

# AN ANALYSIS OF LEARNERS' DEGREE OF ACTIVATION IN INDUCTIVE LESSONS FOR DIFFERENT WHITE COLLAR COURSES AT GERMAN VOCATIONAL COLLEGES

BJÖRN PAAPE, CHRISTOPH MAUS, IWONA KIERETA,  
STEFFEN BOBMANN, KRISTINA EICHBERG, MATHIAS  
JENDRYKA, FRANK KOFFERATH, EDUARD RATH,  
ELISABETH RÜTTERS

RWTH Aachen University, Didactics of Economics, Aachen, Germany  
paape@wiwi.rwth-aachen.de, maus@wiwi.rwth-aachen.de, kiereta@wiwi.rwth-  
aachen.de

**Abstract** The objective of this teacher training project is to examine the degree of learner activation during inductive lessons given at vocational colleges to students of various courses in the subject area of economics. The hypothesis that inductive teaching is more suitable for courses at a lower educational level and that it has a positive impact on learner activation is confirmed. Insights are offered that provide opportunities for teachers of economics at vocational colleges to suitably use this teaching method in their daily work. It is shown that inductive lessons are effective for both of the examined educational levels; however, with regard to increasing motivation and avoiding boredom as well as maintaining concentration, the inductive form of teaching is more effective at the lower educational level.

**Keywords:**

vocational  
education,  
learners  
activation,  
didactics



DOI <https://doi.org/10.18690/um.fov.3.2023.60>  
ISBN 978-961-286-722-5

---

## 1 Introduction: Research question, state of research, and research gap

There is controversial debate about the correct method of teaching. Is frontal teaching preferable, where the focus is on the teacher who conveys knowledge to her students, or is a more cooperative form of teaching preferable which involves a large amount of group work? Is frontal teaching being replaced by a more learner-focused teaching approach? By now, the latter approach has been broadly disseminated with the help of inductive methods. It is intended to help learners to penetrate a learning topic more deeply, to store gained knowledge in the long-term and – due to the activation of individual degrees of prior knowledge – to increase a learner’s participation. Further to this, the definition of “learning” is undergoing change. According to Weinert, learners should be given the opportunity “to understand the knowledge to be acquired and the problems to be solved as part of a subjectively meaningful context (Weinert 1996:66).”<sup>1</sup> This perspective is consistent with inductive teaching concepts. However, does it mean that these are the key to activating learners? Should these teaching methods be used in all classes and all school forms for all subjects and topics?

For many years now, the teaching concept known as “The Nurnberg Funnel” has been regarded as antiquated; new concepts have replaced it. One of them, stemming from the inductive approach, has come to the forefront – learner activation: learners acquire knowledge themselves, link it to content they have already learned or to their own experiences, and recognize rules (cf. Fisher, Frey, Lapp 2012:22). The traditional differentiation between teaching and learning is replaced by a cognitivist-constructivist perspective, where the learners themselves becomes the constructors of their knowledge. Knowledge is not passed on to the learners by the teacher; it has to be actively acquired and construed. Impulses from the teacher activate the learner. Learners are confronted with different topics which they have to work through situationally and cooperatively (cf. *ibid*). It must be the objective of any lesson to activate the learners and particularly to ensure that the activation remains as constant as possible in order to achieve a construction of knowledge. An activation can primarily be achieved through creating an emotional relationship with the subject of

---

<sup>1</sup> Authors’ own translation from the German

the lesson. For instance, this can take the form of addressing an individual case, thus corresponding to an inductive approach (cf. De Jong 2009:25).

