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L2 input and characteristics of instructional techniques in early foreign language classrooms – Underlying theory and pedagogical practice

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Abstract

Linguistic input is considered one of the most important prerequisites for the acquisition of a foreign language. In recent decades, theoretical approaches within a cognitive-interactionist framework (Long, 2015) have identified various aspects of L2 input and characteristics of instruction that predict learners' L2 outcomes. Teaching principles relate (1) to characteristics of communicative activities in which the L2 is embedded and encountered by the learners, and (2) to the quality of L2 input, L2 interactions and learners' L2 output (Ellis & Shintani, 2014). They are in line with task-based and content-based L2 teaching approaches. This chapter starts out with the theoretical underpinnings to L2 instructional principles (Gass et al., 2020, Kormos, 2011, Leow, 2015, Truscott & Sharwood Smith, 2019). Based on two graphical illustrations on characteristics and processes in ISLA and internal knowledge construction, it introduces the roles of sensory input and individual perception, the internal meaning-making process, prior knowledge and selective attention. Consequences of this type of information processing for instruction are discussed with respect to the instigation of noticing, salience, cognitive activation and depth of processing.

The second part of the paper gives an overview of characteristics of teachers' linguistic behavior which includes how teachers modify verbal input in the L2 both lexically, structurally and prosodically, how they shape communicative interactions in terms of authenticity, negotiation of meaning, feedback and focus on form, and how they create opportunities for productive L2 output of the learners. Linguistic input is typically supported by different types of non-verbal scaffolding techniques and is embedded in communicative-instructional activities that have the potential to facilitate L2 acquisition. Especially scaffolding techniques which foster comprehensible input are crucial in early stages of SLA. Instructional characteristics of activities comprise autonomous action-oriented problem-solving (construction of knowledge), the activation of learners' prior experiences, the stimulation of multiple senses, and a positive learning environment. The goal of these instructional principles is to provide comprehensibility and cognitive stimulation during the L2 acquisition process, induce wide-spread neural activity and ultimately facilitate long-term retention.

All of these principles are derived from the above mentioned theoretical framework and operationalized as 'teaching techniques' in the *Teacher Input Observation Scheme* (TIOS, Kersten et al., 2018) which serves as a structuring matrix for the second part of the paper. Techniques are defined as "description of how a communicative behavior or activity is carried out in the classroom at a given moment as the actual point of contact with the learner/s". This operationalization has specific measurement implications for research studies as it provides a systematic basis of multidimensional categories of L2 teaching techniques. In terms of teaching practice, the classification of these techniques allows for L2 classroom observation, teacher training and teachers' self-evaluation. The paper closes with empirical and practical examples on the effect of such teaching techniques in preschool and primary school classrooms.

1. Introduction

Decades of research have looked at linguistic input, at the nature of linguistic interactions and learner output both from a leaner-centered SLA- and a classroom-centered instructional perspective. Notably, input is considered one of the most important prerequisites for the acquisition of a foreign language, the *sine qua non* in language acquisition. It is commonly defined as "language that a learner is exposed to in a communicative context" (Gass & Mackey, 2015, p. 181).

While varying definitions and emphasis on different facets of input have been suggested, I shall adopt a recent rather comprehensive understanding which enables us to shed light on a variety of aspects that are considered crucial for the language learning process. It stresses the internal processing perspective of input including different types of sensory information such as

> sights, including pointing and gesturing, sounds, smells, tastes, etc., in other words everything that contributes to the interpretation of an utterance and which can lead to further development of an individual's linguistic ability, i.e. all the relevant external contexts. This should be included in a comprehensive understanding of what input is. (Truscott & Sharwood Smith, 2019, p. 10)

In L2 instructional settings, thus, input cannot be regarded as detached from the specific contexts in which the L2 is encountered by the learners *(situational context)*. This regards not only the specific linguistic features of the input delivered to the learners in a narrow sense *(discourse context)* and the supporting techniques used to render it comprehensible, but it also pertains to the characteristics of *activities* chosen as the matrix for language learning opportunities (Truscott & Sharwood Smith, 2019, p. 56). This interplay of principles and their effect on the process and attainment of L2 learning is one of the major foci of the relatively new field of Instructed Second Language Acquisition (ISLA, Loewen, 2020).

Numerous hypotheses within ISLA have identified aspects of L2 input and characteristics of instruction that predict learners' L2 outcomes (Loewen & Sato, 2018). Their common goal is to describe how the L2 learning process can effectively be shaped, e.g. by providing comprehensibility and cognitive stimulation during the acquisition process, by inducing widespread neural activity, facilitating processing, and ultimately fostering long-term retention in and retrieval from memory. Among these, instructional scaffolding techniques which promote comprehensibility of the input are especially crucial for young learners to build up their emerging L2 system. Long (2015) accounts for these effects in his theoretical approach dubbed the *cognitive-interactionist framework. Task-Based Language Teaching* (TBLT, Ellis, 2003) and *Content-Based Language Teaching* (CBLT, which subsumes various and very different types of bilingual programs such as CLIL or immersion, Lightbown, 2014, Larsen-Freeman & Anderson, 2011; comp. also *Content-Based Instruction*, Richards & Rodgers, 2014) are two influential instructional approaches that aim at incorporating these principles. The following argumentation is positioned within this framework.

The paper thus aims to give an overview of effective L2 instructional techniques both from a theoretical perspective and regarding their practical implementation in the classroom. While theory and teaching principles are relevant across different groups of learners, research studies and examples will be discussed with reference to young learners, ranging from preschool age to pre-teens. Section 2 will first introduce the most important aspects and processes currently discussed in ISLA based on a graphical illustration of external instructional factors and learner-internal processing of the incoming information. These will pertain, on the one hand, to the aspects controlled by the teacher, such as choice and characteristics of classroom activities, verbal and non-verbal input and interactional strategies, and, on the other hand, to the internal context which conditions individual information intake and knowledge construction, i.e., the actual learning process from the learner's perspective. Using a second model, section 3 will then focus in more detail on this *internal context* of knowledge construction. To that end, I will first discuss the nature of input as sensory stimuli, the role of prior knowledge, selective attention and (incomplete) conscious perception, and then address their consequences for instruction, focusing particularly on cognitive activation, depth of processing, and the role of salience for noticing and awareness. These underlying processes are crucial in order to understand why the

teaching principles promoted within the cognitive-interactionist framework are assumed to be effective for L2 acquisition. The section will end with a discussion of how to operationalize instructional techniques for empirical purposes and pedagogical practice, and will introduce the *Teacher Input Observation Scheme* (TIOS, Kersten et al., 2018) which was derived from the above framework and developed for that purpose. The goal of all techniques accumulated in this instrument is, accordingly, to increase saliency and comprehensibility of stimuli, to facilitate attention, noticing, intake and deep processing. The selection of these specific L2 instructional techniques that are part of the TIOS will serve as a structuring element for sections 4 and 5, which focuses on the *external context*. In these sections, I will discuss concrete characteristics of L2 instructional activities which represent the matrix for linguistic input, and the quality of L2 input, interaction and support of learners' output. In section 6, I will then summarize implications of the issues discussed in this paper with reference to examples from different primary programs, and provide some recent empirical evidence which incorporates a combination of these factors to show their effects on the L2 acquisition of young learners.

2. The nature of variables and processes in Instructed Second Language Acquisition

The empirical investigation of ISLA focuses on numerous external and internal elements that have been identified as relevant for language learning. This section will provide an overview of the most important aspects as discussed in ISLA based on a graphical illustration (Fig. 1; for overviews on different aspects of the graphic see, e.g., de Graaff & Housen, 2009, Gass et al., 2020, Ellis & Shintani, 2014, Leow, 2015, Loewen, 2020, Loewen & Sato, 2018, Long, 2015). They will be briefly introduced here and then described in more detail in the following sections 3-4.

