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## From eating to discovering: How metaphors of learning change during students' enculturation

### Abstract

During their enculturation process students need to adapt their conceptions of learning to the learning culture at the university. However, conceptions are usually implicit and therefore difficult to assess. Metaphors have been proposed as a possibility to examine conceptions. In a longitudinal study (N=30), changes to metaphors of learning were examined over the course of the first year of studies. In general, we found that metaphors were more congruent with university learning culture in the 2<sup>nd</sup> year of studies than in the 1<sup>st</sup> year, indicating that students undergo a complex enculturation process changing their conceptions of learning.

### Keywords

Enculturation, metaphors of learning, conceptions of learning, higher education

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## **Vom Essen zum Entdecken. Wie sich die Metaphern des Lernens im Laufe der Enkulturation von Studierenden verändern**

### **Zusammenfassung**

Während ihres Enkulturationsprozesses am Anfang des Studiums müssen Studierende ein gutes Verständnis für die universitäre Lernkultur entwickeln. Dabei spielen die Lernüberzeugungen von Studierenden eine zentrale Rolle. Diese sind jedoch in der Regel implizit. Metaphern stellen eine Möglichkeit dar, solche impliziten Überzeugungen zu erfassen. In einer Längsschnittstudie mit 30 Studierenden wurde untersucht, wie sich die Metaphern von Studierenden im Verlauf des ersten Studienjahres verändern. Insgesamt zeigte sich, dass die Metaphern der Studierenden im zweiten Jahr eine höhere Kongruenz mit der universitären Lernkultur aufweisen als am Anfang des Studiums.

### **Schlüsselwörter**

Enkulturation, Metaphern des Lernens, Vorstellungen über Lernen, Kompetenzerleben, Hochschule

## **1 Introduction**

The transition from school into higher education has been described as a process of enculturation (e.g. BRUFFEE, 1999). In this process of enculturation, students not only need to acquire skills allowing them to act in the new learning environment, such as learning strategies, but also need to undergo fundamental changes in their understanding of what learning is about, that is, their conceptions of learning (WINGATE, 2007). At the same time, students' conceptions of learning are difficult to assess because individuals are often not aware of their implicit beliefs (PAJARES, 1992) and measures such as questionnaires are prone to social desirability issues (KANE, SANDRETTO, & HEATH, 2002). Metaphors, on the other hand, have been proposed as a means for assessing implicit aspects of cognition (e.g. SABAN, KOCBEKER & SABAN, 2007) because they help to communicate as-

pects that are otherwise difficult to express (VISSER-WIJNVEEN et al. 2009), such as teachers' professional identities (e.g. NEVGI & LÖFSTRÖM, 2014), academics' conceptions of teaching (WEGNER & NÜCKLES, 2015), personal epistemologies (PATCHEN & CRAWFORD, 2011), or teachers' professional development (e.g. BOLLOUGH, 1991). In order to learn more about the changes students' conceptions of learning undergo in their process of enculturation into university learning culture, we examined how students' metaphors of learning change during their first year of university.

## 1.1 Learning at universities

In contrast to most educational institutions, universities serve a double function as both educational *and* research institutions. This double function fundamentally influences all educational processes. For example, lecturers are usually at the same time researchers and teachers, and scientific inquiry is typically part of all university curricula. Traditional forms of university courses emphasize typical activities of scientific inquiry, such as scientific writing in the humanities (BRUFFEE, 1999; KRUSE, 2011), or conducting and interpreting experiments in sciences. Also, several authors found that a large proportion of academics view teaching as a process of enculturating students into their own scientific communities (e.g. ROBERTSON, 2007). For example, VIRTANEN and LINDBLOM-YLÄNNE (2010) found that most teachers in biosciences

“[...] seemed to regard their own position as a teacher to mainly include guiding the students to find information, to use it in practice or to use it in developing their own personal view of the subject matter, and to pass on the key ways of thinking in the discipline.” (p. 367)