The term “induction” originates from the Latin and means “to lead in”. Thus, inductive teaching is understood as “a stepwise progression leading on from individual instances and particular instances to generalizations.” Individual instances are examined through recognizing, describing, comparing, ordering, and abstracting. “The result is a generalization (Köck, Ott 1994:322).”<sup>2</sup> This means that the teacher presents a specific, student-oriented case, with the help of which a theory or rule should be learned. A procedure of this kind is described as being “bottom-up”. This means that the learners should where possible recognize by themselves which rule should serve as a basis and can potentially retain the findings better and more long-term with the help of the example. According to Köck and Ott (1994:322), personal experiences of the learners are called up through the inductive organizational structure, which is why this is an appropriate procedure for a “young” group of learners. In contrast, “deduction” (Latin: to lead away) implies logically deducing things and facts. Here, specific items are logically deduced from the “general picture”. During a lesson, learners can autonomously derive another quantity from two known quantities. When doing so, learners have to recognize the relationship and the existing rule between the given quantities in order to derive a new quantity that follows the same rules. Thus, learners are able to recognize interdependencies, to discover similarities, and to transfer the unknown to the known. This process can be described as “top down” learning. It is apparent that this procedure is challenging for learners and, in contrast to inductive approaches, this approach requires autonomy from a class. It is, then, more suitable for experienced learners. Through its application, learners are taught to be able to explain individual phenomena by themselves later on in their lives (cf. Köck, Ott 1994:322). This procedure requires a high capacity for abstraction, since deductive teaching begins with “conceptual-abstract preliminary explanations (Meyer 2006:126).”<sup>3</sup> Meyer regards the ability to abstract to be decisive for scholastic success and crucial to learners’ further educational paths, since the construct “school” conveys purely theoretical knowledge in the field of economics, usually in the form of a model – the ideal case

---

<sup>2</sup> Authors’ own translation from the German

<sup>3</sup> Authors’ own translation from the German

---

– and is not representative of reality in the world of business and economics (cf. Meyer 2010:215). Therefore, in contrast to the inductive approach, the deductive approach is associated more with the future, because learners will face abstract situations in their future lives and careers. When this approach is applied within the sheltered atmosphere of the institution “school”, it enables learners to explore and test their abilities there.

In the classroom, a combination of both approaches can make sense. In order to facilitate the storing of new knowledge and to examine further case studies with regard to the legitimacy of a rule, deduction is introduced in a later elaboration phase after that rule has been learned (induction) (cf. Köck, Ott 1994:322).

However, at the same time, Meyer warns that solely applying the deductive teaching approach leads to “apathy and an avoidance of content-sensitive engagement with the topic (Meyer 2010:215).”<sup>4</sup> Owing to the small-stepped implementation of the lesson, the problem may also arise that some learners feel under-challenged and that the before-mentioned autonomy disappears if teacher guidance is too strong. In such a case, the advantage of this type of teaching approach is null and void and the implementation of the approach would be worthless for the participants.

The choice of approach is also dependent on what the learning goal is or what topic is to be addressed. If the skill to be learned is more of a basic and non-complex one, then “strong teacher guidance”<sup>5</sup> (cf. Renkl: no year) can indeed be applicable. When complexity increases and a deep understanding is required, learners should be assigned a “more mentally active role”<sup>6</sup> (ibid.), which includes, for example, cooperation in groups and activation of prior knowledge. Consequently, induction is a (more) suitable method for learning goals of this kind. The method can be applied in “project lessons, cooperative learning, learning with computer-based simulations, etc.”<sup>7</sup> (ibid.), all of which belong to concepts of situative learning. Moreover, inductive lessons involve greater time and preparation input than deductive lessons do. A combination of the two approaches for everyday teaching,

---

<sup>4</sup> Authors’ own translation from the German

<sup>5</sup> Authors’ own translation from the German

<sup>6</sup> Authors’ own translation from the German

<sup>7</sup> Authors’ own translation from the German

tailored to the group of learners, can – due to the a.m. aspects – be most useful for the teacher as well as for the class (cf. Meyer 2010:215). The choice of teaching method is determined by the subject-content construction and by the target group (i.e. the class or individual learners). Through the alternating of inductive and deductive teaching methods and lesson design, a greater degree of learner activation is aimed for in order to be able to productively shape the subsequent lesson progress. It is not clear whether, apart from personal characteristics of individual learners, overlapping factors exist which determine the choice of method in dependence on the learners. It would be conceivable that, in various vocational courses where each involves a different level of education, it might be more expedient to use different types of teaching. However, in the context of economics teaching, there are no comprehensive research findings available.

## 2 Creation of hypotheses

The choice between a deductive and an inductive approach is a basic aspect when planning a lesson and implementing it. In particular in vocational colleges, lessons are built around examples from the life environment of learners and trainees/apprentices in order to awaken their interest and to have a direct connection to the content of their future occupations. But does an inductive lesson really awaken learners' interest and thus increase student activation? It is precisely this question that the current project will address. It will also compare different vocational courses to examine whether an inductive approach leads to greater activation in a class at a lower educational level than in classes at a higher level of education.