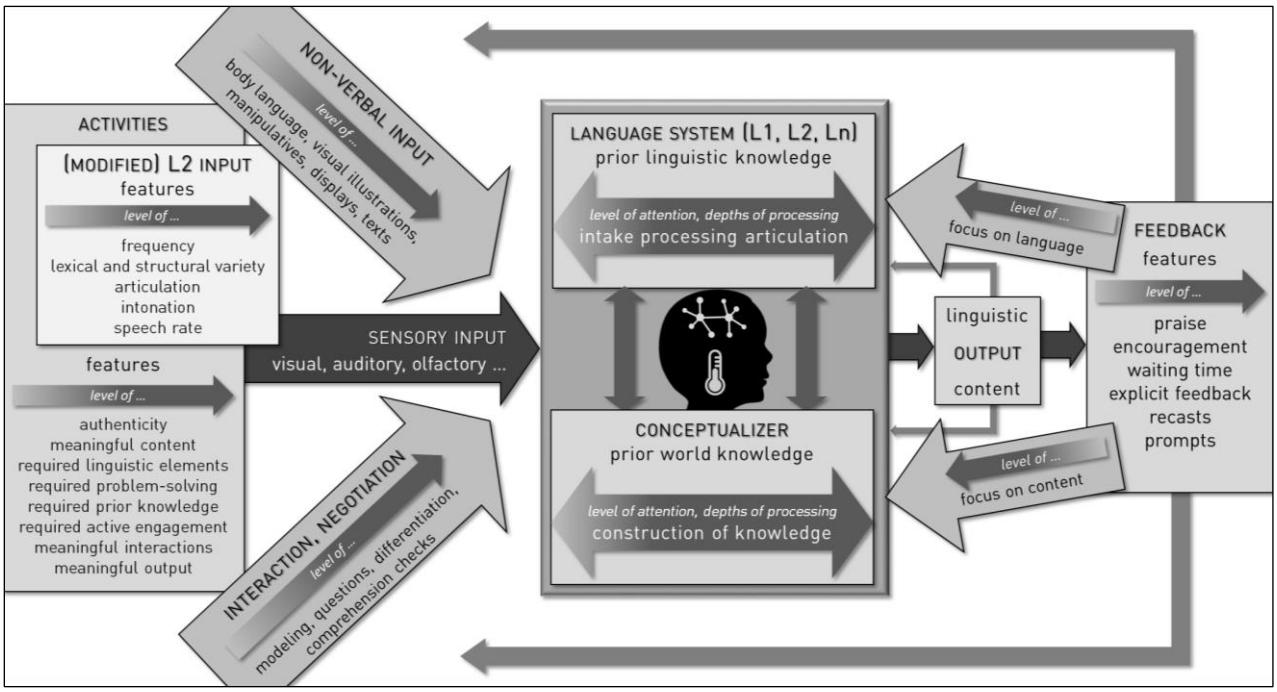

Fig. 1: Model of characteristics and processes in ISLA
External context (*activities*, *modified input* and *feedback*, shaped by *non-verbal input* and *negotiation techniques*) *stimulating* the leaner's internal cognitive system (*conceptual* and *linguistic* system) in the form of *sensory input*

The overview of characteristics and processes in ISLA in Fig. 1 depicts, first of all, the external situational and linguistic contexts in which learners encounter the L2. This context is composed of *activities* and *modified linguistic input* usually chosen and delivered by the teacher in accordance with the age and language level of the learners. They are accompanied by different types of verbal and non-verbal measures to enhance comprehensibility and cognitive engagement. These then reach the learner in form of sensory input. As will be further specified in section 4, sensory input is the only form in which types of input stimulate the learner's internal system. Within the learner's internal system (the grey box in the center of the figure), linguistic and non-linguistic representations are stored in the conceptualizer and the language system/s (Truscott & Sharwood Smith 2019), where internal processing, knowledge construction and the generation of output take place (section 3). Learner's output, finally, leads to monitoring by the individual cognitive system, and to different types of external feedback, which again serve as ongoing input in communicative interactions. These different elements and underlying processes will now be introduced in the remainder of this section, and subsequently explained in more detail in the following ones.

Activities and (modified) L2 input: The graphic depicts L2 activities in foreign language classrooms which serve as a matrix for linguistic L2 input, and specific features of both language and activities that are thought to affect SLA. Language and activities are accompanied by non-verbal aspects of communication such as body language and illustrations, and are further shaped by the ways in which they are modeled and structured. It is important to note that the model in Fig. 1 restricts itself mostly to descriptive form- rather than function-related terms because these input characteristics – input used in the encompassing sense of the term – do not always result from a conscious goal or decision of the teacher to intentionally use scaffolds (cf. section 3.3).

Sensory input and information processing within the cognitive system: All non-linguistic and linguistic features represent the incoming sensory stimulation of the learner which reach the learner only in form of visual, auditory and other sensory perceptions (this process is described in more detail in section 4). They enter the learner's processing systems where content as well as linguistic information are processed, depicted here as the *conceptualizer* and the *(L2) language system* (for an overview of the relationship of L1 and L2 processing/storage components in current processing models see de Groot (2015) and Truscott & Sharwood Smith (2019); these could easily complement this graphic but are not relevant for the current purpose). In that sense the model in Fig. 1 emphasizes the multisensory character of input both from an external and an internal perspective.

Linguistic input is never devoid of content, which means that language learning and general learning mechanisms are intrinsically intertwined: The conceptualizer, i.e. the non-linguistic component which stores and processes mental representations (ideas, concepts, meaning, comp. Levelt, 1989, p. 9, Kormos, 2011) is strongly involved in the meaning-making process. In the underlying models this meaning-making process, i.e. actual *comprehension* of the incoming information, is seen as *individually constructed* by each learner. This notion of individual construction of knowledge is essential for all instructional techniques referred to here, and will be further discussed in section 3.1.

The language system, on the other hand, is thought of as the module in which linguistic information, here: information specific to the L2, is processed and stored. It needs to contain processing modules for lexical, grammatical, phonetic-phonological and other types of linguistic

information. SLA models identify numerous steps and factors which lead from an external stimulus to different types of learners' internal *intake*, *processing* and *storage*, and, in the case of a verbal reaction, to the planned verbal message (phonetic plan) for the *output* in the articulator (Gass et al., 2020, p. 578ff, Leow, 2015, p. 241ff, Levelt, 1989, p. 9, Kormos, 2011, p. 43). Intake is most commonly referred to as the process in which input gets transformed and becomes available for further processing and incorporation within the learner's internal system (Gass et al., 2018, p. 10). For further detail on these processes, see two influential models by Gass and colleagues and by Ron Leow, who depict these processes in more detail as *apperceived input – comprehended input – intake – integration – output* (Gass et al. 2020, p. 579) and as *input processing – intake – intake processing – internal knowledge – knowledge processing – output* (Leow 2015, p. 241ff; 2018).

Input also has the potential to impact the learner's affective system. Emotions, symbolized by the 'thermometer' in the learner's internal system, have been found to play an important part in SLA. Krashen (1985) claimed in his Monitor Model that emotions may function as an *affective filter* which determines whether learners are open to comprehensible input: A high affective filter would result in low reception and no further processing. In more recent work, emotions play a central role in the *affective system* of Truscott & Sharwood Smith's (2019) Modular Cognition Framework (MCF), and have been thoroughly investigated in terms of *foreign language anxiety and enjoyment* (Dewaele & MacIntyre 2014). Correspondingly, the 'thermometer' in Fig. 1 indicates the role of the *perceived learning atmosphere* and *emotional availability* of the learner.

Type and *level of stimulation* from the incoming sensory input are thought to affect whether incoming information leads to intensive mental operations (*intake, depths of processing*, section 3.2.1), which condition whether it gets stored and becomes readily available for retrieval when the learner wants to use it. Each stimulus can occur on a continuum from very low to very high intensity. This *intensity* of the stimulus, is indicated by the arrows labeled 'level of …' in the graphic, is thought to be relevant for the level of attention and the following cognitive engagement with the stimulus. This engagement is a prerequisite for further processing. A crucial role in these processes has been attributed to the activation of prior linguistic and world knowledge as a basis for extended knowledge construction (section 3.1.2).

Feedback: Teachers (and peers) react to the learner's L2 output both with regard to language and to content. At the same time, learners' productions feed back into their own linguistic and conceptual monitoring systems as indicated by the small arrows (Kormos, 2011, Gass et al., 2020, p. 586). Typologies of positive and corrective feedback types and their differential effects have been described in numerous studies (e.g., Lyster & Saito, 2010). Feedback can be seen as part of an ongoing communicative interaction and thus also represents an element of input, which is again shaped further by features of verbal and non-verbal input, etc. This is indicated by the loops directed back at the input part of the graphic and will be discussed in combination with these features in section 5.3.

Section 3 will now outline in more detail the nature of sensory input and knowledge construction as a basis of SLA and ISLA. Sections 4 and 5 will then discuss characteristics of L2 instructional activities and the quality of input, interaction and support of output. This will be presented in reference to an observational schedule which helps to operationalize these instructional techniques for empirical research and pedagogical practice, and which has been found especially helpful for early stages of L2 acquisition. In addition, I will provide some recent

empirical evidence on young learners which incorporates a combination of these factors and their effects on SLA.

3. Sensory input and knowledge construction

To follow the argumentation outlined in this section more easily, Fig. 2 represents a graphical illustration of internal cognitive-linguistic meaning-making processes known as *construction of knowledge*. The different elements depicted in Fig. 2 will be explained in detail in the subsequent sections. If not indicated otherwise, Fig. 2 as well as the following sections 3.1-3.2 rely on Gass et al.'s (2020) *Model of Second Language Acquisition*, Leow's (2015) *Model of the L2 Learning Process in ISLA*, Kormos' (2011) *Model of Bilingual Speech Production* and Truscott & Sharwood Smith's (2019) *Modular Cognition Framework (MCF)*. For a detailed overview of the underlying cognitive processes of instructed language learning, see also Böttger (2016).

3.1 The internal meaning-making process (construction of knowledge)

Our mind is constantly exposed to a great amount of incoming information through all of our senses. This relates to everything we see, hear, smell, touch, and taste, not only in everyday but also in instructional contexts.

