

## Identifying, Developing and Grading 'Soft Skills' in Design and Technology Education: A Methodological Approach



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### Abstract

Soft skills (Professional skills) complement hard skills to enhance an individual's relationships, job performance and career prospects. Strategically targeting the development of these skills requires the recognition of key qualities, the capacity to discriminate between qualities (Orsmond, Merry, & Reiling, 2000; Sadler, 2009) and a mechanism that will validly and reliably reward acquisition. Educators and learners must take cognisance of the sophisticated relationships between acquiring content knowledge and professional skills through specific ways of working and thinking.

This research, which is part of a three year longitudinal project funded by the European Commission, frames the initial challenge of untangling *Hard* and *Soft* skills for the purpose of explicit development and assessment.

Understanding the nature of evidence that is suggestive of soft skill acquisition is central to this research. Key design considerations are presented in this paper and outline the potential use of information and communications technology (ICT) to enhance teaching, learning and assessment tailored for the recognition of soft skills.

The paper proposes an assessment architecture that acknowledges the importance of educator, peer, and self-appraisal when adjudicating on subjective and often personal data. The proposal has the capacity to balance, weight, and triangulate the objective and subjective evidence of soft skill acquisition ensuring the validity and reliability of resultant digital accreditation. The work presented in this paper outlines a conceptual framework for the assessment approach that has been designed for implementation in the initial pilot phase of the GRASS project. On completion of the pilot phase data will be analysed for the validation of the assessment approach which will be presented in future work.

### Context

Grading Soft Skills (GRASS Project) is a 3-year longitudinal research project financially supported by the European Union focusing on representing soft skills of learners of various ages and at different levels of education in a quantitative, measurable way, so that these skills can become the subject of formal validation and recognition. The project is being developed with the support of the Lifelong Learning Programme (LLP) of the EU, the flagship European funding programme in the field of education and training. The overall objective of the project is to create mechanisms that enable educators to continuously support, monitor, assess, and acknowledge the development of learners' soft skills by leveraging state-of-the-art ICT tools. The project consortium includes eight project partners from four different European countries. Each partner institution developed specific application cases for the

implementation and testing of the assessment approach. The context of the application cases range from lower second level schooling to higher education at University level. A key principle of the project is to create an assessment approach that will accommodate the variables of soft skills, subject discipline and student developmental stage. A key consideration for the research is the impact student experience and maturation will have on the nature of the soft skill presented and the level of attainment. This will be evidenced through the student inputs to the assessment instrument across the range of application cases. An initial pilot phase will investigate the validity and reliability of the assessment approach from the perspectives of specific soft skills, context and student developmental stage. This paper proposes the principle based assessment architecture that supports the grading of soft skills that is applicable to all applications in the pilot phase of the study. Understanding the nature of soft skills is a critical aspect of the assessment architecture design to ensure a valid interpretation of student evidence of capability.

### **Definition of Soft Skills**

It has become critical for educators and educational systems to revise and redefine the knowledge and skills required for living in an evolving world. Many efforts have been made to identify the skills required to successfully navigate this new space, e.g., "21st century skills" (Dede, 2010; Voogt & Roblin, 2012) or "new literacies for the knowledge society" (Mioduser, Nachmias, & Forkosh-Baruch, 2008). Soft skills are closely related to what are described as 21st century skills - a broad set of knowledge, skills, work habits, and personal traits that are considered highly important for success in today's world, especially in modern workplace settings. Soft skills have been defined in different ways, but a common trait of all those different definitions is that they, either explicitly or implicitly, distinguished soft skills from hard or technical skills (Litecky, Arnett, & Prabhakar, 2004). Soft skills have also been defined as a dynamic combination of cognitive and meta-cognitive skills, interpersonal, intellectual and practical skills (Haselberger, Oberhuemer, Perez, Cinque, & Capasso, 2014). They help people to adapt and behave positively so that they can deal effectively with the challenges of their professional and everyday life. The SCANS report (U.S. Department of Labour, 1992) and MODES final report (Haselberger et al., 2014) are two of the most cited and often used lists of soft skills both within employment and educational domains. Haselberger et al. (2014) identifies 22 soft skills and clusters them into three groups: personal, content-reliant/methodological, and social. In the MODES project (Haselberger et al., 2014) each soft skill is defined and also associated with other soft skills, demonstrating that the relationships between individual soft skills and the evidence of soft skill attainment is a complex amalgam of numerous variables.

