

# ASSESSMENT OF WHAT? FROM MEASURING MEMORIZED CONTENT KNOWLEDGE TOWARDS A MULTILEVEL ASSESSMENT OF COMPETENCIES – THE JOURNEY'S STARTING POINT

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# Abstract

The present paper draws on recent calls from the industry to support students' development of "Future Skills" (Ehlers, forthcoming), thereby highlighting the corresponding need for new assessment methods that can be applied in both contexts: organizations as well as higher education institutions (HEIs). To date, identification of such skill sets makes up the lion's share of publications, dedicating little attention to the important question of how to assess them. The present paper seeks to provide an attempt to fill this gap thereby linking Hackman's conceptualization of effective outcomes (organizational perspective) and Bloom's Learning Taxonomy (educational perspective). The key point the present paper aims to make is that to assess future skills, pure performance evaluation is not sufficient; instead, viability and learning are introduced as two additional types of outcomes suited for the future skills context.

### Introduction

This article investigates the nature of competencies and how they can be assessed, placing a special focus on future requirements for organizations as well as for higher education. Daniel Pink described these special requirements for future graduates and employees as follows: "The future belongs to a very different kind of person with a very different kind of mind creators and emphathizers, pattern recognizers, and meaning makers. These people-artists, inventors, designers, storytellers, caregivers, consolers, big picture thinkers-will now reap society's richest rewards and share its greatest joys" (2008; p.1). Pink's vision of the future worker is now already more than ten years old, and recent research evidence supports what Pink saw evolving in his crystal bowl. Ehlers (forthcoming) inquiring advanced German organizations identified seventeen "Future Skills" - skills organizations deemed to be key for the future worker. This umbrella term houses skills such as communication competence, creativity or innovation competence as well as sense-making, for instance - skills related to the types of minds described by Pink. By communication competence we understand "the ability of an interactant to choose among available communicative behaviours in order that he (she) may successfully accomplish his (her) own interpersonal goals during an encounter while maintaining the face and line of his (her) fellow interactants within the constraints of the situation" (Wiemann, 1977; p.198). Innovation competence is understood "as the disposition of an individual to act and react in an innovative manner in order to deal with

different critical incidents, problems or tasks that demand innovative thinking and reactions, and which can occur in a certain context" (Cerinšek & Dolinšek, 2009; p.170). With sensemaking competence, we refer to "a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively" (Klein, Moon, & Hoffmann, 2006; p.71). Rieckman (2011), Noweski et al. (2012), Deming (2017), the Organization for Economic Cooperation and Development (OECD, 2017; 2018), or Loshkareva, Luksha, Ninenko, Smagin, and Sudakov (2018) identified similar skill sets. These studies stress that students and employees need to not only possess the necessary knowledge within a certain field or domain, but further, and with increasing vehemence, need to be equipped with future skills, too. This trend has its roots within shifting labour market demands - a result of our changing work-world reality affected by digitalization, demographic change and globalization (OECD, 2017). Within Industry 4.0, companies have realized that in order to stay competitive, they need to become much more flexible and agile, and so need their employees (OECD, 2017). A focus on future skills thus emphasizes the importance of "learning for life" instead of "learning to the test" (Cliath et al., 2000; Jones & Egley, 2007), which becomes explicit in such future skills as "(self-) study skills" (Loshkareva et al., 2018) "self-guided learning skills" (Luksha et al., 2018), or "learning skills" (Ehlers, forthcoming).