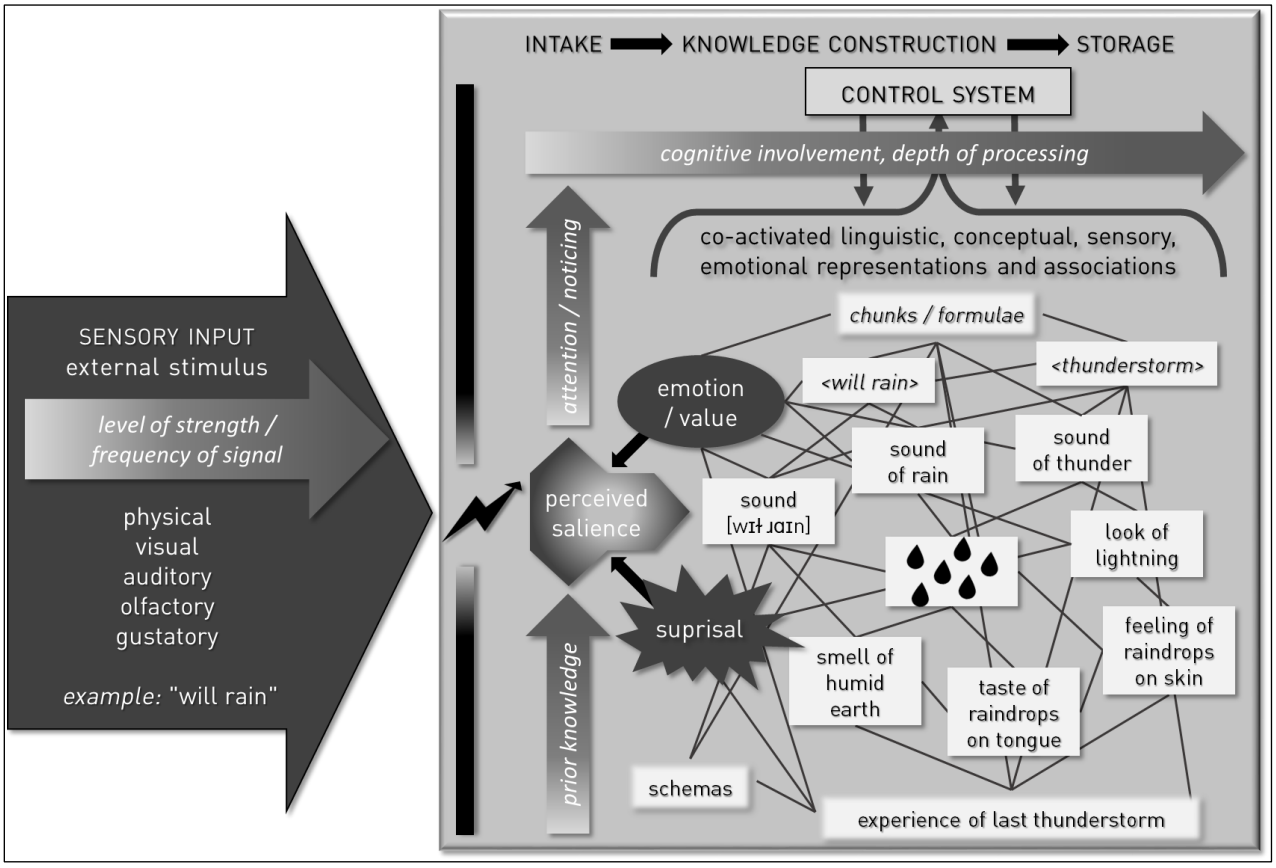

Fig. 2: Internal processing and linguistic-conceptual knowledge construction.
Factors affecting how external sensory impulses stimulate mental representations during intake and knowledge construction across linguistic and conceptual systems – an exemplary network of linguistic and non-linguistic representations is co-activated in language processing

Fig. 2 gives a more detailed overview of how recent models of input processing depict the central part illustrated in Fig. 1, i.e. a conception of what happens when incoming linguistic and environmental stimuli hit the mental system and are comprehended and stored. (Note that, as in Fig. 1, this graphic is not supposed to be exhaustive but is rather used as an illustration to highlight some effects described in this paper. This holds particularly for the network of associations depicted on the right which just serves an exemplary modeling purpose of a highly complex and widespread activation pattern.) These processes will now be further described in the following.

3.1.1 The nature of sensory stimuli

All types of knowledge we accumulate based on external input, and which we subsequently store in our brain, are conveyed through the transmission of external sensory stimuli. Already in the middle of the 18th century, David Hume pointed out that "[t]he mind has never anything present to it but the perceptions" (Hume, 1907[1748], p. 162). On a neurophysiological level information processing refers to electrochemical coding of stimuli from different sources. There 'is' no light or color, no sound, no music, no heat or cold that 'enters' the brain but only electromagnetic waves, fluctuations in air pressure and kinetically driven movements of molecules (von Foerster, 1981). As a consequence, in order to make sense of all of this and to survive (in life *and* in the classroom), the mind needs to actively reconstruct meaningful representations from the huge number of incoming stimuli. (This is why Carroll, as cited in Truscott & Sharwood Smith, 2019, p. 9, suggested in 1999 to replace what was generally called 'input', i.e. linguistic information in the external social world, with 'sensory data', to which input is reduced when the learner first perceives it). In pedagogical literature, this is referred to as *knowledge construction* (Cameron, 2001, Rüschoff & Ritter, 2001).

This internal meaning-making process is further complicated by the fact that the brain cannot, in principle, distinguish between internal and external events. The human body has only about 100 million sensory cells that perceive stimuli from the outside, but over 10.000 billion synapses at which information is transmitted; so we are "100.000 times more receptive to changes in our inner environment than to changes in our outer environment" (von Foerster 1981, p. 50f;he goes on to say that the chemical composition of the transmitter substance filling the synaptic cleft determines the transmission of an impulse to the dendrite of the target neuron. In this micro-environment of the neuron the transmission of impulses can, under certain circumstances, be both inhibited and promoted, and thereby influences which stimuli reach the CNS, and in which intensity they do so). Therefore, our inner experiences and emotions can influence our perception of reality to an even greater extent than external circumstances, or, to quote Truscott & Shwarwood Smith (p. 53), "[t]his activation can come, perhaps most notably, from the affective system, interacting with varying situational context". The psychosomatic branch of medicine or phenomena such as phantom limbs attest to that.

3.1.2 The role of prior knowledge

The mind's meaning-making process is highly individual. First of all, all incoming stimuli are automatically 'compared' to previously stored knowledge: The situational context functions as a kind of prime, which means that external stimuli raise the activation levels of certain aspects of mental representation that are stored in our brains. The core of these mental representations

is referred to as *concepts*, defined as "a conglomerate of inter-related memory traces consisting of information concerning word meaning" (Kormos, 2011, p. 42). Thus, these incoming stimuli are categorized based on the mental structures we have already constructed and which constitute the sum of our previous individual experiences. In fact, that way our existing mental structures act as a kind of 'guide' for what we become aware of, or what we deem relevant in a situation. That is why "a significant role is assigned to prior knowledge and experience as activators of selective attention" (Gass et al., 2020, p. 581). This categorization based on prior knowledge facilitates cognitive processing immensely: instead of a disordered flood of raw data about the environment, we almost instantly receive meaningful, already ordered mental representations which enable us to make even complex decisions in a very short time.

It should be noted that external stimuli, linguistic messages included, are thought to co-activate representations in all different mental modules *(parallel activation, activation spreading)*: linguistic representations (meaning, sound, grammar) and all other sensory information related to this (visual, spatial, motor, affective, auditory, gustatory etc.), "resulting in the virtually immediate experience of the meaning of the utterance in the listener's mind" (Truscott & Sharwood Smith, 2019, p. 53). These co-activated modular networks are referred to as representational *schemas* (p. 61ff). Schemas may differ in L1 and L2 because they might be stored with different activation patterns in both language contexts, depending on previous experiences which generated these co-activation patterns (Kormos, 2011). (Note that the Modular Cognition Framework posits that L1 and L2 are processed by the same mental modules. For an overview of other models of bilingual processing see de Groot, 2015.) What exactly it is that gets activated, how strongly it gets activated, and what finally reaches the threshold for further processing depends both on the strength of the external trigger and on the individual's internal reaction.

3.1.3 The role of selective attention

An important guiding factor for this process is *selective attention*. As a student for example, I obviously see the teacher writing a mathematical calculation on the board and hear her oral explanation of it, but at the same time I feel the chair I am sitting on, feel my hand lying on the table, I see my classmates sitting in between myself and the blackboard, I hear a wasp buzzing in the window, and a car passing outside, while secretely tasting the chewing gum in my mouth and smelling the gum's faint pepperminty odor. These and many other sensory stimuli are incessantly registered by our brains – which does not mean, however, that we are *aware of them* at all times. Actually, if we were, it would be a total information overload for our system and we would not be able to follow (let alone learn) a single thing the teacher is currently trying to convey at the blackboard.

