the state of the art and future development. *Emotion Review*, 5(2), 119-124. DOI: [10.1177/1754073912468165](http://dx.doi.org/10.1177/1754073912468165)

Pollock, E., Chandler, P., Sweller, J. (2002). Assimilating complex information. *Learning and Instruction*, 12, (1), 61-86. [https://doi.org/10.1016/S0959-4752(01)00016-0](https://psycnet.apa.org/doi/10.1016/S0959-4752(01)00016-0)

Praetorius, A.-K., Gräsel, C. (2021) Noch immer auf der Suche nach dem heiligen Gral: Wie generisch oder fachspezifisch sind Dimensionen der Unterrichtsqualität? *Unterrichtswissenschaft*, 49, 167-188. https://doi.org/10.1007/s42010-021-00119-6

Praetorius, A.-K., Kleickmann, Th. (2022). Nutzung von Lerngelegenheiten im Unterricht: Konzeptuelle und methodische Zugänge und Herausforderungen – Einführung in den Thementeil. *Unterrichtswissenschaft*, 50, 4, 149-155. https://doi.org/10.1007/s42010-022-00145-y

Richardson, J. (2017). Student learning in higher education: a commentary. *Educational Psychology Review*, 29 (2), 353-362.https://doi.org/10.1007/s10648-017-9410-x

Scherer, Kl. (2009). The dynamic architecture of emotion: Evidence for the component process model. *Cognition and Emotion*, 23(7), 1307-1351. DOI: 10.1080/02699930902928969

Schild, K., Leng, M., Hammer, Th. (2019). Die Rolle von transformativem Lernen für eine Bildung für nachhaltige Entwicklung an der Hochschule. *Werte in der Hochschullehre*. VSH-Bulletin 45/2, VSH: Vereinigung der Schweizerischen Hochschuldozierenden. [doi/10.7892/boris.132869](http://dx.doi.org/10.7892/boris.132869)

Schober, P. Boer, Chr., Schwarte, L., (2018). Correlations coefficients: appropriate use and interpretation. *Anesthesia&Analgesia*, 126(5),1763-1768. DOI: [10.1213/ANE.0000000000002864](https://doi.org/10.1213/ane.0000000000002864)

Seidel, T.(2014). Angebots-Nutyungs-Modelle in der Unterrichtspsychologie. *Zeitschrift für Pädagogik*, 60(6),850-866.

Sweller, J. (1994). Cognitive load theory, learning difficulty and instructional design. *Learning and Instruction*, 4, 295–312. [https://doi.org/10.1016/0959-4752(94)90003-5](https://psycnet.apa.org/doi/10.1016/0959-4752(94)90003-5)

Tetzlaff, L., Hartmann, Ulr., Dumont, H., Brod, G. (2022). Assessing individualized instruction in the classroom: Comparing teacher, student, and observer perspectives. *Learning and Instruction*, 82 (6),101655. DOI: [10.1016/j.learninstruc.2022.101655](http://dx.doi.org/10.1016/j.learninstruc.2022.101655)

Vermunt, J. D., Donche, V. (2017). A learning patterns perspective on student learning in higher education: state of the art and moving forward. *Educational Psychology Review*, 29(2), 269-299. https://doi.org/10.1007/s10648-017-9414-6

Wang, M.C., Walberg, J.H. (1983). Adaptive Instruction and Classroom Time. *American Educational Research Journal*, 20(4),601-626. DOI:10.3102/00028312020004601

Wemmer-Rogh, W., Praetorius, An.-K W., Schreyer,P., Herbert, B. (2024). Konzeptualisierung und theoretische Fundierung von kognitiver Aktivierung: Ein kritischer Literaturüberblick.In An.-K. Praetorius, Wemmer-Rogh, W., Schreyer, P., Brinkmann, M.(Hrsg.) *Kognitive Aktivierung unter der Lupe. Bestandsaufnahme und Möglichkeiten der Weiterentwicklung eines prominenten Konstrukts*. (S.15-51). Münster, New York: Waxmann. https://doi.org./10.31244/9783830999010.

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