The corresponding hypothesis to be tested is the following:

**Hypothesis:** *Inductive teaching at a lower educational level activates learners more strongly than at a higher educational level.*

## 3 Design of study

In order to answer the research question, we selected a quantitative approach, where learners at vocational colleges in Germany are questioned at the end of a lesson with

the help of a questionnaire. Lessons presented by university students as part of their practical training semester served as a basis for participants' evaluations.

As expected, an inductive approach was chosen for the lesson concept. For the selection of vocational courses, care was taken to ensure that the classes were as homogenous as possible with respect to age and to previous education. As a comparison of the impact of inductive teaching between higher levels and lower levels of education was intended, these two factors were firstly defined. To do so, the indicator was taken as the latest school leaving qualification at the time of the survey. The higher level vocational courses in this study were selected as those classes where at least 75% of the participants held a *Fachhochschulreife* polytechnic-entrance qualification or higher. The lower levels of education were defined as those where 75% of the learners in a lesson held at least the *Fachoberschulreife* (up to 12<sup>th</sup> grade) qualification. The following vocational programs were duly allocated to the two different levels of education:

Higher level of education		Lower level of education
Salespersons – wholesale and foreign trade Automobile salespersons Vocational secondary school		Retail salespersons 2-year advanced vocational college Electronics technician

**Figure 1: Categorizing the level of education**

The questionnaire that was used was compiled as follows:

- Basic details (age, gender, educational program, already acquired educational qualification)
- Questions on the lesson (perception of the speed and difficulty of the lesson)
- Questions about the students themselves (their feeling of personal enthusiasm, concentration, connectedness, motivation, etc.)

The basic details primarily serve the objective of categorizing participants' degree of education and confirming that a class is sufficiently homogenous. The questions about the lesson and the questions about the students themselves form the core of the analysis. They are used to ascertain the impact of an inductive lesson on learners. Regarding the research instrument to this aim, nine items were chosen which could be associated with this effect. With items one to five, the visible features of the inductive lesson were evaluated by the learners. Amongst other things, the introductory example (Item 1) – which is always a part of the inductive lesson – and the pace of the lesson (Item 4) were evaluated. The other items served to examine the effect of this teaching approach on the participants. Hereby, the degree of learner activation is of decisive importance, which is why, for example, an estimation of a learner's concentration during the lesson (Item 7) was required. For all items, a 6-point Likert scale was used ranging from “very strongly agree” to “very strongly disagree”. The reason for using an even number of points was to avoid having too many neutral responses (cf. Kumar 2011:170). 57 questionnaires were collected from the vocational courses with a lower educational level and 48 from those with a higher educational level.

## 4 Results of the study

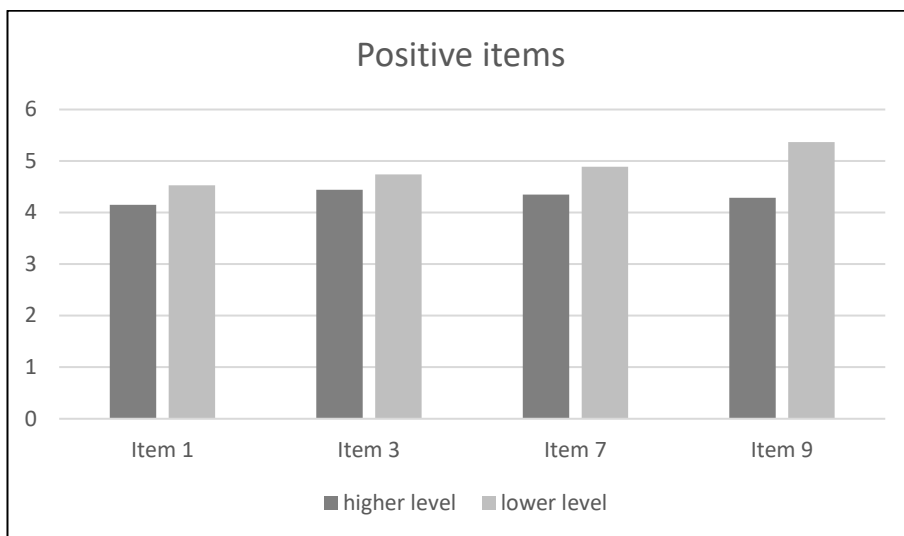
### 4.1 Evaluation process

To test our hypotheses, the mean values of the items are formed. In order to be able to make meaningful statements, we carry out a two-sample t-test. For this test, an Alpha error of smaller than 0.05 is set. This means that with regard to the comparable mean values of the individual items in both groups, only those are regarded as actually significant that have a certainty of more than 95% (cf. Schnell, Hill, Esser 2013:441ff.).