As it is, our mind is able to select only those pieces of information that are currently relevant to us – a survival mechanism without which our species would not have been able to evolve. In our classroom, however, the problem is that the pieces of information we are aware of are not necessarily those that the teacher wants or expects us to focus on. Information that is only registered extremely peripherally and not judged as 'relevant' by our mind (a misleading formulation as this is, as a rule, an automatic, unconscious process) will not be processed in working memory and, consequently, it is then also not available for further processing and for storage in long-term memory. If I deem the wasp, or the fact that Alex is passing Jenny a love letter in front of me, as more important, my mind will only peripherally register Ms Jones' explanations of binomial formulas. It follows that in order to induce some type of learning the first threshold

a stimulus has to overcome to be passed on to working memory for further processing is some kind of awareness, attention or noticing, a phenomenon which has been taken up in ISLA in form of the *Noticing Hypothesis* (Schmidt 1990, section 3.2.1).

While a part of attentional processes are automatic and are not subject to our conscious volition, others can be conscious or controlled, and in that latter function "can be voluntarily directed to different aspects of performance" (Kormos, 2011, p. 52). This attentional control system is thought to intentionally direct our attention, to regulate our actions including language production, and is involved in decision making and problem-solving. It is represented as *control system* in Fig. 2 (compare *supervisory attentional system*, Norman & Shallice, 1986, Green, 1998; but note that, in contrast to other models, the MCF does not conceptualize a supervisory control system as such but rather postulates subconscious control processes and internal conflict resolution as an interplay of the mind's different subsystems which are activated together due to different external stimuli).

3.1.4 The effects of conscious perception: Knowledge construction is individual, warped and incomplete

Another crucial consequence of this phenomenon which is highly relevant for both language and content learning is that the mind can – and very often does – misinterpret incoming information, again for very good reasons of survival (in life – this goes way back to times long before classrooms even existed; comp. Kersten, 2019a). Consider the following examples:

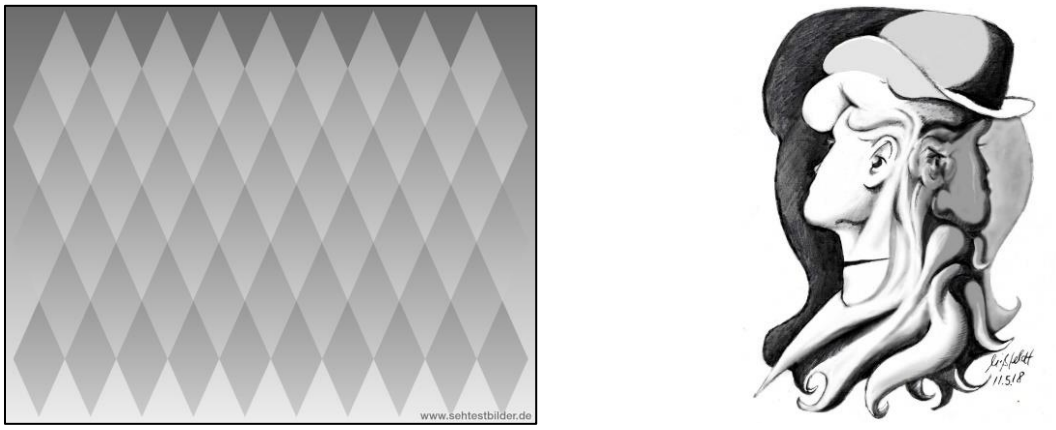

Fig. 3: Optical illusions
Left: all diamonds are equally light, the impression is created by a slight color gradient of the diamonds and the background (https://www.youtube.com/watch?v=1DvtYICr9Qc&feature=youtu.be)
Right: reversible image of old and young woman, old and young man (images created by Martin Mißfeld, 2018, www.sehtestbilder.de/optische-taeuschungen-illusionen/images/optische-taeuschung-alte-junge-frau-alter-junger-mann-me.jpg)

The brain, with its fundamental organizing principles, strives to structure and categorize the incoming stimuli and *apply* meaning to them, as happens for example with the reversible image in Fig. 3_{right} when we make out four different faces in an image composed only of different lines and shades of grey. Optical illusions such as the one in Fig. 3_{left} attest to the fact that this automatic structuring process can lead to distortions or misinterpretations of the actual physical reality where correction is impossible even when the error is understood (we 'know' that the diamonds are of the same color, and yet we cannot 'see' it). The loss of a part of the visual field,

the so-called ‘blind spot’, is seamlessly completed by the brain, a principle that applies to all senses, and to assessment of causal relationships, as well: What we actually perceive are only *consecutions* of events – each *causation* of events is our own interpretation. An example for warped perception from language processing is the so-called *magnet effect* of sound categories of our language, which we perceive as more prototypical than they actually are in acoustic reality (Kuhl 1999). Differences between similar L1 and L2 sounds become increasingly difficult to differentiate, which leads to foreign accents of older L2 learners. This *categorization* effect based on our *prototypical* mental representations, which are, again, vital for speedy information processing, works for input to all of our senses (N. Ellis, 2012, comp. *prototype theory*, Rosch, 1973).

These and many other phenomena of optical and other sensory illusions underline that the things we unconsciously and consciously perceive are *products* of our sensory perceptions, and in that they are only a partial reflection of the external physical reality. There are a number of reasons for that. First of all, our perceptions are limited in their physical spectrum: We can only see part of the color spectrum (butterflies are able to see other parts); we can only hear part of the auditory spectrum (bats are able to hear other parts), etc. Even the machines that we construct to overcome these barriers have their own physical limitations. In combination with automatic mental categorization and selective attention which prevents most of the incoming stimuli from reaching our conscious awareness (see above), this leads to highly automatic processes of *active interpretation and knowledge construction* (Wolff, 2002).

3.2 Instructional consequences and suggested remedies

It has become clear that incoming physical stimuli are not coded by the nervous system in their *quality*, i.e. as ‘color’, ‘sound’, ‘temperature’ etc.; it is, rather, their *quantity* or, in other words, the variety and strength of their impulses which may or may not lead to further processing in the brain. Concerning situational and linguistic input as sensory information, this raises the question: Which conditions exactly lead to the transfer of external stimuli to internal knowledge stores (i.e., processing, retention, and thus learning)?

3.2.1 The role of noticing and cognitive activation

Different models have been put forth to answer this question, but they all share the fact that attention, awareness, noticing and the amount of cognitive engagement – also referred to as *depth of processing* (Leow, 2015) – play a major role in this process (comp. Laufer & Hulstijn’s, 2001, *Involvement Load Hypothesis*). They are thought to be located in working memory (Leow, 2015, p. 243). Terminologically, it makes sense to distinguish between terms that refer to external impulses such as *mental* or *cognitive stimulation*, often in connection with the *complexity* of the stimulus (e.g., task complexity, as argued in Kormos, 2011), and those that refer to the same phenomenon from an internal process such as *mental* or *cognitive effort, engagement, involvement* or *depth of processing*, which is the focus of this section.

> The higher the depth of processing or more cognitive or mental effort that leads to higher levels of awareness, characterized by instances of hypothesis testing, rule formulation, metacognition, and activation of previous knowledge, the more the potential for such processed information to be learned and retained [...] (Leow, 2018, p. 788)

As an example, linguistic features used in a cloze test where the correct form has to be chosen from a given list and added to the correct gaps in the text activate recognition of some lexical items in written form, maybe even without full conceptual understanding of what these items mean. The resulting activation of mental structures in working memory is low, as is the chance of a rich network of associations during processing and storage. On the other hand, linguistic features used in a task in a primary school classroom in which they are needed for problem-solving to create a meaningful product, say the *will*-future is needed for creating a weather forecast, will be processed while many conceptual and situational representations as an example for correct usage will be activated at the same time (Fig. 2). This does not only refer to the core prototypical semantic meaning of a construct, but its more complex pragmatic meaning (meaning in context of use, Truscott & Sharwood Smith, 2019, p. 56) and situational associations, and the sound, written form and grammatical features of the concept as well as frequent linguistic chunks or formulae which it is part of (Kormos, 2011, p. 46). If the teacher succeeds in strongly stimulating even more sensory representations from the learners' prior world knowledge, such as, e.g., the sound of raindrops on the window and of thunder rumbling in the distance, the look of lightning in the dark sky, the smell of humid earth during a thunderstorm, the emotions experienced during the last thunderstorm and the location where it took place, etc., the linguistic element will be processed within a rich network of associations (Fig. 2) and, as theory goes, will have a much greater chance of intake, of strong memory traces and easier retrieval afterwards. (Note that these are just a few examples of a much more widespread activation pattern connected to each sensory stimulus.) For teaching purposes, it is therefore vital not to restrict the concept of prior knowledge to *prior linguistic knowledge* as encountered in earlier language lessons, but to encompass especially *prior world knowledge* as the entirety of prior experiences pertaining to situations of use. Only the latter has the potential to activate the huge variety of associations relevant for the construction of a well-rounded conceptual-linguistic representation in the learner's interlanguage system.