As a result the GRASS project team initially developed a categorisation that would help focus the learning and assessment activities without atomising the inter-related nature between the soft skills and the subject content being studied. Lorenz (2014) presents the term soft skills as a set of transferable skills that include personal and social behavioural traits and competencies. These socio-emotional skills can be categorised by two distinct perspectives; i) intra-personal skills that support the holistic development of the individual, and ii) inter-personal skills that enable the individual to participate effectively within a society. Aligned with the work of Binkley et al. (2012) this project acknowledges the sophisticated interplay between these dimensions and considers soft skills through the following four categories:

- **Ways of working (Intra–Personal Development):** enthusiasm, positive attitude, inquisitive, persistence, self-regulatory, professional
- **Ways of working with others (Inter–Social Participation):** collaboration, communication, negotiation, conflict resolution, teamwork, networking, managing divergence, leadership, emotional awareness
- **Ways of thinking (Intra–Personal Development):** problem solving, critical thinking,

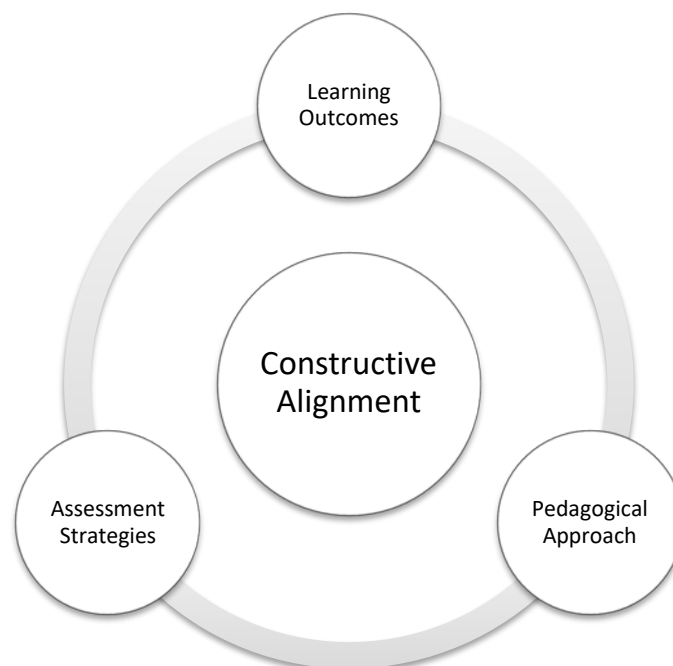
synthesis, evaluation, divergent and lateral thinking, strategic thinking

- **Ways of thinking with others (Inter-Social Participation):** creating, refining and negotiating meaning, confidence to be different, differentiation of contributions, exploration, cumulative discourse, disputational judgement

Categorisation is the initial phase of the planning and development of soft skill integration in learning activities. Soft skills are strategically targeted, specific to individual and disciplinary requirements. The study aims to establish a hierarchy and groupings of soft skills for progressive development appropriate to the phases of student cognitive development. This is an important outcome that will be made explicit through the contextual student inputs to the project assessment architecture. The focus of this paper is on the key elements to the assessment architecture that will support the development, capture and evaluation of student capability in the area of soft skills.

### **Constructive Alignment**

Supporting an effective assessment approach requires the underpinning of well-developed and appropriate pedagogical practices. Constructive alignment (Biggs, 1996) is the theoretical underpinning of an outcomes-based curriculum used for devising teaching and learning activities and assessment tasks that directly addresses the nature of learning. Constructive alignment describes the coherence between intended learning outcomes, pedagogical approaches, and assessment strategies in an educational programme (Figure 1). Biggs (1996) suggests that the intended learning outcomes are designed first, teaching and learning activities are designed second, and the assessment regime third. If this sequence is adopted, it is important that activities are designed which enable students to learn and demonstrate achievement at the highest level described by the learning outcomes.



**Figure 1: Biggs' Constructive Alignment**

This project subscribes to a participative approach to learning, where the dominant pedagogy is drawn from the experiential learning model presented by Kolb (1984). The critical nature of learning task design and pedagogical approach are acknowledged in the overall project, however the focus of this paper is to define an assessment approach that can identify and reward the evidence of qualities associated with soft skills.

## Elements of the Assessment Approach

Moore (2004) considers two schools of thought in relation to the teaching and development of soft skills; the *generalists* and the *specifics*. The rising recognition of soft skills in the 1970's was initially approached by generalists' theory and practice. They thought that soft skills were indeed generic, and could therefore be mastered separately from any specific topic/domain and applied to any discipline. By contrast, 'specifics' argue that soft skills cannot be separated from their disciplinary context; they see knowledge as fundamentally situated. There are also *relativists* whose position is in the meridian of the generalist and specific positions. They argue that a generic attribute such as critical thinking needs to be learned contextually, but once learned, can be transferred to another context. This study adopts the relativists position where soft skills and hard skills must be developed concurrently and with the added view that soft skills can only be meaningfully assessed if they have been a central part of the learning activity. This is the first element of the assessment approach.