Although working formats like group work have manifested within classrooms acknowledging the fact that social skills are important (Magnesio & Davis, 2012; Zhang, 2012), outcomes are still measured mainly in terms of performance (Johnston & Miles, 2004), that is, focusing on assessing the "product" as opposed to the "process" (Centre for Teaching Excellence, 2017; Luksha, Cubista, Laszlo, Popovich, & Ninenko, 2018), which goes contrary to the "learning for life approach" education is aiming at (Jones & Egley, 2007). Hence, one may assume that cooperation and communication competencies are being developed through engaging in a group task, but usually no major focus is on measuring whether competencylevels have increased indeed. However, as indicated by the research cited above, there is a strong need for the development of future skills. With this shift of what students should be equipped with, assessment methods need to be adapted accordingly (Ang & Slaughter, 2000), or as Andreas Schleicher (Director for Education and Skills, OECD) recently stated: "We need to transform assessment to address transformation of our society. Assessment instruments haven't really evolved since 1950s, it is the area of education where the least progress has been made" (as cited in Luksha et al., 2018; p.36). The present paper positions itself within this problem area, acknowledging that although there are many definition attempts to what a future skill is, the concept of preparing students and professionals for tomorrow's challenges follow often naïve approaches. It appears to us that it is not enough to focus on a number of new soft skills and enrich the current education approaches in this way but that a fundamental rethinking of the assessment of learning outcomes is needed. For a similar line of thought, see Loshkareva, Luksha, Ninenko, Smagin, and Sudakov (2018). This is not only a major challenge for HEIs; for organizations (companies, firms, enterprises), determining whether an individual has successfully completed a certain training program, or whether the

outcome of a group can be considered a success, for instance, are but two sides of the same coin. Adopting a complexity theories view calls for realizing phenomena not just as states (learning outcomes), but also as processes (Arrow, McGrath, & Berdahl, 2000). Thus, in addition to performance, the present paper aims at broadening our understanding, drawing on a multilevel conceptualization of outcomes from organizational research as performance, viability, and learning (Hackman, 1987) that accounts for the circular effects of achieved outcomes for future activities.

The current paper aims at providing a fruitful approach for both, higher education and professionals that shall serve to kick-off paving the way for future assessment models, thereby linking organizational research with learning theories. Specifically, we ask: "How can successful learning outcome(s) within the context of changing skill demands be defined?"

To answer this question, we will investigate and relate to different approaches of 'success', 'outcomes', and competency levels: (a) we investigate how to define "success" vs. "effectiveness", (b) we will describe Hackman and Morris's "Input-Process-Outcome-Framework" (1975), (c) use Hackman's (1987) three-fold typology of performance, viability, and learning, and (d) draw on "Bloom's Taxonomy" to provide a first approach for potential measurement of the identified outcomes. We will finish the paper by drawing a conclusion.

### **Defining success and outcome**

To understand what is meant by "successful outcomes", we need to understand a) what is meant by *successful*, and b) what *outcomes* refer to in this context. The next two sub-chapters aim at shedding some light onto these concepts.

# Differentiating "Success" from "Effectiveness"

*Success* and *effectiveness* have a long and problematic tradition of interchangeable use (Belout, 1998). Although the concepts are related to each other, there are some differences to be noted. Effectiveness approaches outcomes from a mechanistic point of view (Murdick & Shuster, 1976), generally pursuing objectives such as attaining target dates, achieving financial plans and controlling the quality of the final product (Belout, 1998; p.22). Thus, effectiveness usually can be measured numerically; for example, whether a certain target date coincides with the actual date the task was completed, or whether the calculated budget was exceeded, met, or remained below the calculation. On the other hand, whether a task has been completed *successfully*, is a question of perspective. Thus, we can refer to effectiveness as an objective evaluation.

A following question would then be: *Who* is evaluating? We can assume that a certain outcome may not only adopt various forms but that it will also depend on the evaluator whether this outcome is considered as successful or not. According to Mohammed and Ringseis (2001), an outcome of a group task can be valued by the team or by the organization the team is working for. Approaching the question of potential beneficiaries more