The focus on linguistic form has a special place in this debate (section 5.3). Although theorists agree that a certain amount of attention to a language element is necessary to ensure intake, it is an ongoing controversy as to how much attending to a feature is needed to guarantee further processing and storage (*Noticing Hypothesis*, Schmidt 1990). The Noticing Hypothesis posits that a voluntary or involuntary degree of consciousness (i.e., registering a linguistic feature) is necessary for language learning. Schmidt claims that conscious noticing is the necessary and sufficient condition, but that only the first encounter of a feature needs to be conscious for successful learning, a notion with which not all experts agree (see Mitchell et al., 2019, p. 187.) Other controversies pertain to the questions of whether *explicit* learning (using conscious attention) or *implicit* learning (without conscious awareness) is more helpful for this, and whether explicit knowledge can be converted more or less automatically into implicit knowledge (*no-*, *weak*, or *strong interface positions*, R. Ellis et al., 2009, p. 20ff). While some researchers make a strong argument that implicit learning is the default learning mechanism in L2 acquisition, there is wide agreement that the capacity for it seems to diminish with age and that explicit learning facilitates SLA, especially given the fact that L2 exposure in the classroom is highly limited (Long 2015). Another matter of debate is the degree of awareness necessary for 'noticing'. Other relevant distinctions in this debate are made between *incidental* (unintentional) vs. *intentional learning*, *declarative* vs. *procedural knowledge*, and *automatic* vs. *controlled* processing, often operationalized in very different terms (see R. Ellis et al., 2009, for an overview.)

What seems clear, however, is that the conscious noticing of a certain linguistic element functions as a 'door-opener' for future conscious or unconscious recognition of this particular feature in the input: If a learner has noticed for example adverb formation in L2 English using *-ly*, s/he will be more likely to notice *-ly*-structures in the input from then on. This phenomenon is referred to in SLA as *priming* (Gass et al., 2020, p. 578, Long, 2015 p. 52). (Note that the term *priming* is used in a much narrower sense in other disciplines.)

For the sake of the argument of this overview, I will hold that increasing levels of awareness / noticing will lead to increasing depth of processing and chance of storage; that incidental and implicit learning are possible in L2 acquisition, and that explicit knowledge is a different type of knowledge than implicit knowledge and stored in a different way, but that it can be used to form (and in that way, be converted into) implicit knowledge. As to the exact nature of this conversion, for the purpose of this article I remain agnostic.

It seems that learners differ individually in their aptitude (or their ease) to acquire explicit and implicit knowledge, and that very different cognitive skills are related to both types of learning (Long, 2015). This provides a strong argument for teaching approaches which cater to both implicit and explicit learning at the same time, such as TBLT and, even more strongly, CBLT. Massive doses of L2 input are helpful for implicit L2 leaning (Long, 2015). CBLT in the form of intensive bilingual programs in which a large part of the curriculum is taught through the L2 has a high potential for *both* types of learning due to the high amount of L2 input and frequent opportunities for *focus on form* during content-based activities (section 5.3).

Research in ISLA asks the question what input characteristics lead to attention, noticing, deep processing, and storage, and how they can be achieved through instructional techniques. The following section will focus on these discussions.

3.2.2 What leads to high levels of attention, noticing, cognitive involvement and knowledge construction?

Fig. 2 shows that many processing models see perceived *salience* of an impulse as a strong moderating factor for attention and noticing, and as a trigger for activation of mental representations (Gass et al. 2018, N. Ellis 2012). This trigger is closely connected with what we experience as unexpected *(surprisal)* or as important *(emotion / value)*. *Salience* means that a certain stimulus is registered as standing out from other perceptions by the learner. "Salient items or features are more likely to be perceived, to be attended to, and are more likely to enter into subsequent cognitive processing and learning" (N. Ellis, 2016, p. 342). (Note that salience, however, is by no means a clearly defined construct in (I)SLA. For other differentiations as well as highly relevant empirical evidence on the topic see collected works in Gass, Spinner and Behney's (2018) volume on *Salience in Second Language Acquisition*.)

N. Ellis refers to three ways in which a signal can 'pop out' for the learner. First of all, it may depend on the intensity of an external stimulus such as unexpected loud noises or sudden movements, which represent a strong contrast to the background *(psychophysical salience*, also often referred to as *perceptual salience)*. Secondly, something may stand out because it is relevant to our current mental state or prior experiences *(salient associations)*. This may have to do with our emotions, with motivation, with what we value, all of which is highly individual. If the teacher for instance uses the picture of a well-known soccer player, salience might be much higher for soccer fans (and of that particular club in particular) than for those unfamiliar with

him or her. Finally, a stimulus is salient when we experience a *surprise* because our expectations did not come true (N. Ellis, 2016). Most of our experiences rely on the regularity in our outside world – in fact, we would not be able to function if it weren't for recurring patterns in almost everything we experience from communicative situations to other patterns of human behavior to the physical operating of the world. We function, therefore, based on ongoing predictions with respect to all of these matters. If these predictions are violated because the signal we perceive is highly unexpected, this surprisal might lead to learning even based on a single strong experience. This may refer to content as well as language learning. If a teacher throws two balls to the ground of which only one bounces back and the other remains on the floor, this is a surprising impulse which might introduce a general studies lesson in primary school (content). For salient linguistic forms Gass et al. (2018) take the example of article use in the L2, which might be unexpected if the learner's L1 does not contain articles. And, obviously, all three types of salience interact with each other. This concept of salience is very much in line with Piaget's notion of *disequilibrium* in his theory of learning in which accommodation, i.e. the internal shift of stored schemas, happens because of an imbalance in the learner's internal representations based on a new, surprising experience.

While different forms of salience occur naturally across contexts, one aim of teaching is to generate or to increase salience of certain linguistic structures (or subject content, for that matter) to facilitate learning *(constructed salience,* also referred to as *pedagogically manipulated* or *externally induced salience)* (Gass et al., 2018, p. 7ff, 292). This may happen, for example, "by enhancing their transparency, modifying their input frequency, or otherwise increasing their salience so that, ultimately, their learning difficulty is mitigated" (Housen & Simoens, 2016, p. 169).

After a stimulus got noticed by the learner, and a network of mental representations was triggered (Fig.2), *comprehension* is an essential part of knowledge construction and storage: Noticing a certain feature does not help much if its meaning in the context does not become clear *(form-function mapping)*. This was stressed in Krashen's *Comprehensible Input Hypothesis* (1985) which is generally considered a starting point of the fruitful input-interaction-output debates that resulted in the cognitive-interactionist framework recently formulated by Long (2015). For this meaning-making process to take place teachers use a variety of instructional strategies both on a linguistic and a non-linguistic level.

Sections 4-5 report on a number of such strategies used in instructional contexts to meet these different goals as summarized above: Modifying situational contexts (e.g., tasks), input and classroom interaction to increase saliency and comprehensibility of stimuli, in order to facilitate attention, noticing, intake and deep processing. An important modification of the situational context which induces widespread cognitive stimulation including the activation of prior world and language knowledge is to involve learners in active *problem-solving* processes: Tasks and subject content which engage learners in intensive thinking processes facilitate construction of new knowledge and long-term retention. These instructional techniques will be elaborated on in section 4. Section 5 will then focus on modifications of the linguistic context with respect to characteristics of the teacher's input, interaction and the support of learner's output.

It is important for the classification of such instructional techniques to be clear about the types of constructs used for that description. They will, therefore, be explained beforehand in the following section.

3.3 Operationalizing L2 instructional techniques

It is essential for empirical studies in ISLA to define the strategies described above in such a way as to render them measurable. Classroom observation instruments with clear definitions of each strategy are helpful means to that end, and can furthermore serve to inform pedagogical classroom practice (compare COLT, Spada & Fröhlich, 1995; ITSOC, Fortune, 2014; TALOS, Ullmann & Geva, 1982; SIOP, Echevarría et al., 2010; and IQOS, Weitz et al., 2010, Weitz, 2015, Kersten et al., in prep.a, which was specifically developed to measure L2 input to very young learners, and which is a precursor to the instrument on which the following part of this paper relies). One such instrument which was recently developed on the basis of the above framework is the ***Teacher Input Observation Scheme*** (**TIOS**, Kersten et al., 2018, Kersten et al., in prep.b). The TIOS observation scheme and manual can be downloaded from https://www.researchgate.net/publication/340096869_Teacher_Input_Observation_Scheme_TIOS_and_Manual. It includes 41 instructional strategies used in the L2 classroom, which are derived from the research presented here. It operationalizes these strategies as *L2 teaching techniques*, which are defined as "description of how a communicative behavior or activity is carried out in the classroom at a given moment as the actual point of contact with the learner/s" (Kersten et al. 2019, p. 23, comp. Cook, 2008, p. 235, Larsen-Freeman & Anderson, 2011, p. 1).