### 4.2 Results for the hypothesis

**Hypothesis:** *Inductive teaching at a lower educational level activates learners more strongly than at a higher educational level.*

In order to evaluate the data collected from the learner survey, two categories were formed. The first one is concerned with the positively formulated questions; the second one with the negatively formulated questions. The reason for the different formulations stems from the risk of acquiescence, which can lead to biased results (cf. Singleton, Straits 2005:93). For a better overview, the positive and negative items are shown and interpreted separately.



**Figure 2: Mean values of the positive items**

Figure 2 compares in graph form the mean values of the positive items 1, 3, 7, and 9 of the higher (dark) and the lower educational level. The following tables provide a detailed overview of the individual mean values and standard deviations.

**Table 1: Mean values of the positive items at a lower educational level**

Lower educational level	Item 1	Item 3	Item 7	Item 9
Mean value	4.53	4.74	4.89	5.37
Standard deviation	1.09	0.78	1.25	0.67



**Table 2: Mean values of the positive items at a higher educational level**

<b>Higher educational level</b>	Item 1	Item 3	Item 7	Item 9
Mean value	4.15	4.44	4.35	4.29
Standard deviation	1.14	1.02	1.41	1.40

The mean value of the learners with a lower education level for Item 1 is 4.53 (MWniedrig) and is different from that of the participants with a higher educational level. For the latter, Item 1 – which measures the interest aroused by the introductory example – is 4.15 (MWhoch). This leads us to infer that the interest of learners with a lower educational level was aroused slightly more. For both groups, the spread of values is at a similar level with a standard deviation (SD) of SDniedrig = 1.09 for the lower educational level und SDhoch = 1.14 for the higher educational level. For the mean values of Item 3, findings are similar. With a mean value of MWniedrig = 4.74 for Group 1, it becomes clear that the introductory example contributed somewhat more strongly to comprehension than it did for Group 2 (MWhoch = 4.44). The values for Group 1 – with a spread of SDniedrig = 0.78 for the lower educational level – are closer together than those for the higher-level Group 2 (SDhoch = 1.02).

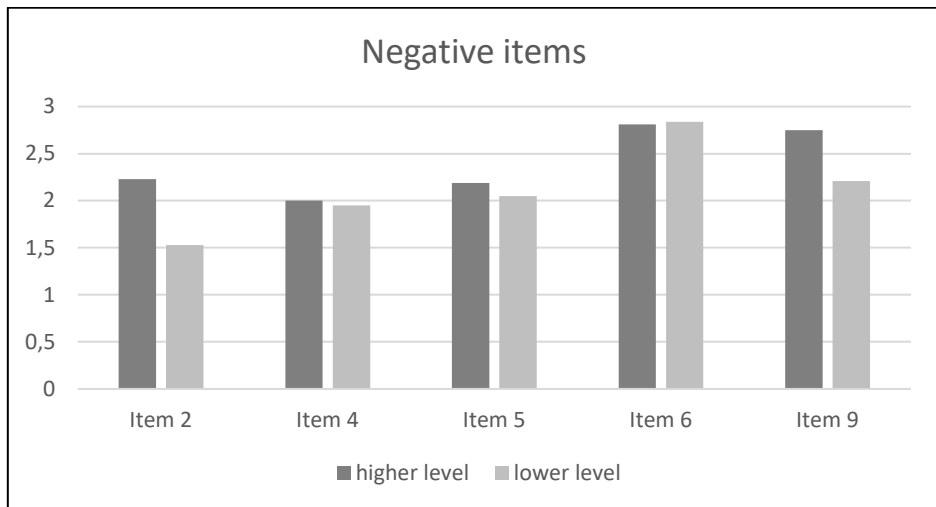
With regard to the remaining positively formulated items, again we see that the mean values for the lower educational level are higher than those for the lower educational level. This can be seen for Item 7 (MWniedrig = 4.89 for lower educational level vs. MWhoch = 4.35 for higher educational level), which asks about learners' level of concentration. It can also be seen in Item 9, (MWniedrig = 5.37 for lower educational level vs. MWhoch = 4.29 for higher educational level), which asks about the enjoyability of the (inductive) lesson. For Item 9, the difference between the mean values is substantial. The same applies to the spreads: with SDniedrig = 1.25 for the lower educational level and SDhoch = 1.41 for the higher educational level with regard to Item 7, there is not such a large difference in spread, in contrast to Item 9 (SDniedrig = 0.67 for lower educational level and SDhoch = 1.40 for higher educational level).