The second element of the assessment approach establishes the nature of the assessment data for interpretation. The approach taken to the development of soft skills in this research is to support the contextual integrity of this development as an integral part of the acquisition of hard skills. It is widely acknowledged that hard skills are easily differentiated from soft skills. While it is not difficult to identify, develop and reward evidence of hard skills, the evidence of soft skills is somewhat more problematic. Despite clear descriptors of specific soft skills (Griffin, McGaw, & Care, 2012; Litecky et al., 2004) the authentic evidence is not always easily attributable to a particular skill and may in fact represent only partial alignment or suggest multiple skills. The difficulty lies in separating the evidence of specific soft skills from other soft skills, for the purpose of development and grading. This requires a more qualitative approach, specifically interpretative. The next element to consider is the source of the assessment interpretation.

Although an interpretive approach contrasts with generalizable results, the validity of the measure of soft skills must be considered within the educational transaction and the situational context. In addition, the interpretation of this context and situation can be variable depending on the role of the stakeholder in the educational transaction. It is proposed that the separation of evidence appropriate to the award of a specific skill may only be interpreted validly by the person(s) directly involved in experiencing this evidence as it was created. This is the third element of the assessment approach which identifies the teacher, learner and peer as the sources for judgement on the assessment data. Although it can be argued that the valid interpretation of evidence requires stakeholder involvement, it is considered that interpretations are also variable, especially with respect to maturation, self-efficacy, self-esteem, latent values etc. The capacity of such variables to impact on the validity and reliability of the recognition of soft skills is also a key consideration of the proposed assessment architecture.

Element four of the assessment approach is considered as a key support for the student integration in the assessment process. When embracing a constructivist approach to learning, formative assessment becomes a central issue. As students work within their zone of proximal development (Vygotsky, 1978) their guidance and support from a more skilled person is informed by assessment of their progress. Black and Wiliam (1998) outline the positive influence of formative feedback on student learning. Yorke (2003) details the formal and informal nature of formative assessment and presents the potential of formative assessment in promoting self-regulation in students. This enables students to develop an appreciation of the standards expected of them. Black and Wiliam (1998) report that the effectiveness of formative assessment is dependent on the quality of feedback and the interaction between student and assessor. Black and Wiliam (1998), Orsmond et al. (2000), Sadler (1998, 2009) and Yorke (2003) consider teachers, peers and students themselves as

potential contributors to the formative assessment process and outline the importance of strategic planning for the integration of formative assessment into any learning activity. Therefore, the fourth element of the assessment approach is that there must be evidence of teacher and student led formative assessment in the award of the soft skill credential.

### **Assessment Architecture**

The nature of the evidence resulting from the constructivist based approach, supported by active learning methodologies, is personal, diverse and often idiosyncratic. By comparison to evidence of hard skills which tend to be more declarative in nature, soft skill evidence is exposed in the authentic performance of the learner within the learning task, shifting the focus from the 'product' of learning to the actual learning process. The context dependent nature of soft skills requires an assessment approach that offers flexibility in the capture of evidence, clarity in its presentation and coherence in the judgement on evidence of soft skill demonstration and attainment. Aligned with the work of Bevir and Kedar (2008) the GRASS project assessment architecture supports an interpretative paradigm where the evidence is considered within an experience-near orientation that sees the learners' actions as meaningful and progress contingent. This paper proposes four key characteristics of the assessment architecture that supports the grading of soft skills:

- **Capture:** Capture authentic evidence of student performance both reflexive and reflective in a representative form – multi-modal capacity
- **Context:** Accounts for the situational context in which the skill is being demonstrated and presents the learners personal construct of capability by determining what is presented as evidence of learning relative to the task and context
- **Coherence:** Track the multi-modal meta-data produced by students throughout the learning task(s) presenting clear evidence of progression relative to the initial attainment and targeting specific benchmarks
- **Perspective:** Acknowledge the value judgements of stakeholders within the learning task (self, peer and professional) and consider with reference to the experience-near orientation