systematically, we adopt an ecological systems perspective (Bronfenbrenner, 1977). This perspective allows for a multi-level inspection of the interrelated systems that represent the different parties. Being surrounded by a variety of microsystems, such as his/ her family members or group members in a work context, the individual forms the nucleus in Bronfenbrenner's framework. The sum of micro-systems together comprises the individual's mesosystem, e.g. this individual's organization (s)he is working for. The norms, laws, economic structures and culture of the individual's society characterize the macro-system. According to Bronfenbrenner, these systems are interrelated, and thus changes on one layer induce changes on other layers (1977). Moreover, the direction is bidirectional, meaning that not only macro-level changes will level down to effect the individual, but also that changes on the individual level can lead to changes on the higher levels (Bronfenbrenner, 1977). This is important in so far as it underlines the fact that (group) outcomes are not only beneficial for one of the systems, but usually have positive effects for other systems as well. For instance, from an organizational point of view, the success of an individual actor may lead to this individual being committed to the organization and his/ her work. This, in turn, will be positive for an organization as well, because commitment has been found to be positively related to e.g. job performance (see e.g. Becker, Billings, Eveleth, & Gilbert, 1996). The same holds true for the group's outcome. If the group meets its performance goals, the organization benefits, too, as it contributes to the achievement of overall organizational objectives. Using this framework, we are able to identify relevant parties for our question about who may evaluate an outcome as successful: the work world, an employee's and/ or group's organization, as well as the group an employee is affiliated with, and the employee him-/ herself.

So far, we have clarified what we mean by "successful", thereby also taking into consideration that the evaluation of an outcome may depend on the respective perspectives of different, yet interrelated parties. In a second step, we can now approach the concept of "outcomes".

### Understanding "Outcome"

The term "outcome" is used adopting the Input-Process-Outcome framework (Hackman & Morris, 1975). This framework is considered the dominant theoretical approach for group and team work (Martins et al., 2004; Mohammed & Ringseis, 2001), but as we will see, it is also suitable to describe outcomes for and of individuals. According to the framework, inputs refer to the starting conditions for group work such as material or human resources (Martins et al., 2004). Processes then describe how these inputs are transferred into outcomes, thus representing "the dynamic interactions among group members as they work on a group's task" (Martins et al., 2004; p.809). However, we can also speak of processes within the context of individuals. Processes may then refer to an individual's activities of transforming certain inputs into outcomes. Finally, outcome is understood as the result of the (group's) activity that represents the consequences of these activities; these may be task- and non-task related (Martins et al., 2004). Adopting the ecological system's perspective again, we have seen that the systems – here, the parties – are interconnected; thus, we would expect outcomes in one

system to be beneficial for other systems as well. Additionally, an individual is not "only" an employee, but moreover a private person, maybe a basketball player, a member of a certain religious orientation, and the like. Introducing axes to Bronfenbrenner's framework serves to illustrate this line of thought: One axis in the n-dimensional space (where all systems are located) represents the individual as an employee, whereas on another axis, the systems making up an individual's space as a basketball player may reside. Depending on the respective axis, different outcomes are to be expected – some outcomes may be relevant for an individual as a person and as an employee, whereas others might only be relevant to the individual as a basketball player. Thus, not only systems, but also the spaces made up by the introduced axes are interrelated.

Still, we currently only have a basic understanding of the outcome itself. To investigate the nature of potential outcomes in a more detailed way, we draw on Hackman's threedimensional conceptualization as performance, viability, and learning (1987). Performance thereby refers to meeting the quality standards assigned with the activity. Hackman and Wageman (2005; p.272) further specify that the outcome may be a product, a service, or a decision, for instance. Although the performance outcome dimension seems to be easily assessable applying objective criteria, (e.g. Was a certain deadline met? Have certain skills been acquired?), Suskie reminds us that every assessment is inherently subjective (2009; p.19). Thus, whether a certain performance is deemed successful or not is again dependent on the perspective of the evaluator. Whereas one student may be frustrated with a "B" in an exam, another could be delighted achieving a "B". Both receive the same grade representing the student's performance, but the perceptions differ from one another. Moreover, the measurement of performance as either subjectively evaluated by the team (subjective measurement), or in terms of objective performance data (measures of team decision quality) has been shown to lead to different patterns in an analysis of shared mental models within student teams (van den Bossche, 2006). Drawing on the previous students grading example again, the "happy B student" would rate his outcome as successful, whereas the "sad B student" would probably not claim it a success. The teacher however, would rate the success of both students as equally good, as they both obtained the same grade. Only if all actors (in a group context) or the individual (in the context of an individual engaging in a certain task) define certain performance measures before they engage in the task (e.g. a certain grade), will it be possible to objectively assess the performance afterwards. Otherwise, multiple heterogeneous interpretations might exist that probably cause variability in the perceptions of an outcome as (un-)successful.