In contrast, processes of scientific inquiry are present to a much lesser extent in high schools (e.g. SCARDAMALIA & BEREITER, 2006). Often, information on the processes of scientific inquiry is even excluded from high school instructional text material (e.g. BRAUN & NÜCKLES, 2014; PENNEY, NORRIS, PHILLIPS & CLARK, 2003). LACHNER and NÜCKLES (2015) found that math teachers at

high schools tend to just explain the mathematical procedure without including background information on underlying principles, while university teachers more often embed the explanation of the procedure within explanations of basic mathematical concepts, thus fostering ways to think like a mathematician.

The strong focus on scientific inquiry in the process of learning also results in two other important features of learning at university (SCHIEFELE, STREBLOW, ERMGASSEN & MOSCHNER, 2003). Just as researchers must do, students in higher education are required to access learning contents by themselves and to comprehend the underlying structure of the material. Secondly, students have to regulate their learning by themselves because there are few obligations at university and students usually receive little feedback on their learning progress (ZIMMERMAN, 1990). Both characteristics are in accordance with the strong focus on learning by and through scientific inquiry at university (see also BRUFFEE, 1999). Thus, in the process of enculturation into an academic learning environment, students need to develop conceptions of learning which define learning as a self-regulated process in which they need to structure knowledge by themselves and which is embedded in an environment aimed at generating new knowledge through scientific inquiry.

VIRTANEN and LINDBLOM-YLÄNNE (2010) found that there is a large gap between university teachers' and students' understanding of learning. Whereas teachers often describe learning at university in terms of enculturation into the scientific community, students mainly have the idea that information should be transmitted to them. Thus, there is a dissonance of understanding learning between teachers and learners. However, congruence and dissonance between teachers' and students' strategies of teaching and learning has been linked to students' cognitive, motivational and affective self-regulation skills (VERMUNT & VERLOOP, 1999). Congruence or constructive frictions enhance students' learning, but there can also be destructive frictions which impede learning, for example, when students have good self-regulation strategies but the learning environment externally regulates the learners. Therefore, it is important to help students to develop more congruent conceptions of learning.

## 1.2 Metaphors as an indicator of learning cultures

An understanding of abstract concepts such as “learning” does not develop consciously, but rather results from implicit changes in beliefs and conceptions. Because these changes usually occur subconsciously, they are difficult to assess. Questionnaires are prone to biases due to social desirability, and methods such as interviews, which might stimulate reflection on unconscious aspects, are time consuming and difficult to analyze (KANE et al., 2002). Therefore, metaphors or other images are increasingly used as a means of assessing implicit aspects of cognition, because metaphors help to describe new or abstract experiences via more familiar or more concrete experiences (e.g. LÖFSTRÖM, NEVGI, WEGNER & KARM, 2015).

In the last half of the 20th century, metaphors have received attention by researchers from such diverse domains as philosophy (BLACK, 1993), cognitive science (GICK & HOLYOAK, 1980), or cognitive linguistics (LAKOFF & JOHNSON, 1980). Metaphors have been identified as being more than a deviation from the ‘normal use’ of language. Instead, metaphors are closely linked to the way our conceptual system is structured, thus being one of the basic mechanisms in which we perceive the world (LAKOFF & JOHNSON, 1980). Because metaphors are based on the detection of similarities between new experiences and familiar experiences, they are a vehicle to understand novel information, concepts, or information in terms of already familiar concepts. So-called “conventional metaphors” are engrained in our language and we cannot communicate without them. For example, we often speak metaphorically of knowledge as an entity a student receives, such as in the expression “*students need to grasp the idea*” or “*I want to get the knowledge across*”, or we link learning to the experience of moving if we use expressions such as “*learning progress*”.