**Table 3: t-Test of the positive items**

Significance values (t-Test)	Item 1	Item3	Item 7	Item 9
p-Value	0.0833	0.1033	0.0440	0.000
Certainty	91.17%	45.37%	95.60%	100%

With regard to the comparable mean values of the individual items of both groups, only those regarded as being actually significant are those that have a certainty of above 95% (cf. Schnell, Hill, Essert 2013:441ff.). This is the case for Item 7 and Item 9, which address concentration and enjoyment, respectively. Items 1 and 3, on the other hand, show no certainty.

Figure 3 is a comparison in graph form of the mean values of the negative Items 2,4,5, 6, and 8 for both educational levels

**Figure 3: Mean values of the negative items**

The following tables provide a detailed overview of the individual mean values and standard deviations.

**Table 4: Mean values of the negative items – lower educational level**

<b>Lower educational level</b>	Item 2	Item 4	Item 5	Item 6	Item 8
Mean value	1.53	1.95	2.05	2.84	2.21
Standard deviation	0.75	1.19	1.10	1.95	1.51

**Table 5: Mean values of the negative items – higher educational level**

<b>Educational level high</b>	Item 2	Item 4	Item 5	Item 6	Item 8
Mean value	2.23	2.00	2.19	2.81	2.75
Standard deviation	1.00	1.17	1.15	1.63	1.38

Item 2 is concerned with whether, from their perspective, learners agreed that the lesson was “boring”. For both levels of education, agreement with this statement was rather low. In the vocational courses at a lower level of education, agreement was even lower.

The mean values are 1.53 (MWniedrig) for the lower level of education and 2.23 (MWhoch) for the higher level. The standard deviations are also rather far apart (SDniedrig=0.75 for the lower level and. SDhoch=1.00 for the higher level). Thus, here we observe a greater degree of the feeling of “boredom” in vocational courses at a higher level of education.

Items 4 and 5 address whether the pace at which learning material was presented was too fast and whether the topic introduced in the lesson was too broad. Here, too, agreement tended to be rather low for both categories of vocational courses and, with respect to the mean values for both items, there are no big differences (for item 4: MWniedrig=1.95 for the lower level of education vs. MWhoch=2.00 for the higher level; for item 5: MWniedrig=2.05 for the lower level vs. MWhoch=2.19 for the higher level). Likewise, hardly any differences can be found in the standard

deviations (for Item 4:  $SD_{niedrig}=1.19$  for the lower level of education and  $SD_{hoch}=1.17$  for the higher level and for Item 5:  $SD_{niedrig}=1.10$  for the lower level and  $SD_{hoch}=1.15$  for the higher level). Consequently, the pace and the breadth of the lesson were evaluated similarly and there were no deviating results between the two levels of education.

Also, for the next negative item, Item 6, the mean values are practically identical. This item addresses the perceived disinterest of the learners and is assessed almost the same at both levels of education ( $MW_{niedrig}=2.84$  for the lower level of education and  $MW_{hoch}=2.81$  for the higher level). There is a slight difference with regard to the standard deviation only ( $SD_{niedrig}=1.95$  for the lower level of education and  $SD_{hoch}=1.63$  for the higher level).

Finally, with the last negative item, Item 8, we examined whether participants agreed that they were in a state of mind that they would themselves describe as “unenthusiastic”. For the mean values, the tendency to agree with this statement within the lower level of education ( $MW_{niedrig}=2.21$  and  $SD_{niedrig}=1.51$  for the lower level) is even lower than for the higher level of education ( $MW_{hoch}=2.75$  und  $SD_{hoch}=1.38$ ). Lack of enthusiasm is, then, apparently rather more widespread among the higher level vocational courses.