Instead, *viability* – acknowledging the circular learning effects of outcomes – refers to the group's ability to work together in the future as "the social processes used in carrying out the work should maintain or enhance the capability of members to work together on subsequent team tasks" (Hackman, 1987; p.323). Exploring viability beyond the group context, we find that it primarily means an individual's "ability to live, grow, and develop" (viability, 2019). Hence, we infer that viability may also refer to an individual's grown abilities to solve a given

task. Thus, where a group's increased viability denotes the actor's ability to maintain to work together again in the future (individual-group-relationship), an individual's *self-viability* may characterize his/ her improved ability to find successful ways for future task solving (individual-self-relationship). Note that whereas group viability is a potential outcome solely possible in situations of group members interacting with each other, we find the more individual-oriented self-viability to occur as an outcome of both, group and individual task solving situations. Thus, we classify viability into group and self-viability.

Ultimately, *learning* denotes the actors' professional growth (Hackman, 1987). Thus, we do not see learning as a mere process here that leads to a certain outcome, e.g. some behaviour because of an individual having learnt something, but rather as an outcome itself. To understand what is meant by professional growth, we draw on the "Interconnected Model of Professional Growth" by Clarke and Hollingsworth (2002). For them, professional growth as an outcome means changes within an individual's personal domain and his/ her domain of practice. The domains are part of the individual's growth environment as represented in Figure 1. Within the personal domain, an individual's knowledge, beliefs and attitudes are located, whereas the domain of practice houses (professional) experimentation. Change processes (learning) in one of the domains are transferred via reflection and enactment into change processes in the other domain. By enactment Clarke and Hollingsworth (2002) refer to the translation of a belief or model into action. When these changes occur, learning takes place and the individual grows professionally. Note that in the original model, four domains are present that influence each other. However, we stick to the personal and the domain of practice for the purposes of this paper as they represent the two main learning objectives.



Figure 1. Learning as professional and/ or personal growth (own representation based on Clarke and Hollingsworth (2002))

Although Hackman's typology accounts for important outcomes, it seems plausible to extend his understanding of learning not only considering it as professional growth, but also in terms of *personal growth*. As work and private life become increasingly more intertwined (Ehlers, forthcoming), personal growth is likely to be an important outcome, too, and should therefore be added to the typology. Our adapted framework building on Bronfenbrenner's ecosystems framework elaborated on earlier, accounts for this fact as the integrated axes

concept acknowledges that individuals may act out different roles – a professional one as an employee as well as a private one as for instance a mother. Although the interconnected model of professional growth as it is exemplified by Clarke/Hollingsworth was intended to describe a person's professional growth only, no apparent reason argues against applicability to the personal context, too. Here, as for the professional context, changes in knowledge, beliefs and attitudes (personal domain) can spur behavioural experimentation (domain of practice), as well as the other way round, trying out a new activity (domain of practice) can change the way one feels, believes or thinks about a certain topic (personal domain). To sum up, learning as an outcome refers to developments in the personal domain (knowledge, beliefs, attitudes) and the domain of practice (behaviour) leading to professional and/ or personal growth.

Having gained a clear understanding of the outcome types relevant within an organizational context, we can now move on to propose ways of how to assess them in both contexts, the organizational and the educational.

### The three outcome types within a future assessment scenario

As has been stated in the introduction part, the performance outcome type is probably the most prevalent and assessed outcome type within the current educational and professional context. When employers consider hiring a graduate, one of the key criteria assessed are the grades that are deemed to represent a student's performance. Of course, it is handy for recruiters to have grades as they serve to discriminate between individuals, suggesting that the students having obtained better grades in relevant subjects might be better suited for a certain position. In the context of (group) performance, we have seen that performance is commonly measured in terms of reaching a certain target, such as designing a product until a certain deadline for instance. To evaluate the success of this, usually a supervisor assesses then, whether the prescribed objective was reached or not (Hackman & Wageman, 2005). Performance as an outcome type will definitely maintain its right to exist as it serves to evaluate the degree to which quality standards have been met for the activity or task carried out. However, performance mainly provides a snapshot, usually not acknowledging that the processes during the task can yield benefits for future activities. Therefore, our emphasis in this chapter will be on the two types of outcomes that we believe are able to capture these circular effects, and thus are suitable for measuring the development of future skills: viability and learning.