According to LAKOFF and JOHNSON (1980), metaphors used in a language not only give information about how a phenomenon is conceived of in a certain culture, but the metaphors used in the culture also feed back into the conceptual system. This can also be found in the area of education. For example, GUSKI (2007)

analyzed conventional metaphors in the context of “schools” in pedagogical texts from different historical epochs and linked them to the pedagogical practices in these epochs. WEGNER and NÜCKLES (2015) interviewed 36 academics on their metaphors of teaching and learning at university. As in other studies (e.g. DALL’ALBA & SANDBERG, 1996), a large proportion of academics described metaphors of teaching and learning in terms of enculturation of students into a disciplinary community. The metaphors the academics used were also related to their goals and approaches in teaching.

However, most studies using metaphors to date focus on high school teachers (e.g. SABAN, KOCBEKER & SABAN, 2007; MARTINEZ, HUBER & SAULEDA, 2001), and little is known about post-secondary students’ metaphors of learning. One large Israeli study analyzed the metaphors of more than 400 high school students. Most of the metaphors were related to being imprisoned, thus depicting a rather negative picture of being at school (INBAR, 1996). Again, the study found large discrepancies between teachers’ and students’ metaphors of learning. Therefore, we wanted to close this gap and learn more about the metaphors students in higher education use to describe learning. Also, we wanted to find out whether students adapt their metaphors of learning to the university learning culture in the course of their academic enculturation.

## **2 Summary and scope of the study**

Congruence between students and teachers in teaching and learning has been singled out as an important aspect shaping students’ learning. When entering university, students have to adapt to a learning culture that is based on scientific inquiry and in which students have to structure contents and regulate their learning processes by themselves. Such adaptation processes are usually not conscious. However, metaphors can be a good tool for examining implicit aspects of cognition.

In our study we aimed at examining *a)* which metaphors students use to describe learning when they begin their studies, *b)* how these metaphors change within the

first year at university, and *c*) whether students adapt their metaphors to university learning cultures in terms of awareness for the need to structure knowledge and to regulate learning by themselves, and the awareness for learning as a process of developing new knowledge.

## 3 Methods

### 3.1 Sample and procedure

Altogether, 30 students of educational science from a German university (70 % female and 30 % male, mean age<sub>t1</sub> = 21.07 years, SD=2.13) participated in the study. Participants were asked twice for their metaphor of learning. The first measurement (*t*<sub>1</sub>) took place at the very beginning of the students' first study year, the second measurement (*t*<sub>2</sub>) at the beginning of their fourth semester, that is, halfway through their second year. Both measurements were set in university courses at the beginning of a lesson.

### 3.2 Material

On both occasions, students were first given a brief example of what was meant by a metaphor. We chose the classical example of "Argument is war" as described by LAKOFF and JOHNSON (1980), because it is unrelated to the topic of learning, education or university, while at the same time well elaborated. Based on SABAN et al. (2007), the participants were then asked to write down their metaphors of learning, prompted by the questions "*learning is like...*", "*because...*".

### 3.3 Analysis of metaphors

Metaphors were analysed inductively according to the procedure proposed by CHI (1997), which involves the steps of segmenting the data into units of analysis, development of a coding scheme, coding and depicting the data and subsequently the

detection of systematic patterns within the coded data. All decisions were discussed within a research team consisting of two researchers.

*Unit of analysis.* Each answer consisted of a source of a metaphor and a description. We noted that the same source could be complemented by conceptually different explanations. For example, the metaphorical source *jigsaw puzzle* was described by one participant as a finite process which ends when the jigsaw is completed, or by another participant as a never-ending process of problem-solving in which new pieces are constantly added. Therefore, we decided to analyse the metaphors by two different kinds of analyses. In order to find out which metaphors students use and how these metaphors change, we coded the answers in terms of the *sources of metaphors*. In order to assess adaptation to university learning culture, a coding scheme was developed based on *both* the source *and* the explanation of the metaphors.