In order to provide a more exact observation of the findings, we now present an overview of the significance levels with regard to the mean value differences for both levels of education.

**Table 6: t-Test of the negative items**

Significance values (t-Test)	Item 2	Item 4	Item 5	Item 6	Item 8
p-Value	0.0002	0.8222	0.5463	0.9333	0.0607
Certainty	99.98%	17.78%	45.37%	6.67%	93.93%

As a p-value of 0.05 or smaller may be regarded as evidence for a statistical significance, we can only make a definite statement on the negative items regarding the effect of Item 2 (finding the lesson boring). It is only in this case that the difference between the mean values of both the lower and the higher level of education can be described as statistically significant

## 5 Conclusions, limitations, and future research

Although our striving was to obtain valid and reliable results as far as possible, we cannot completely rule out any disturbance factors. As six trainee teachers with different personalities and diverse student-teacher relationships participated in this research project, this might be a potential disturbance factor. Similarly, the (prescribed) topic of the lesson might influence the study. Moreover, external factors, such as the timing of the lesson (position in timetable/time during the school year) and student-dependent factors (atmosphere in classroom, daily form of a student) might impact results (cf. figure 4).

Disturbance factors
<ul style="list-style-type: none"><li>• Teacher-student relationship</li><li>• Timing of lesson</li><li>• Divergence of subject areas or courses</li><li>• Quality of the lesson</li><li>• Atmosphere in classroom</li><li>• Divergence of performance within the group at the higher educational level or within the group at the lower educational level</li><li>• Topic of the lesson</li></ul>

Figure 4: Disturbance factors

On the basis of the mean values from Section 4, we can establish that the inductive lesson is somewhat more supportive and effective in the courses at the lower educational level. However, the results of the t-test show that only three of the nine items show statistical significance in this context. With regard to the aspects of an inductive lesson, which were examined via these three items, we can say that there is a different effect, although to a rather limited extent. For the rest of the items

---

which cover further aspects of inductive teaching, we cannot make any definite statements. We can, then, not fully confirm our hypothesis.

A further conspicuity is to be found in the overall result: For all items at both levels of education, inductive teaching is received favorably on the whole. This can be seen in the high tendency of agreement among all learners on the positively formulated items and in the low tendency of agreement among all learners on the negatively formulated ones.

Since inductive teaching is multi-faceted, an analysis of all areas of this teaching principle is potentially too complex. Further and deeper research could address the remaining items. Qualitative methods – such as conducting interviews with learners at both levels of education – could supplement the quantitative research methods.

## References

- De Jong, T. et al. (2009): Explorations in learning and the brain. New York: Springer.
- Fisher, D.; Frey, N.; Lapp, D. (2012): Building and activating students' background knowledge: It's what they already know that counts. *Middle School Journal*, pp. 22 - 32. Available from: <http://mathenrich.pbworks.com/w/file/attach/52803823/BuildingandActivating.pdf> [Retrieved: 20.08.2016].
- Kumar, R. (2011): *Research Methodology – a step by step guide for beginners*. London: Sage Publication.
- Köck, P.; Ott, H. (1994): *Wörterbuch für Erziehung und Unterricht*. Donauwörth: Auer.
- Meyer, H. (2006): *Unterrichts-Methoden I: Theorieband*. Frankfurt am Main: Cornelsen.
- Meyer, H. (2010): *Unterrichts-Methoden II: Praxisband*. Frankfurt am Main: Cornelsen.
- Renkl, A. (no year): *Pädagogische Psychologie*. Available from: <http://www.spektrum.de/lexikon/psychologie/paedagogische-psychologie/11082> [Retrieved on: 20.08.2016].
- Schnell, R.; Hill, P.; Esser, E. (2013): *Methoden der empirischen Sozialforschung*. München: Oldenbourg Wissenschaftsverlag.
- Singleton, R. A.; Straits, Jr. B. (2005): *Approaches to social research*. New York: Oxford Univ. Press.
- Weinert, F. E. (1996): *Lerntheorien und Instruktionsmodelle*. In: Weinert, F. E. (Ed.): *Psychologie des Lernens und der Instruktion. Enzyklopädie der Psychologie, Band 2, Serie Pädagogische Psychologie*. Göttingen: Hogrefe, pp.1-42.