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Considerations for academics and their professional learning****[OECD Education Working Paper No. 280]**

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Abstract

Developed as one of the resources within the context of the OECD Centre for Educational Research and Innovation (CERI) project entitled “Fostering and assessing students' creative and critical thinking skills in higher education”, this paper focuses on ways in which students' creativity and critical thinking can be fostered in higher education by contextualising such efforts within the broader framework of academics' professional learning. Intended for system or institution-level stakeholders, the paper draws on the empirical literature, review articles, and meta-analyses, reports, institutional websites, and input from project participants to: (a) highlight models and best practices of academics' professional learning as well as institutional and individual factors which render professional learning desirable, valued, and effective, and (b) elaborate key elements in professional learning which institutions can introduce and/or strengthen to promote instruction that fosters cognitive, social and emotional processes associated with students' creativity and critical thinking.

Résumé

Développé dans le contexte du projet du Centre de l'OCDE pour la recherche et l'innovation dans l'enseignement (CERI) intitulé "Favoriser et évaluer la créativité et l'esprit critique des étudiants dans l'enseignement supérieur", ce document se concentre sur l'apprentissage professionnel des universitaires. Destiné aux parties prenantes au niveau du système ou de l'établissement, il s'appuie sur la littérature empirique, les articles de synthèse et les méta-analyses, les rapports, les sites web institutionnels et les contributions des participants au projet du CERI pour : (a) mettre en évidence les modèles et les meilleures pratiques d'apprentissage professionnel des universitaires ainsi que les facteurs institutionnels et individuels qui rendent l'apprentissage professionnel souhaitable, apprécié et efficace, et (b) élaborer les éléments clés de l'apprentissage professionnel que les établissements peuvent introduire et/ou renforcer pour promouvoir un enseignement qui favorise les processus cognitifs, sociaux et émotionnels associés à la créativité et à l'esprit critique des étudiants.

Abbreviations and terminology

CCT	Creativity and Critical Thinking
OECD	Organisation for Economic Cooperation and Development
CERI	OECD Centre for Educational Research and Innovation

The term ‘academics’ is used to represent academic staff and is synonymous with faculty; lecturers, university teaching staff.

The term ‘higher education’ is used synonymously with ‘tertiary’ and ‘post-secondary’ education.

The term ‘course’ is used to represent an independent module in a curriculum.

The term ‘programme’ is used to represent an academic offering, leading to a degree, generally composed of several curricula on different topics (divided themselves into courses).

The term ‘teaching and learning centre’ (TLC) is used to represent institutional units dedicated to support teaching and learning.

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1. Introduction

At the outset of the COVID-19 pandemic, in a television interview an analogy was made between COVID-19 and luminol, the light used to detect, among other things, latent prints in crime scenes. The point being made was that the COVID-19 virus shed light on imperfections in every context, irrespective of geography and sector, race or culture, status and wealth. The higher education sector was no exception. Among the revelations and reactions to the COVID-19 pandemic in the higher education arena, three are most relevant to the scope of this paper.

The first was the general unpreparedness of some institutions and individuals to deal with such an unprecedented challenge and the resiliency of others to adapt to the new circumstances by changing well-established practices. Resilient people and institutions have been able to quickly find ways to continue delivering their mission effectively and with minimum disruption, despite all restrictions. As determinant factors of resiliency and timely responsiveness, the existence of a culture of professional learning and communities of practice played an important role to enable widespread change within a short period of time in these institutions.

The second was a lack of institutional and individual knowledge and capacity to exploit the affordances of technologies for remote teaching and learning in many institutions. More notably, what the situation has revealed is that institutions that have established and formalised communities of practice and units dedicated to the support of professional learning have been better able to transition to remote learning, swiftly and effectively.

The third was the revelation and appreciation that effective teaching in higher education extends beyond transmission of knowledge. It also involves the development of higher-order skills such as creativity and critical thinking and other cognitive, social and emotional skills.