### **Authentic Capture**

This study aims to create mechanisms and methodologies that will enable educators to develop, support, monitor and assess soft skills through effective pedagogy, integrated assessment and leveraging state of the art ICT tools. This creates the need for a learning management system that supports the non-invasive creation of evidence of learning to be presented for the purpose of assessment. A soft skill credentialing service tool is also required that supports the relevant stakeholder in the learning task to exercise their judgement on the evidence of soft skill attainment. When selecting appropriate ICT tools, digital badges and more specifically Open Badges (OBs) were found as the most viable means of recognising and credentialing soft skills (Jovanovic & Devedzic, 2015). A digital badge is a validated indicator of an accomplishment, skill, quality or interest that can be earned in various learning environments. Their major advantage lies in the traceability and transparency of learning evidence associated with a badge as a digital credential. The approach facilitates the seamless documentation of meta-data that will present the chronology of engagement by the learner throughout the learning task. This will help the assessor gain an insight into the performance of the student to contextually understand the evidence of learning. The badging system can be populated from multiple sources, i.e. learner/peer/teacher, throughout the learning task where the context and discrimination of evidence of learning can be demonstrated. In addition, the reported experiences on the use of OBs in a variety of educational settings indicate that they could serve as a means of; i) motivating learning; ii) charting learning routes; iii) supporting self-reflection and planning and iv) supporting alternative forms of assessment. Accordingly, the project team has decided to rely on the concept and technology of Open Badges coupled with learner-

centred, social-constructivist pedagogical approaches, in order to build a viable solution for developing, recognising, assessing, and grading learners' soft skills.

### Context and Coherence

Having considered the implication and infrastructural requirements necessary to capture the authentic evidence of the learners' soft skills, the second dimension to the proposed architecture is to explore the inference that can be drawn from the evidence. A key aspect of the architecture is to acknowledge and credit the ongoing development and mastery of the soft skill throughout the learning task. With emphasis on capturing the process of learning, the approach presents the opportunity to track the meta-data accumulated through the digital badging infrastructure as evidence of learners soft skill development emerges. The ongoing visibility of the assessment data through the digital badge award is both helpful for the teacher and learner in tracking progression and identifying the appropriate next step to take. This is important in the development of the student's personal construct of the nature and value of the soft skill being attained. The contextual development and tracking of progression in the learning task presents the opportunity for the learner to identify critical skills to help them effectively navigate the challenges in both their learning and future professional lives.

### Perspective

On a systems level the proposed architecture recommends that the decision reached in relation to attainment of a specific soft skills should be an aggregation of the interpretation of the partners in the educational transaction. The significance of the triangulation that respects the learners own self-reflection, the peers experience and evaluation, and the professional's perspective and critique is grounded in the ecological validity of the approach (Figure 2).

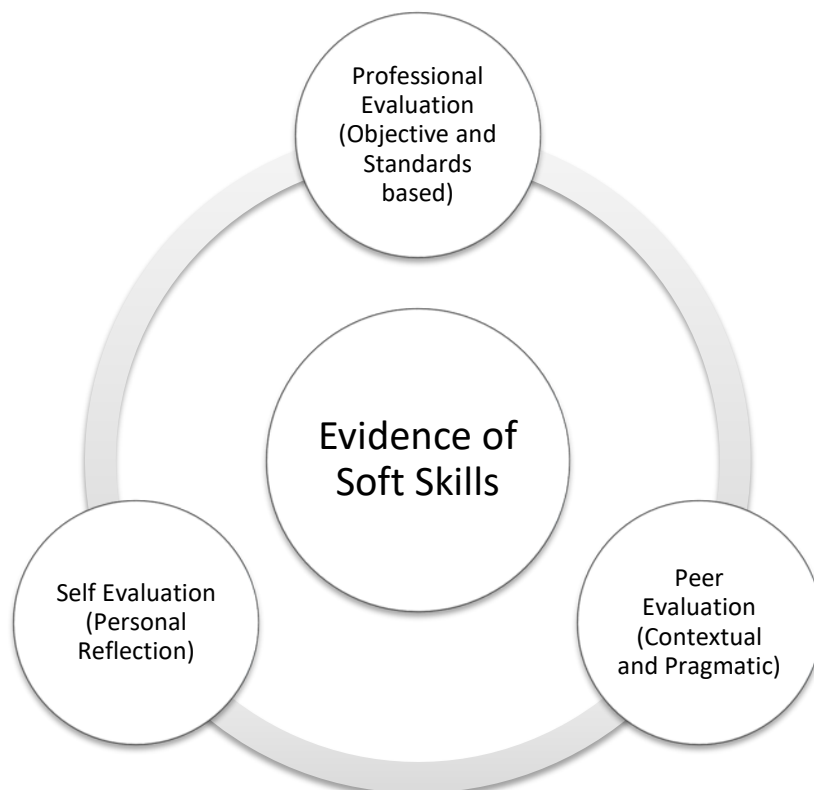


Figure 2: Assessment Architecture

In principle the approach (and technological capacity) supports the dynamic distribution and redistribution of the weighted impact of all three stakeholders' interpretation with respect to

the context and situation. For example, it is conceivable that in certain circumstances the peers view of the evidence may outweigh that of the teacher, or the self-evaluation of the learner may be a more reliable interpretation than the peers depending on the nature of the learning task or purpose of the educational intervention.