*Coding of metaphorical sources.* For the analysis of the sources, all metaphors of both measurement points were grouped according to the sources of the metaphor (e.g. *Moving, Eating, Constructing, Growing, Collecting*). Metaphors which were so idiosyncratic that there were no similar sources were classified as *other*. Differences in grouping were discussed until consensus was reached.

*Coding with regard to congruence to university learning culture.* For the development of this coding scheme, we sorted students' answers according to their similarity with regards to the key features of learning at university as outlined above, namely *a)* the embeddedness of learning in an environment of scientific inquiry, *b)* the need for structuring of knowledge for oneself, and *c)* the need for self-regulation. The process of sorting was conducted iteratively in an interplay between two researchers. First one researcher sorted the metaphors, and then the other independently sorted it again. Deviations between the groupings of the researchers were discussed. Because in all metaphors, the learners themselves were the initiators of learning processes, and no metaphor included an external regulation instance, we decided not to analyse the metaphors in terms of the degree of self-regulation separately. Our analysis thus resulted in the coding of two dimensions,



*structure of knowledge* and *development of knowledge*. Since the coding scheme is part of our results, it is described extensively in section 4.2, see Table 4. All metaphors were classified again by an independent rater. Cohen's Kappa was good for both dimensions (structure of knowledge:  $\kappa = .86$ , development of knowledge:  $\kappa = .85$ ), indicating a good inter-rater reliability (WIRTZ & CASPAR, 2002).

## 4 Results

### 4.1 Sources of students' metaphors and changes in the first year

The analysis of the sources of metaphors yielded that the most common sources of metaphors were *discovering/seeing*, *growing*, *building*, *collecting/sorting*, *exercising*, *moving forward/upward* and *eating* (see Table 1 for all codings). Interestingly, only two metaphors described learning as a process in a group (*Learning is like meeting friends/ Learning is like a board game*); all other metaphors depicted the learner as a person on his/her own.

Table 1. Sources and concrete metaphors and their frequency in the first and in the second year

Source	Metaphors	t <sub>1</sub>	t <sub>2</sub>
<i>Exercising</i>	exercising, running a half-marathon, working out, climbing on a mountain, training	4	2
<i>Eating</i>	eating food, great festive never-ending dinner, marble cake	3	0
<i>Collecting</i>	collecting, photo album, getting a library for your home, collection of books, unpacking presents, fishing	5	4
<i>Growing</i>	Tree, apple tree, flower, watching a tree/flower grow, creation and maintenance of a garden	2	5
<i>Discovering</i>	never-ending voyage, world trip, discoveries of Christopher Columbus, deep-sea journey, walking in the park and discovering new things, conquering new land, walking in the fog, Travelling and filling empty maps, wide horizon, chest with drawers in which you discover new things	3	8
<i>Constructing</i>	building a house/a skyscraper, construction site, village in time lapse, a ladder whose steps you can build at your pleasure	4	3
<i>Moving</i>	permanently moving forward, walking, a river flowing, climbing up a staircase,	3	3
<i>Connecting</i>	Jigsaw puzzle, sorting of documents on your computer	2	2
<i>Other</i>	Discussion with books and the Internet, memory game, cleaning & tidying up, breathing, baking, meeting friends and talking to each other, a board game.	4	3

When comparing the sources of metaphors between both measurements across the whole sample, we found that at t<sub>1</sub>, the most common source of metaphors was *collecting*, (N=5), while at t<sub>2</sub>, the most common source was *discovering* (N=8). *Eating* disappeared as a source within the first year, and *exercising* was reduced from four to only two metaphors. The strongest increase was found in the sources of *growing* and *discovering* (see Table 1).

When looking at changes on the individual level, we found that quite a number of students produced more or less exactly the same metaphor in the first and the second year (e.g. *a growing flower/a growing flower*), or had kept a similar kind of source, with expanded or changed description (e.g. *a world-trip/a deep-sea jour-*

ney, see Table 2). Just over half of the students (N=17) changed the source of their metaphor completely (e.g. *jigsaw puzzle/wide horizon*, see Table 3). We found that none of the students who had used the sources *discovering* or *growing* at  $t_1$  changed their metaphor, but everyone who had used *eating* did.