These higher-order and soft skills need to be explicitly targeted as learning outcomes, and require intentional pedagogical planning, delivery, and assessment. With restrictions imposed on campuses for face-to-face teaching and the limited pedagogical knowledge that most academics have, fostering these skills has been even more of a challenge for many. The context has made the value of formal or informal professional learning, especially interventions that situate the learning within the context of actual and authentic practice, even more evident.

This paper is one of the resources developed within the context of the Organisation for Economic Cooperation and Development (OECD)/Centre for Educational Research and Innovation (CERI) initiated project entitled "Fostering and assessing students' creative and critical thinking skills in higher education". It is organised in 2 sections. The first section comprises a general discussion about academics' professional learning, with a focus on teaching. It offers insights into models, and best practices as well as institutional and individual factors which render professional learning desirable, valued, and effective.

Importantly, it offers general evidence-based principles of effective teaching in higher education, innovative pedagogies, and conducive contexts and learning environments. The second section offers more specific insights on professional learning opportunities that promote creativity and critical thinking. Specifically, it addresses questions such as whether creativity and critical thinking are domain-general or domain specific, what learning outcomes to consider, and which teaching approaches and assessment schemes to consider in designing courses and curricula that aim to foster creativity and critical thinking.

The synthesis provided in this paper is based primarily on the empirical literature, review articles, and meta-analyses. Additional elaborations are compiled from reports, institutional websites and the OECD/CERI project dedicated site, and from a few project participants.

1.1. Terminology

Academics' professional learning, particularly one that has a focus on pedagogical development, became mainstream in the sixties in North America following expansion in enrolments in higher education, student activism, and dissatisfaction with the quality of teaching and learning. Since then, this endeavour has expanded both geographically and in scope. Given its long history, there is considerable literature, both empirical and descriptive, on the topic. To help the reader navigate through seemingly desperate bodies of literature in the area of academics' professional learning, a short preamble is necessary.

Several terms such as “faculty development”, “educational development”, “staff development”, “instructional development”, “teaching development”, “professional development”, and “professional competence” have been used synonymously and differently to capture individual and/or organisational professional learning within academia (Saroyan and Trigwell, 2015^[1]). For example, “faculty development”, when first used, denoted personal (i.e. affective and improved teaching behaviour), instructional (i.e. course and curriculum), and organisational (i.e. team-building and managerial) development (Centra, 1978^[2]). Later use of this term did not encompass organisational development. Similarly, “professional development” of academics, the way it is used in North America, refers to the formative processes intended to foster improved pedagogies and teaching - see for example (Amundsen and Wilson, 2012^[3]; Stes et al., 2010^[4]; Taylor and Bédard, 2010^[5]). In the Australasian and British contexts, the more common term used for the same concept is “academic development” and the European perspective reflects a slightly different interpretation, extending “professional development” to include the development of research capacity of academics.

Within the context of the Bologna process ... educational development is seen from a broader perspective than instructional design, with an emphasis on building teaching and learning capacity and supporting educational innovation and changes in teaching and learning models. ... professional development acknowledges the need to professionalise academic work and offer suitable training to satisfy research and teaching mandates (*Rege-Colet, 2010, p. 48*^[6]).

Oddly, it is the terminology used in the 1970s - see for example (Bergquist and Phillips, 1975^[7]; Gaff, 1975^[8]) - that places “professional learning” more in line with ideas inherent in the forward-looking concepts of learning organisations (Senge, 1990^[9]) and organisational learning (Cohen and Sproull, 1996^[10]; March, 1991^[11]). These two concepts purport that through the continuous infusion of new knowledge and practice and constant awareness of what is happening beyond its boundaries, an organisation can be better prepared for change. More importantly, it is more favourably positioned to produce creative solutions to unprecedented challenges (Argyris, 1990^[12]). The COVID-19 context and the

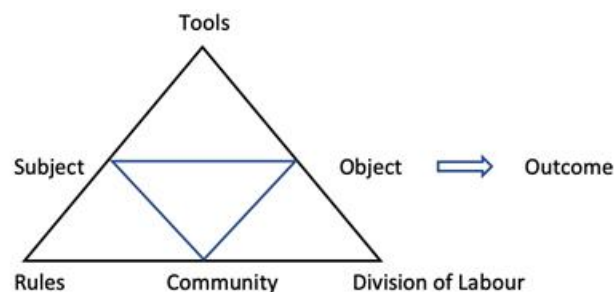
ability of some institutions and individual faculty to adapt to extraordinary circumstances underscore the relevance of these concepts to present times.