It has to be pointed out that this descriptive definition precludes the use of general terms such as *scaffolding* or *negotiation of meaning* since they inherently contain a *function* and/or teachers' *intention* or *goal*; however, those are not possible to determine through mere observation and are thus not suitable as an item for an observational instrument. The TIOS also restricts itself to an observable and practically applicable level within a hierarchy of supercategories and subcategories of strategies (e.g., the selection of 'prompt' in the hierarchy of 'feedback ➞ **prompt** ➞ elicitation') for data coding. This systematic classification of techniques (Bruhn & Kersten, 2018) allows for L2 classroom observation studies as well as teacher training and teachers' self-evaluation, and has been found to be especially beneficial for primary classroom levels.

The following sections describe the instructional strategies derived from the above framework for characteristics of classroom activities (section 4) and modified L2 input, interaction including corrective feedback and output (section 5). In these sections, I will refer to respective techniques as operationalized in the TIOS (T) using 'T' plus the respective item number/s in the TIOS observation scheme [T+item number]. For instance, for task characteristics, which are operationalized in the TIOS in items 1-13, I will use [T1-13], and so on.

In addition, for classroom practitioners, these instructional techniques discussed here may also serve as best practice recommendations for classroom application. The TIOS manual gives additional important practical information on the interpretation of each technique. It has been successfully used in teacher training events for early L2 acquisition, but is not restricted to it. It has to be noted, however, that each technique has to be adapted to the actual learner group and might look very different when applied to young, adolescent or adult learners, or to beginners versus more proficient L2 learners (van de Pol et al., 2010). As L2 proficiency is highly variable even for young learners depending on the L2 program they attend (comp. Fig. 4), teachers might need to recur to different adaptations of these techniques. Learners in a low-intensity fourth grade class might, for instance, need much more comprehension scaffolding

than second grade learners in an intensive bilingual program, while the choice of activities should also be geared at the cognitive level of different age groups.

Finally, I will describe some empirical evidence for effects of a combination of various techniques on young learners' L2 attainment, before I summarize the pedagogical implications for (early) L2 acquisition and reach a final conclusion.

4. Characteristics of communicative-instructional activities in which the L2 is embedded

4.1 L2 activities

Linguistic input is typically embedded in *language- and/or content-based activities* (Fig 1). Research in ISLA, and notably within the cognitive-interactionist framework, has centered around characteristics of activities with a high potential to facilitate L2 acquisition. I use the term activities here as a cover term to encompass both teacher-induced exercises or tasks (Ellis & Shintani, 2014, pp. 135-136). It is not the intention of this article to enter the fine-grained discussions in the field with respect to very specific task traits under scrutiny in many empirical studies. These investigations are vital to drive forward our knowledge base and inform classroom practice in very specific ways (for comprehensive overviews see e.g. Ellis & Shintani, 2014, Long, 2015, Loewen, 2020, Loewen & Sato, 2018). I will rather try to give a general overview of the main features of activities discussed in ISLA, where (arguably) many researchers agree that they are effective to a certain extent for SLA, and which are in line with the theoretical models outlined above (see TIOS items [T1-13], Kersten et al., 2018). If not indicated otherwise, the following aspects are based on these sources.

The key properties of activities that are assumed to lead to intake, strong cognitive involvement and knowledge construction (Fig. 2) are those that capture and hold the learner's attention, strongly activate their prior experiences (prior world knowledge and linguistic knowledge) [T8], stimulate multiple senses using various channels of information and materials [T12], and involve the learners actively at all times [T9], all the while being present in a positive, non-threatening learning environment. As experts have argued countless times, all of these features converge mainly in activities which are based on *meaningful content* [T1,2] (Krashen's (1985) *meaning-focused instruction* was an important driving force for this discussion), which contain some kind of *open-ended* purpose [T1,10,11], and which are carried out as individual problem-solving activities (Heine, 2010) to ensure deep processing and knowledge construction [T7]. 'Problem' may refer to both language- or content-related questions to be solved actively by the learner, and may range from very small to very large dimensions (Long, 2015, p. 65ff).

The recent rise in TBLT research, a teaching approach which is exemplary in integrating current research findings in this area and which provides a very good framework of the most important elements discussed here, can be seen against this backdrop. Another framework which provides this and is also compatible with TBLT is CBLT. Here, language and content learning are integrated in that subject content it taught through the L2 in bilingual programs, e.g. immersion programs (e.g, Lightbown, 2014). The L2 is built up concurrently (hence the term *content and language integrated learning* or *CLIL* used as a cover term for bilingual programs in the European context). Teaching a content subject can very well be centered around a task (in the TBLT sense) and should optimally be accompanied by the facilitating techniques mentioned in this overview.

Other aspects considered crucial for (language) learning as embedded in the construction and instruction of activities are an explicit awareness-raising function for the learners with regard to the learning objective (section 3.2.1), and the linguistic forms and type of interactions required: To achieve this meta-level of understanding, activities need to be explicitly and comprehensibly linked to their specific learning goals [T5]. Furthermore, activities are considered effective if they provide opportunities for genuine interactions between learners and, relatedly, for genuine output (language use) [T10,11] (Fig. 1). For incremental language learning to take place, they need to require specific linguistic elements [T6] which are necessary to complete the goal of the activity and which can be attended to explicitly (comp. section 5 *output*, *focus on form*). Preferably, these are increased in complexity over time.

Finally, learning activities have to be geared at the cognitive and linguistic levels of the target group to be comprehended and to become intake. Researchers pay increasing attention to learners' individual differences which account for huge differences in academic attainment both in content knowledge and in linguistic terms (Dörnyei 2005). For this reason educators are called to construct differentiated activities that cater to different levels of readiness, interests and learning styles of heterogeneous groups of learners (Tomlinson & Moon 2013) [T13]. Such measures pertain to the learning *content*, the learning *process*, the forms of presentation with which learners present the learned content *(product)*, and the learning climate *(affect/environment)*.

4.2 Interaction and negotiation of meaning and form

Comprehensibility is a necessary condition for most if not all types of learning. This is no different for activities carried out in the classroom together. Comprehensibility can be ensured through ongoing interaction between teacher and learners, notably in a process referred to as *negotiation of meaning* (NoM) and, with a focus on language, *negotiation of form* (NoF). These are considered the vital, SLA-driving processes in the cognitive-interactionist framework. Different forms of interaction and negotiation cover a wide range of techniques which refer to or combine all other external aspects of Fig. 1, i.e. negotiating contents of classroom activities, modifying verbal input, encouraging learner output and giving corrective feedback, which is why a number of interactional techniques are covered within different sections of this paper, and analogously, in different scales of the TIOS.

The first step to render an activity comprehensible is its delivery to the learners, i.e. whether the activity is clearly introduced and explained and in what way it is modeled or demonstrated [T3,4]. They are followed by questions and comprehension checks combined with further explanations as a continual part of the instructional process [T25].

5. The linguistic context: Quality of input, interaction and the support of learner's output

Scaffolding techniques which foster comprehensible input (Burmeister, 2006, Massler & Ioannou-Georgiou, 2010) are crucial especially in early stages of SLA (Krashen 1985). They refer to teachers' intentional "temporary support provided for the completion of a task that learners otherwise might not be able to complete" (van de Pol et al., 2010, p. 2). In L2 research, they are often related to linguistic *input quality*, a construct which has been defined in very different ways in SLA. One strand of studies operationalizes it as *native speaker*- vs. *non-native speaker*-input and defines it in terms of proficiency, richness/complexity or authenticity of the linguistic

input, while other studies rather look at scaffolding techniques such as fostering comprehensibility, interaction, and L2 output, etc. Positive results for different aspects of input quality have been found in various studies (for overviews see, e.g., Graham et al. 2017, Loewen & Sato 2018, Weitz et al, 2010, etc.). I will use *linguistic input quality* here to describe the teacher's linguistic behavior as the form in which the L2 is encountered by the learner in the classroom. These aspects of input are operationalized in the TIOS items T14-25. More specifically this concerns how teachers modify *verbal input* in the L2 both lexically, structurally and prosodically. *Input quality* in more general terms concerns teachers' communicative behavior beyond speech modifications, notably how teachers shape their verbal interactions with the learners for example in terms of *authenticity of communication, negotiation of meaning*, how they accompany them with *non-verbal* scaffolds, types of *feedback* and *focus on form* including all strategies that are needed for these types of interactions. An important aspect of interaction is how teachers create opportunities for the productive *L2 output* of the learners. These issues were first raised in Krashen's *Comprehensible Input Hypothesis* (1985), Long's *Interaction Hypothesis* (1981, 1996), and Swain's *Output Hypothesis* (1985, 1995).

An example for L2 input for very young learners in a bilingual preschool, in which the L2 educator displays numerous such techniques within a short content-based activity introduction can be found in Kersten (2019b, pp. 46-49). Fig. 4.b (see below) shows an example of a teacher's input modifications in an L2 primary classroom. (It should be noted that classroom input obviously also contains the linguistic utterances of the peers. However, for the sake of simplicity I focus on the teacher while it is clear that many aspects described here also pertain to input provided by peers.)