## **Discussion**

This paper proposes a responsive and dynamic approach to the assessment of soft skills. Understanding the interrelationship between working and thinking independently and with others requires a relativist approach to the grading of these skills. The social-constructivist view of learning is holistic in nature, focusing not only on the construction of knowledge, but also on aspects of attitude, emotions, values and actions (Breck & Kosnik, 2006). This approach encourages the development of relationships between teachers, students and peers, thus creating an environment supportive of personal and academic development. Thus the social-constructivist view of educational practice supports the development of soft skills; however, the problem arises with the tacit and difficult to quantify evidence of learning.

Sadler (2009) strongly advocates that students be inducted into the assessment process to help them make sense of the progress of their learning. This leads to the development of a personal construct of capability by the learner where the learner not only shows understanding of the discipline knowledge/skill but can also discriminate on the quality of performance or attainment. Providing the opportunity to develop this personal construct requires a learning environment that supports the student in their exploration of value and meaning which can be achieved with the constructivist paradigm (Sadler 2009). Providing the opportunity to exercise their judgement in the award of capability can intrinsically motivate students leading to a more valuable educational experience. Designing an assessment architecture is dependent on the interpretation and judgement of learners and peers must ensure that all learners develop a construct of understanding in relation to the soft skill to ensure validity of the assessment credential.

Exercising the students' self-judgement requires learners to become aware of the sophisticated relationships between ways of working and ways of thinking. This is best achieved through a learning environment that supports students in their exploration of value and meaning (Sadler, 2009). Peer assessment activities are best suited to evaluating student performance in the inter-personal categories of soft skills where they can make judgements based on their authentic experience with others during the learning activity, e.g. ways of working with others and ways of thinking with others.

This approach has potential to help students gain knowledge about themselves. It requires learners to learn how to use knowledge appropriately in a context that is relevant to a given task. For example, having completed some tasks related to the development of collaboration skills students would not only be expected to exhibit good collaborative practice, they would also be expected to identify when it may be beneficial, recognise effective collaborative practices, and identify qualities of collaboration in support of determining varying levels of attainment. The digital badging infrastructure has the capacity to award badges as the evidence emerges over time. The accumulation of badges from the multiple perspectives of self, peer and teacher creates a matrix of evidence that will determine the ultimate award. Determining the appropriate weighting of the individual elements and perspectives is a critical element of this research project.

The assessment framework places the student at the centre of the learning and assessment activity. Learning and assessment is not seen as something that is imposed, but rather as activities that allow them to grow and explore the value of their learning. The real-time capture of authentic evidence for the purposes of evaluation and assessment is a central feature. This has been made possible through the ICT infrastructure and digital badge issuing platform. The dynamic communication between the professional, peer, and self-

judgements on quality provides the opportunity for the student voice to be considered in the award. The method employs judgement of quality through skills of appraisal based on a personal construct of capability by the learner, teacher and objective standards. Based on the relativist paradigm, this approach validates judgments based on triangulated data and facilitates the non-uniform rational weighting of judgements in response to context and situation.

The strength of this approach is in the triangulation of judgements to ensure the validity and reliability of the assessment. It is proposed that the outcome of this approach will produce a cumulative score awarding a performance on a descriptive scale. Criteria and levels of attainment for the assessment of qualities of soft skills can then be applied by the awarding body appropriate to the context and needs of their corresponding discipline.

## Conclusion

This paper proposes an assessment architecture that focuses on the performative evidence of the learner created in real-time. This evidence is multi-modal and responsive to the needs of the learner or task. Using state of the art ICT tools and services the learners' data can be reviewed and tracked over time to demonstrate progression and competency, with respect to context and situation. Due to the personal and often idiosyncratic nature soft skill evidence, the paper proposes a relativist interpretation of the evidence. Empowering the stakeholders as critical partners in the assessment activity supports the ecological validity of their judgements on the presented evidence. Reliability is strengthened by the triangulation of these judgements. Exploiting the advances in technology, this approach also proposes the capacity to weight the judgement of stakeholders relative to any given context or situation, usually determined prior to the generation of evidence. Currently, the project is completing the piloting phase where the rubrics for constructive alignment and the assessment architecture are under review. The integration of appropriate ICT tools to support the student and teacher are also being assessed.

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