Table 2. Metaphors that were same or similar metaphors at the two measurement points. Each row represents one student. The table is sorted by source of the metaphor at  $t_1$

Source	Metaphor $t_1$	Metaphor $t_2$
<i>Exercising</i>	Exercising	Sports
<i>Collecting</i>	A photo album in which you collect nice and interesting pictures	A photo album
	Getting a library for your home	A library
<i>Moving</i>	A river flowing through a mountain	A flowing river
<i>Growing</i>	A flower	A growing flower
	Watching a tree grow	A growing tree
<i>Discovering</i>	A never-ending voyage of discovery	A never-ending voyage
	A world trip	A deep-sea journey
	The discoveries of Christopher Columbus	A walk in the park and discovering new things
<i>Constructing</i>	Building a house that is constantly expanded	A construction site that is never finished
	Building a skyscraper	A village in time lapse

Table 3. Different metaphors at the two measurement points for each participant. Each row represents one student. The table is sorted by source of the metaphor at  $t_1$

Source $t_1$	Metaphor $t_1$	Metaphor $t_2$	Source $t_2$
<i>Exercising</i>	Running a half-marathon	A walk in the fog	<i>Discovering</i>
	Working out	Building a house	<i>Constructing</i>
	Climbing on a mountain	A never-ending jigsaw puzzle	<i>Connecting</i>
<i>Eating</i>	Eating food	Breathing	<i>Other</i>
	Great festive never-ending dinner	A board game	
	Marble cake	Baking	
<i>Collecting</i>	Collecting	A memory game	<i>Other</i>
	A colourful collection of books	Climbing up a staircase	<i>Moving</i>
	A collection of books	To conquer new land	<i>Discovering</i>
	Unpacking presents	Travelling and filling empty maps	
<i>Constructing</i>	Building a house	The creation and the maintenance of a garden	<i>Growing</i>
	A ladder whose steps you can build ad libitum	Permanently moving forward	<i>Moving</i>
<i>Moving</i>	A river	An apple tree	<i>Growing</i>
	Walking	Fishing	<i>Collecting</i>
<i>Connecting</i>	A jigsaw puzzle	The sorting of documents on your computer	<i>Connecting</i>
	A jigsaw puzzle	A wide horizon at the sea	<i>Discovering</i>
<i>Other</i>	Meeting friends and talking to each other	Sports or training	<i>Exercising</i>
	A discussion with books and the Internet	A tree that never stops growing	<i>Growing</i>
	Cleaning & tidying up	A shelf with loads of drawers	<i>Other</i>

## 4.2 Congruence of metaphors with university learning culture and changes during students' enculturation

In order to determine how students adapt their metaphors to university learning culture during their enculturation, we looked at how the metaphors changed with regard to the both dimensions described above, namely *structure of knowledge* and *development of knowledge*. We will first describe both dimensions in depth and we will then outline how students' metaphors changed on these dimensions.

### Dimension 1: Structure of knowledge

Students' metaphors differed strongly in terms of the underlying assumptions on the need for structuring knowledge. In some metaphors it was explicitly stated that knowledge has to be connected and structured (such as in *learning is like solving a jigsaw puzzle and connecting pieces*), whereas others described knowledge as unconnected parts (*learning is like a photo album in which you collect nice and interesting pictures*), or did not contain any information about structure at all (*learning is like exercising, because you have to motivate yourself*). We could discern three levels in the degree to which the source and explanation of the metaphor described a need for structuring and interconnecting knowledge, (1) *no reference to knowledge as structured*, (2) *knowledge as a simple structure* and (3) *knowledge as a complex and interconnected structure*.