5.1 Verbal input

In line with the models of cognitive processing presented in Fig. 1 and 2, verbal utterances have a high chance of intake if they are encountered frequently and demand recurring attention. This is in line with the *Frequency Hypothesis* (Hatch & Wagner-Gough 1976, N. Ellis, 2012) which claims that the use of large amounts of input in which elements reoccur frequently and many examples of the same phenomenon are made accessible, these elements will be better stored in memory. In instructional contexts for young learners, this may be ensured by a large amount of input in general [T15,16] – intensive L2 programs with many hours of FLT per week such as bilingual programs yield higher L2 levels than non-intensive programs which, in the German context, usually comprise two 45-minute lessons per week (see below) – and by any type of verbal input modification which increases the use of L2 elements. This includes recurring routines and rituals in the classroom [T18], repetitions of key elements [T19] and lexically and structurally rich language which provides paraphrases, synonyms and antonyms, etc. [T17]. Concrete speech modifications which promote comprehension include clear articulation [T21], a slower speech rate for certain aspects of the message if necessary for the group of learners [T22], prosodic elements with intonation and stress of certain key elements [T23] and, most importantly, pauses to help segment the incoming stream of sounds [T24] and to support recognition of key elements. For heterogeneous groups of learners (which, in fact, pertains to almost all groups we are talking about) these techniques would have to be adapted to different levels of learner skills [T20]. Finally, all of these modifications are, of course, closely related to the L2 teacher's overall proficiency in the L2 [T14], which is not self-evident in most L2 classrooms and a discussion in its own right (Carlson, 2020).

5.2 Non-verbal input

Linguistic utterances in the classroom are usually accompanied by unintentional or intentional non-verbal cues [T26-30]. Type and amount of non-verbal support often depends on the language level of the learners and gets reduced, like other scaffolds, with increasing skills (van de Pol et al., 2010). Non-verbal techniques comprise the use of body language (facial expressions, gestures, mime) [T26], visual illustrations such as pictures, graphs, videos, etc. [T27], and actual hands-on materials often referred to as manipulatives [T28]. Non-verbal written forms of input include simple labels, phrases or single sentences and texts, which are highly dependent on the learners' L2 level [T29] (see Long, 2015, ch. 9.2 for a discussion of level-appropriate use and elaboration of texts). Non-verbal support can be made more permanent, and thus increase frequency, by displaying materials, written labels/texts and visual illustrations in the classroom [T30].

5.3 Interaction and support of output

Learner's productive L2 use and the feedback they receive about it has a central place in ISLA. First raised as part of Long's *Interaction Hypothesis* (1981, 1996) and Swain's *Output Hypothesis* (1995), means to support learner output and the function of corrective feedback have received much attention in a multitude of studies. The *Interaction Hypothesis* emphasizes that input is rendered comprehensible in interactive exchanges between learners and proficient L2 speakers, which contain many opportunities for comprehension checks, negotiation of meaning and explanations. The *Output Hypothesis* posits that a strong support of productive learner output is necessary because it provides learners with opportunities to monitor their speech production, test their hypotheses about and notice gaps in their interlanguage. *Corrective feedback* both with regard to content (especially crucial in meaningful activities and in CBLT) and to language is considered a means to focus the learner's attention on non-targetlike representations, to render them more salient and to increase the chance of deep processing and subsequent storage.

Ways to foster output in the L2 classroom depend strongly on the language level of the learners and the choice of activities. Scaffolds such as prepared key vocabulary and phrases for learners' utterances on the targeted level [T36] are a helpful way to encourage beginning learners to use the L2 [T33]. In a meaningful task- or content-based context, questions which require open answers are part of the teaching approach [T31], and are considered especially beneficial as they increase the chance of widespread activation of conceptual structures both with regard to language and content (Fig. 1), and make active retrieval from memory necessary. In some cases, especially if the activation of prior world knowledge concerning a meaningful problem is successful and requires strong learner involvement, beginning learners might not yet possess the necessary language skills to express their thoughts. However, since language in content-based teaching contexts should not be learned at the expense of the subject content, or even at the expense of widespread activation of the learners' associative networks in their mind, it might become necessary to allows learners to use the L1 to compensate for some gaps in the L2 [T34], and to use alternative non-verbal ways of expression [T35]. In such context it is vital to give learners enough time for their answers [T32] and to show appreciation for their productions [T37], which contributes to motivation and a positive classroom climate, or in Krashen's framework,

lower the affective filter (Krahsen, 1985, Dewaele & MacIntyre, 2014). The time spent for L2 learning in the classroom and thus the learners' individual speaking opportunities are naturally very limited, which is another argument for using interactive tasks that involve all learners actively in peer-peer interactions.

5.3.1 Corrective feedback

The term *corrective feedback* (CF) refers to any type of verbal reaction to a learner's non-targetlike utterance which puts a focus on the (content or language) error [T38,39] (for an overview see Ellis & Shintani, 2014). (Much of the work in this field has been carried out with regard to linguistic errors; however, with the rise of content and language integrated programs which aim to promote content as well as language learning a combined focus of on both types of errors is deemed necessary.) These reactions can range from very implicit to very explicit ways of pointing out the error. Researchers have suggested different taxonomies of how to classify types of error corrections. A common classification has been suggested by Lyster & Saito (2010), who differentiate between *recasts* [Tb,e], *explicit corrections* [Ta,d], and several different types of *prompts* [T40c,f]. *Recasts* are reformulations of the non-targetlike utterance in a correct form without requesting further uptake by the learner – they represent an implicit form of feedback (which can easily be ignored by the learner especially if there is a strong focus on meaning in the exchange), even though there are ways to render recasts more explicit, e.g. by adding stress and intonation. Long (2015, p. 55) points out:

> Recasts are crucial points at which implicit and explicit learning converge in optimal ways. […] The learner is vested in the exchange, as it is his or her message that is at stake, and so will probably be motivated and attending, conditions likely to induce intentional learning and facilitate noticing of any new linguistic information in the input. The fact that the learner will already understand all or part of the interlocutor's response (because it is a reformulation of the learner's own) also means that he or she has additional freed-up attentional resources that can be allocated to the form of the response and, again, to form–function mapping.

Explicit corrections, on the other hand, draw the learner's attention strongly to the error in that the error is pointed out explicitly (such as in "no, that's not correct, the correct word is …"). Finally, *prompts* force (or 'prompt') the learner to reformulate their utterance themselves by marking the problem but without providing the correct answer. According to Lyster & Saito's classification, prompts consist of *clarification requests* ("Pardon me?") [Tc1,f1], *repetitions* of the non-targetlike form [Tc2,f2], *elicitations* which encourage the learner to reformulate ("What is that called in English? It's a …") [Tc3,f3], and *metalinguistic clues* which comment on the correctness or give the learner a hint as to the type of error involved ("You need a comparative adjective", Lyster & Saito, 2010, p. 280) [Tc4,f4]. Different types of CF are thought to tap into different mental processes – recasts are processed in working memory while for prompts learners have to retrieve the correct form from long-term memory (p. 281) – which might explain their differential effects on L2 learning.

5.3.2 Focus on Form

Finally, the discussion about how and when to use corrective feedback most effectively in the language classroom has been discussed in the context of grammar-focused versus communicative classrooms (comp. *synthetic* vs. *analytic approaches*, Long, 2015). It has been argued that, especially in communicative meaning-based teaching, learners often do not attend explicitly to

linguistic aspects which are not yet part of their knowledge base (their L1 system or their current state of interlanguage). For that reason, researchers in ISLA point out the benefits of explicit teaching approaches which guide the learners' attention to those linguistic aspects which are not salient (enough) in the input to lead to implicit intake. Long (2015) differentiates between *Focus on Form* and *Focus on Forms* approaches. *Focus on Form* refers to situations in which the teacher raises explicit awareness of certain linguistic elements at the precise moment when they arise or lead to a problem within meaningful communicative situations or tasks, so that learners can understand and analyze them in the context of the situation [T41]. In accordance with input processing models (Fig. 1), the network of meaningful representational associations is supposed to be widespread and highly active at those times, assumedly leading to better knowledge construction (Fig. 4.b). This is much less the case in *Focus on Forms* activities, i.e., exercises, in which only very limited mental capacity is needed, L2 input is impoverished and the chances of deep processing within a wide network of associations is restricted (Fig. 4.a).

In this context, the *Counterbalance Hypothesis* (Lyster, 2007) emphasizes that, in order to increase saliency, it is most effective to guide learners' attention to elements which are incongruent with (or run counter to) "a classroom's predominant communicative orientation" (Lyster & Mori, 2006, p. 269). That means that in mainly form-focused classrooms attention is consciously directed at meaningful content while in meaning-based instruction it is directed at linguistic phenomena so that activities and feedback act as a counterbalance. This contrast, i.e. the repeated change of focus between form and content, is presumed to increase awareness for gaps in the learners' knowledge and to strengthen links in memory, thus facilitating language acquisition.