We want to dedicate the remainder of this paper to suggest potential ways for assessment building based on what is commonly known as "Bloom's Taxonomy" (Bloom et al., 1964). We chose Bloom's taxonomy, as it is one of the most cited and discussed taxonomies in the field (Forehand, 2010), but will use it in its most recent version rethought by Anderson and Krathwohl in 2001. We do so because the newer version was developed taking into consideration many of Bloom's own concerns surrounding his original taxonomy (Krathwohl, 2002; Wilson, 2016). This taxonomy arranges cognitive learning outcomes in a

hierarchical fashion sorting them from the least complex (at the bottom) to the most complex outcome (at the top) ranging from remembering and understanding over applying and analysing up to evaluating and creating. However, and as Piaget noted: "[A]t no level, at no state [...] can we find a behaviour or a state which is purely cognitive without affect nor a purely affective state without a cognitive element involved" (as cited in Clark & Fiske, 1982; p.130). Thus, it is somewhat alarming that Shephard (2008) upon analysing educational endeavours in affective learning found that most teaching and assessment focused on cognitive skills only - leaving aside affective outcomes. The present paper seeks to acknowledge this by means of considering potential affective elements within the identified outcome types, too. Consider for instance the group viability outcome type: Here, it was argued that the social processes within the group should lead to improved abilities to work together again in the future. Within a group context, values and attitudes of the group members will play a key role because they affect the "ability to listen, to respond in interactions with others, to demonstrate attitudes or values appropriate to particular situations, to demonstrate balance and consideration, and [...] to display a commitment to principled practice on a day-to-day basis, alongside a willingness to revise judgement and change behaviour in the light of new evidence" (Shephard, 2008; p.88). In Krathwohl's taxonomy the affective learning outcomes (enumerated from the least complex to the most complex) are: Receiving, responding, valuing, organization, and characterization (Krathwohl et al., 1964). Thus, a potential way to assess group viability, and individuals' different levels of this type of outcome, could be to draw on Krathwohl's taxonomy of the affective domain. For an overview on particular assessment methods based on the Krathwohl taxonomy, see for instance Buissinik-Smith, Mann, and Shephard (2011). The same holds true for self-viability. Yet, in this situation no other individuals are involved. Thus, the individual rather grows affectively in terms of getting to know him-/ herself better instead of developing affectively as a result of working together with others. For instance, Shephard (2008) states that an individual needs to be willing to revise judgements in the light of new evidence; this accounts for revising a judgement about a colleague within a group work context (group viability), as well as for reconsidering whether a certain way of handling a given task is beneficial (selfviability).

However, and acknowledging Piaget's interjection, the other outcome types should also possess elements of affective development, as well as cognitive outcome properties.

In addition to cognitive and affective learning, Dave (1975) formulated a third taxonomy that focuses on the psychomotor domain. As the two taxonomies discussed before, Dave's taxonomy also arranges the five outcomes in a hierarchical fashion. The psychomotor learning outcomes (enumerated from the least complex to the most complex) are: Imitation, manipulation, precision, articulation, and naturalization (Dave, 1975). Taking a look at the learning outcome types of personal and professional growth for instance, we can assume that psychomotor skills will play a role here. According to the Clarke and Hollingsworth's model (see previous chapter), growth is triggered by changes on both, the personal domain (in terms