### Dimension 2: Development of knowledge

With regards to the culture of scientific inquiry, we found that metaphors could be differentiated in terms of whether or not they assumed that learning involves the development of something new. Some of the metaphors implied simply that existing knowledge has to be acquired, such as *learning is like eating*. Others still described learning as something existing, but that the existing knowledge has to be re-discovered by the learner, such as in *learning is like collecting*. Finally, there was a group of metaphors which described learning as the development of something new, such as *learning is like a plant growing* or like *building a house*. Thus, we could also discern three levels of the degree to which the metaphors and their

explanations describe learning as the development of something new, (1) *learning as acquiring something*, (2) *learning as re-discovering something given*, (3) *learning as development of something new*. Both dimensions could be combined with each other. Examples for the two dimensions *structuring of knowledge* and *development of knowledge* and their combination are given in Table 4.

Table 4. Combination of the both dimensions *structure of knowledge* and *development of knowledge* in a 3x3 schema. One typical example is given for each field of the schema.

	Acquiring something (1)	Re-discovering something given (2)	Developing something new (3)
No structure (1)	Exercising, because you have to motivate yourself, it is exhausting, but at the end you feel good and experience success	Unpacking presents, because for example when reading a text, you do not know what to expect.	Breathing, because everybody has to breathe to live. Every human needs to learn in order to keep on living. Usually you learn automatically, without noticing it, just like how breathing is automatic.
Simple structure (2)	Marble cake, because there are light and dark parts, some things are easy and some are difficult. And if you eat too much, you get sick.	A photo album in which you collect nice and interesting pictures, because without pictures your album is empty and you cannot see anything of interest.	A flower, because you water the flower with new knowledge. It keeps continuously growing. If you forget to water it, you lower your general knowledge. One never stops learning, just as a flower never stops growing.
Complex structure (3)	A jigsaw puzzle. The more we learn, the more pieces are added until a picture appears. Jigsaw pieces need their counterpart. By learning we make connections. Finally we see the whole picture.	A library, because there are departments of different size for different topics, where the knowledge is stored. Some books are difficult to find, but they are nevertheless there.	Travelling and filling empty maps, because the more I learn the better is my overview over the topics and I can see connections and relations between topics.

### Changes between first and second year in both dimensions

We found that in the course of their enculturation, most students developed metaphors that were more congruent to university culture (see Table 5). For the *struc-*

*ture of knowledge* dimension, the total number of students who described knowledge as having a complex structure increased from 30.0 to 43.3 %, while the number of students who indicated no reference to knowledge as structured decreased from 26.7 to 10.0 %. On an individual level, eight students refined their metaphor, but two students also described a less congruent metaphor in their second year than in the first year.

With regard to the question of whether given knowledge has to be acquired or new knowledge has to be developed, we found an increase in the number of students who described learning as the development of something new (from 30 % to 46.7 %), and a decrease in students who described learning as the acquisition of given knowledge (36.7 % to 13.3 %). The amount of students who described learning as a rediscovering of given knowledge remained roughly the same. When looking at changes of metaphors at the individual level, N=13 students increased their score, but three students also decreased their score by describing a less congruent metaphor with regard to the dimension of learning as the development of something new.

When looking at both dimensions in combination, we found that 40 % of the students improved their metaphor in at least one dimension, 50 % remained the same, and only 10 % produced a less congruent metaphor in the second year than in the first, thus showing a general increase in congruence with university culture.

Table 5. Distribution of metaphors between the two dimensions and the two measurement points.