Finally, some processing approaches suggest that corrective feedback can only be effective if it observes learners' developmental schedules. One such approach is Pienemann's (1989) *Teachability Hypothesis* which claims that intake is only possible for L2 elements which are either part of the already acquired developmental stages, or are one stage beyond the current level. The underlying framework, *Processability Theory* (PT, Pienemann 1998), assumes an implicational relationship of processing procedures with increasing complexity of linguistic forms, which means that stages cannot be skipped and therefore learners are not equipped to internalize structures which are two stages beyond their current interlanguage level. This means for example that learners at stage 3 of the model would not be able to incorporate the 3rd ps. sg. -s, as subject-verb agreement is only acquired at stage 5. This does not mean that learners are not able to explicitly attend to linguistic rules and to apply them in the context of an exercise where only declarative knowledge is required. They might be able to recite the rule when to use the -s and even add it correctly in a cloze test; they would, according to PT, however, be unable to use it implicitly in cases of creative production where automated knowledge it required. Corrective feedback which requires active self-correction would thus make most sense, according to developmental sequence approaches, if it refers to stages already acquired or 'within reach' (from a processing perspective) for the learner. (It has to be noted, however, that not all ISLA researchers subscribe to a developmental order of acquisition).

6. Implications for the L2 classroom

The author agrees with numerous theorists who have emphasized that communicative tasks and content-based approaches rather than exercises are best suited to fulfill the criteria summarized in the above sections. While language-focused exercises provide practice opportunities, support explicit knowledge about language and foster (restricted forms of) output, they can stimulate such cognitive processes as outlined in Fig. 1 and 2 only in a very restricted way (comp. Fig. 4.a for an example from a language-based primary classroom). Usually, they mainly trigger

explicit knowledge. Their lack of content focus makes comprehension scaffolding techniques and negotiation of meaning and form unnecessary, which are however considered major driving forces for deep processing. They do not require large representational networks which strengthen memory traces. Active individual knowledge construction hardly takes place. Low cognitive engagement is thought to diminish motivation and consequently attention, noticing and the chance of intake.

On the other hand, meaningful tasks (comp. Fig. 4.b) and content-language integration (comp. Fig. 4.c for meaningful language use in primary classrooms) provide a much higher chance of rich modified input framed by numerous scaffolds, feedback and negotiation techniques, multisensory stimuli, activation of prior linguistic and world knowledge, deep processing and subsequent knowledge construction. Focus on content goals is thought to increase motivation and lower the affective filter. This type of language learning uses many different channels, triggers numerous sensory representations, and stimulates both implicit and explicit learning which can complement each other and cater to different learner aptitudes. That way, it increases the chance for each learner to construct knowledge in a way suitable to their cognitive skills and individual 'mental wiring'. This might also be one reason why high cognitive skills seem to have a stronger impact in language-focused programs which foster (more) explicit learning than in content-focused programs which foster (more) implicit learning (comp. Tagarelli et al., 2011, 2015, Kersten, 2020).

Fig. 4: Examples from different instructional settings from 4th grade German L2 learners of English including teachers' total score rating (score out of 100) in a TIOS study (Kersten et al., in prep.b);
S – student, T – teacher

To suggest these teaching techniques incorporated in the TIOS and outlined in the previous sections as best practice examples for early L2 acquisition, empirical evidence is crucial. Two studies looked specifically at the combined the effects of numerous of the above mentioned instructional factors on the L2 acquisition of young learners. These two projects were carried

out in bilingual preschools by the ELIAS group (Kersten et al., 2010) based on the observation scheme IQOS (*Input Quality Observation Scheme*, Weitz et al., 2010, Weitz 2015), and the team that created the TIOS (Kersten et al., 2018). Kersten et al. (in prep.a) did a reanalysis of the IQOS data with N=210 children aged 3-6 and 21 teachers from nine bilingual preschools in Germany (n=7), Belgium (n=1) and Sweden (n=1). The IQOS contains 15 items on teaching techniques pertaining to input quantity, quality, promotion of comprehensibility, and reaction to children's output, many of which are also part of the TIOS. The study reports a high interrater reliability (r=.966, p<.05*) and a high internal consistency (α=.819) for the instrument, IQOS. Children were tested twice over the course of one year for L2 lexicon using BPVS 2 (Dunn et al., 1997) and L2 grammar with the ELIAS Grammar Test I (Kersten et al., 2010, Steinlen et al., 2010), two picture pointing tests. A multilevel model using Mplus revealed a differential effect on the classroom level: L2 input quality as measured with the IQOS had a significant effect on children's L2-grammar attainment at time 2, while L2 intensity predicted L2 lexical attainment at time 2. (Other significant influences were found at the individual level for children's age, L2 contact duration and socioeconomic status, operationalized as frequency of *reading books to the children in the family*, for L2 lexicon and grammar achievement at time 1.) The authors concluded that input quality, operationalized as modified verbal and non-verbal input, interaction and promotion of output, seem to have a particularly strong effect on (more) explicit attention to grammatical forms as processed in working memory, while frequency operationalized as the intensity of L2 encounters seems to affect (more) implicitly acquired breadth of vocabulary knowledge. More research is needed to shed light on these differential effects and the role that particular scaffolding techniques play.

Kersten et al. (2019) carried out a pilot study with 17 L2 teachers in regular EFL and bilingual primary schools in Germany using the TIOS to operationalize L2 instructional techniques. EFL programs started at grade 1 or grade 3 with two lessons of English per week, while in the bilingual immersion schools all subjects except for German were taught in English starting in grade 1. Nine lessons were videotaped in each type of program (one teacher taught a class in both programs). Interrater reliability (IRR) of two independent raters was high (Krippendorff's α=.882* based on 687 cases, 1374 decisions, item-based IRR Pearson's r=.687**-1.000** with p<.05), as was internal consistency of the TIOS (Cronbach's α=.905 for 38 items). When comparing scores of a subset of these teachers, immersion teachers (n=9) outperformed EFL teachers (n=7) by 13.5 percent points on the TIOS total score (p=.032*); the difference between the two groups was also significant for all scales (p<.05*) except for *support of output*. As content-based programs require increased scaffolding techniques to render content comprehensible, and as more of the immersion teachers were trained L2 teachers, this result was expected and taken as a sign for the construct validity of the instrument. The TIOS scores of ten teachers were then combined with L2 lexical and grammatical comprehension data of these teachers' respective students (N=183, M_{age}=9;5, 93-140 months, 3.-4. grade, four EFL classes: n=83, six IM classes: n=100). Students were tested for L2 lexicon using the BPVS 3 (Dunn et al., 2009) and L2 grammar comprehension using the ELIAS Grammar Test II (Kersten et al., 2012). Results showed that the total score as well *task characteristics* and *verbal input* correlated strongly with both receptive L2 skills. A regression analysis revealed that roughly 22% of variance for receptive lexical skills and 21% of variance for receptive grammar skills could be explained by the teachers' TIOS score (L2 lexicon: R^2=.218, F (1, 167) =46.635, T=6.829, B=.834, p<.001**; L2 grammar: R^2=.212, F (1, 167) =45.026, T=6.710, B=.668, p<.001**).

Results like these support the combined effectivity of instructional quality as described in this paper and as operationalized using observational schedules such as IQOS and TIOS, thus lending further support to processing models as outlined in Fig. 1.

7. Conclusion

It was the goal of this paper to given an overview of L2 input and instructional principles which are currently discussed in the cognitive-interactionist approach in ISLA, and to outline their theoretical underpinnings concerning individual (language) learning mechanisms. Understanding these mechanism in the learner's internal context is crucial to explain effects and effectiveness of teaching principles used in the L2 classroom. Relying on four models of second language acquisition, teachers' choice of classroom activities, their verbal and non-verbal input, interaction and feedback strategies were discussed in terms of scaffolding comprehensibility and inducing cognitive activation. It was argued throughout the text that effective teaching techniques include those which lead to intake, deep processing and, consequently, knowledge construction in the learner, and that this effect is mainly achieved by providing salience, noticing and awareness, by stimulating prior world knowledge and a rich network of meaningful associations, and by ensuring a positive learning environment to induce a state of learning enjoyment. These aspects are compatible with theoretical frameworks such as TBLT and CBLT. The *Teacher Input Observation Scheme* (TIOS, Kersten et al., 2018) operationalizes these principles in form of 'teaching techniques', which also serve as a structuring element for the discussion of practical L2 instruction to young learners in the second part of the paper. While these principles generally apply across all age groups and proficiency levels, adequate age-appropriate scaffolding techniques which foster comprehension, engagement and cognitive stimulation are vital specifically for young learners at the beginning of their L2 acquisition. The paper concluded with concrete examples and empirical evidence from preschool and primary classrooms which testify to the effectiveness of L2 teaching techniques as represented in the TIOS.

In closing, I would like to quote Lotta, an immersion student of the teacher with the highest TIOS score in our data set who taught the 4th grade class in Fig. 4.c. It highlights not only the high level of L2 attainment that can be reached by young learners in intensive L2 programs where teachers provide excellent input quality; it also shows the importance of a positive, inspiring learning environment as emphasized in studies of foreign language enjoyment (Dewaele & MacIntyre, 2014). Asked about the highlight of her four years in primary schools, she answered:

> *My highlight was actually every single second in the school. (…)*
> *I will miss it, this atmosphere,*
> *and feeling confident in the class, and safe.*

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