A discussion about terminology concerning the professional development of academics must also point to the preference by some scholars and practitioners to substitute the word “development” with “learning”. This substitution, which is favoured in this paper, has been proposed to reassert agency and highlight the role that academics play in their own development (Levinson-Rose and Menges, 1981^[13]; Taylor and Bédard, 2010^[5]; Trowler and Knight, 1999^[14]).

1.2. Systemic and individual development

A well-accepted view of professional learning is that to be effective, it ought to be systemic, occurring “... as a consequence of situated social practice.” (Knight, Tait and Yorke, 2006, p. 320^[15]). The concept of “situated social practice” can be better understood from Engeström’s Activity System lens¹. From this perspective, human activity is seen as an interdependent system involving the individual, a problem space, the community of people who are similarly concerned with the problem, the division of labour between community members, tools (e.g. human, physical and financial resources), and rules (e.g. institutional policies and practices which regulate actions). These connections emphasise that the activity of the individual is socially-bound and not independent of other elements that are present in a context. In his model, Engeström shows this interconnectedness through uninterrupted and solid lines between the individual, the community of practice, and the “object” or goal.

Figure 1.1. Engeström’s activity theory diagram



Source: Engeström, Y., *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*, 1987 (^[16]).

Concretely, what this means is that if, for example, improving teaching is the goal, it will require individual development (through professional learning of individuals) as well as the development of institutional policies and regulations. Furthermore, it will require the availability of resources needed to achieve the goal (Bess, 2000^[17]; Saroyan, 2000^[18]).

¹ Engström’s Cultural-Historical Activity Theory (CHAT) is based on the work of Russian psychologists including Lev Vygotsky and his student Leont’ev. See Roth and Lee (2007^[121]) for a description and review.

2. Professional learning: Building general teaching capacity

2.1. Approaches

Broadly speaking, there are two approaches to professional learning and building teaching capacity. One entails knowledge-based strategies whereby some central entity gathers and disseminates largely abstract and theoretical information. Common examples of this approach include lectures, webinars, podcasts, and newsletters on and about the subject (e.g. teaching in general and teaching creativity and critical thinking in particular). Although the ultimate intent is to foster better pedagogical practice, the focus of this approach is more on learning *about* the practice. Often this is referred to as “knowing what”. The other approach to professional learning and building teaching capacity focusses on helping individuals *become* better practitioners by engaging them in activities that result in “knowing how”. This approach involves creating opportunities to practice within authentic contexts with guidance from more experienced members of “community of practitioners”. In other words, in this approach, learning is situated and results from guided actions in real life contexts (Brown, Collins and Duguid, 1989^[19]; Brown and Duguid, 1996^[20]).

Knowledge-based approaches are easier to implement but their effect is less enduring as there is little opportunity to apply and practice the knowledge gained in real life contexts. However, because of their efficacy in reaching more people, shorter duration, and ease of reporting outcomes (albeit this is mostly limited to participation numbers), they are often favoured by institutions, administrators, and academics. In contrast, approaches that involve practice and application have a more lasting effect. However, they often target smaller groups, are longer in duration and require a prolonged process to engender qualitative change. Importantly, they present more challenges in documenting impact.

Both of these approaches to professional learning can take place in informal as well as formal settings. As the aspect of knowledge-based strategies is both self-evident and generally less effective, it is not further elaborated in this paper. Instead, emphasis is placed on both informal and formal professional learning opportunities that foster “knowing how”.

2.1.1. Communities of practice

Professional learning is most effective when it is situated within an authentic context, supported by communities of practice, a concept first introduced by Lave & Wenger (1991^[21]).