		Acquiring something	Re-discovering something given	Developing something new	$\Sigma$	(%)
No structure	$t_1$	5	3	0	8	(26.7)
	$t_2$	2	0	1	3	(10.0)
Simple structure	$t_1$	4	6	3	13	(43.3)
	$t_2$	2	7	5	14	(46.7)
Complex structure	$t_1$	2	1	6	9	(30.0)
	$t_2$	0	4	9	13	(43.3)
$\Sigma$ (%)	$t_1$	11 (36.7)	10 (33.3)	9 (30.0)	30	(100)
	$t_2$	4 (13.3)	11 (36.7)	15 (50.0)		

## 5 Discussion

In our study we examined how students' metaphors of learning change during their enculturation process, and whether students adapt their metaphors to university learning culture. For the complete sample, we found that students improved their metaphors. The metaphorical sources *eating* and *exercising* were reduced, whereas metaphors of *discovering* and *growing* became more common. In terms of the congruence to university learning culture, students indicated a stronger awareness for the need to structure knowledge in their metaphors and more often described metaphors which conceptualized learning as the development of something new. Because at the first measurement, students were only in university for one week, they are likely to have based their first metaphor on their past experience of learning in school, whereas the metaphors at the second measurement are more likely to be based on the experience of learning at university. Thus, these changes in conceptual understanding, which has been discussed as one of the important aspects in a student's enculturation process (WINGATE, 2007), can be seen as a result of their enculturation process. This is especially encouraging in the light of findings that



university teachers and students differ in their conceptions of teaching and learning (VIRTANEN & LINDBLOM-YLÄNNE, 2010), because it indicates that this gap between the conceptions can be bridged. If students start embracing the idea that learning involves the development of new knowledge, they might be more open to understand learning as a process of scientific inquiry, as it is seen by many university teachers (WEGNER & NÜCKLES, 2015; ROBERTSON, 2007).

However, when looking at the individual level, we found that quite a number of students produced the same or similar metaphor at the second time of measurement, that is, more than one year later. This was especially the case for those who had used the sources of *growing* and *discovering*. This is interesting, because usually one would not expect students to remember their answer to an open question in a questionnaire for such a long period. Several explanations for that finding seem reasonable. One could be that students *ad hoc* produced the same or a related metaphor when thinking about their metaphor of learning because at both times of measurement it best resembled their conceptions. Another explanation might be that students actually did remember the metaphor they had produced at the beginning of their studies, because it was especially meaningful to them. This is in line with other studies that used metaphors. For example, BULLOUGH (1991) reported results from a longitudinal study in which teachers kept their metaphors of teaching over a longer period and used it as tool in reflecting deviations between their own beliefs and their actual teaching practice. In any case, the persistence of the metaphorical sources suggests that they are indeed – to quote the title of LAKOFF and JOHNSON's seminal work – *metaphors students live by* (LAKOFF & JOHNSON, 2008). Therefore, for a smoother enculturation process, mismatching metaphors such as *eating* or *exercising* should be addressed actively, for example, by offering more congruent metaphors to students such as *discovering* or *growing* as alternatives, or by discussing alternative metaphors, in order to provoke change and a better adaptation.

Another interesting finding was that most students, even at the first measurement, described learning as an individual enterprise without regulation by external instances. This might be a hint that students do understand the requirement that they

have to learn in a self-regulated fashion, but that failure in self-regulation is a question of a lack of skills (see also ZIMMERMAN, 1990). Also, the metaphors seem to suggest that students do not seem to experience learning as a shared experience in a group, because the overwhelming majority of students described a metaphor in which they were on their own. Further research should investigate whether this is specific to German university students, i.e., that learning at German university is characterized by learning on one's own, or the specific degree in which the students were studying, or whether it is a result of the methodology of using metaphors.

Of course, the sample size of our study was small, and we only assessed students of educational science. Further studies should therefore examine the generalizability of our results in other areas and in larger samples. Also, further studies should look at how metaphors change in the further course of studying, for example, when changing from a bachelor to a master program, or start assessments of students' metaphors even earlier, before they start their actual studies. Especially when looking at transitions between different educational contexts, metaphors might be useful as a research instrument, because as opposed to typical questionnaires, metaphors do not need to be adapted to each context in terms of their wording (e.g. class vs. course, teacher vs. lecturer etc.). Thus, the study suggests that the use of metaphors is a promising approach for the exploration of enculturation processes.

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