of knowledge, beliefs, and attitude changes), and/ or the domain of practice (experimentation). The latter can be associated with the psychomotor domain of learning, whereas the personal domain is related to cognitive and affective development. Along the development of manual tasks and physical movement, the psychomotor domain is also concerned with communication skills for example in terms of public speaking, or the operation of IT equipment, such as telephone and keyboard skills (Chapman, 2006; Rovai, Wighting, Baker, & Grooms, 2009). Thus, in a situation where an employee is asked to represent some data in a graph for instance, this will stimulate the psychomotor domain. If it is a new task for the employee, (s)he might try to recall other charts (s)he has seen and replicate them using the new data ("manipulation"). A more experienced employee (concerning graphical data representation) might instead analyse what kind of chart would be best suited, to design a new graph, which would fall under the "articulation" level. Bringing this back to the Clarke/Hollingsworth model we would assume that the skill of drafting a graph (domain of practice) would stimulate reflection processes, which serve to transfer the behavioural experimentation into knowledge, maybe beliefs and/ or attitude changes, resulting in professional growth. This in turn points back to Piaget (see above), who argued that the affective and the cognitive domain cannot be viewed separately; from the preceding explanation follows that this holds true considering the Clarke/Hollingsworth model, and, moreover, that a third domain, the psychomotor domain, also needs to be taken into account.

One additional note on the assessment of outcomes: Shephard emphasizes that it is of vital importance to specifically evaluate affective outcomes, as otherwise they would easily be missed (2008). Though we generally agree with him, we argue to extend this view to be valid for all three domains, thereby pointing towards Burch's "Four Stages of Competence Learning Model" (1970 as cited in Spool, 2011). Although Burch relabelled the model thinking the steps from a learner's perspective, the original version was developed by Broadwell as "the four levels of teaching" in 1969. According to the model, learners start their learning process in the stage of "unconscious incompetency". When they realize that they lack a certain competency, they enter the stage of "conscious incompetency". Through learning efforts directed at improving the respective competency, they may then progress towards the stage of "conscious competency", where they become aware of the fact that their learning efforts pay off, as they are able to display the competency. Within the last stage, the awareness of being competent has become so natural that it disappears from an individual's consciousness, making the competency unconscious. This should not only hold true for the affective domain, but also for the cognitive and the psychomotor as individuals generally need to develop an awareness for their current level of competency to be able to take meaningful next steps in accordance with this level.

The next chapter will briefly summarize the previous discussion, highlighting the main points and providing some food for thought on potential next steps.

# Conclusion – Where do we go from here?

We started our discussion asking what we would need to measure in the light of changing skill demands towards an emphasis on future skills. We have contrasted the concepts of success and effectiveness, yielding that effectiveness describes objectively whether an outcome fulfilled certain predefined criteria, whereas a successful outcome is linked to the perspective of an evaluator. To gain a more precise overview on potential beneficiaries, who may assess outcomes as (un-)successful, we drew on an ecosystem's perspective, incorporating an axes concept that allows to acknowledge that individuals act out different roles within different contexts (e.g. professional vs. private) and that development in one space can also leverage change in another. Moving on to gain a clearer understanding of outcomes, we generally defined them in an IPO-framework fashion as the valuable result of transformed inputs. However, when assessing, it was claimed that we should focus on assessing more than just the performance. To support a fit between what HEIs equip their graduates with and the employees' organizations are looking for, HEIs will need to shift their focus on developing graduates' future skills (Ehlers, forthcoming). As the demand shift is fuelled by organizational changes, it seems reasonable to also take a look at what organizations deem to be important outcomes. Therefore, we drew on Hackman's (1987) conceptualization expanding it to be applicable beyond the group context, i.e. for individuals.

As we have argued, performance, viability, and learning can also be assessed within a higher education context drawing on the taxonomies of learning outcomes elaborated on in the preceding chapter. They enable us to assess the different outcome types in terms of their complexity level and the respective domain. Using the already developed methods to assess the different levels in the cognitive, affective, and psychomotor domain (see for instance Rovai, Wighting, Baker, & Grooms, 2009), will help to evaluate students' and employees' performance, viability, and learning, and could also serve them to accurately self-assess their current competency levels. The authors developed a short self-assessment instrument to evaluate students' cognitive, affective, and psychomotor learning. Moreover, future research may compile an instrument following the approach of Sipos, Battisti, and Grimm (2008) for the purpose of curricula design, following a constructive alignment approach (Biggs, 1996). Yet, before we engage in such endeavours, a systematic segmentation of the outcome types identified is required in order to be able to understand which cognitive, affective, and psychomotor components they are based upon. The examples provided above only mark the journey's starting point towards assessing the key competencies of the future.

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