At the simplest level, [a community of practice is] a small group of people who have worked together over a period of time. Not a team, not a task force, not necessarily an authorised or identified group – They are peers in the execution of ‘real work’. What holds them together is a common sense of purpose and a real need to know what the others know. (Brown and Gray, 1995, p. 3^[22])

What brings a group of professionals together to form a community of practice is their exposure to a common set of problems or challenges and their desire to find solutions by drawing on the collective wisdom of the group.

The predominant model of learning in communities of practice is apprenticeship. Thus, at any given time, a community of practice will have core members (i.e. those who are experienced - as the master is in an apprenticeship model) as well as “peripheral” members (i.e. new, inexperienced apprentices). Over time and through practice, the apprentices develop into core members and assume the responsibility of guiding new apprentices in the

practice. This process is also referred to as ‘enculturation’ (Brown, Collins and Duguid, 1989^[19]). The cascading effect of this model propagates distributed learning and expertise.

Communities of practice can also exist within formal structures that support professional learning. Most prevalent among these are: (a) centralised or decentralised teaching and learning centres (TLCs) within institutions that propagate both general and domain specific interventions for faculty and academic leaders, (b) professional organisations that have a mission to promote teaching and learning in higher education, and (c) organised professional networks that specialise, for example, in disciplinary areas or delivery modalities. A brief review of these formal structures follows.

Teaching and learning centres

A formal institutional structure, predominantly present in Anglo-Saxon contexts but that have become common across Europe too, is a unit that has a mandate to support teaching and learning within an institution (if centralised) or within a particular discipline (if decentralised). Generally referred to as Teaching and Learning Centres (TLCs), where they exist, these units are a major resource for academics’ professional learning and more specifically, for engendering communities of practice amongst faculty interested in issues related to teaching and learning. TLCs are also influential in raising the profile of teaching in higher education by advocating for supportive policies and evidence-based practices within the institution and a jurisdiction (Saroyan and Frenay, 2010^[23]). (See Annex A for a brief description of typical structures and mandates of TLCs.)

The indispensable role that TLCs play in professional learning were particularly appreciated during the COVID-19 pandemic. The headline of an article in University Affairs, the umbrella publication of the Federation of Canadian Universities, declared that “Teaching and learning centres (TLCs) are the academic heroes of COVID-19. These centres have proven they are not mere ‘support’ units but are crucial to the university’s mission.” (Eaton, 2020^[24]). Their specific contribution to professional learning during this pandemic period has been guiding academics and institutions that had little or no remote teaching experience prepare and deliver their courses effectively and efficiently, using available digital technologies.

To be able to successfully function in propagating communities of practice, enculturating academics, and helping them adopt innovative pedagogies in response to the demands of changing times, TLCs require: (a) experienced staff with appropriate expertise, (b) well-established credibility within their respective communities for fostering professional learning to initially fulfil the role of “core members”, (c) the capacity to offer ‘just-in-time’ assistance when needed to support situated learning, (d) a system in place to evaluate the impact of offered interventions both on faculty and their students, and (e) the willingness to periodically have the impact of their own work evaluated by external peers (Bédard, Clement and Taylor, 2010^[25]).

Professional organisations

Professional organisations also provide the structure for engendering both formal and informal communities of practice. Among organisations that have led the way in fostering teaching and learning in higher education, four stand out. These include the United States based Professional and Organisational Development (POD) Network in Higher Education, Canada’s Society for Teaching and Learning in Higher Education (STLHE) / *La Société pour l’avancement de la pédagogie dans l’enseignement supérieur* (SAPES), Higher Education Research and Development Society of Australia (HERDSA), and the

francophone international association of university pedagogy (*Association Internationale de Pédagogie Universitaire* (AIPU)).

Collectively, these and other similar organisations (a) provide networking structures and opportunities for the exchange of ideas and experiences about teaching and learning in higher education, (b) promote professional learning (e.g. help faculty target the development of critical thinking and creative problem-solving skills in their students; help department chairs to implement organisational change), (c) support research on teaching and learning in higher education in all subject areas and provide the context for the dissemination of results to practitioners, and (d) shape, influence, and lead policy decisions that enhance teaching and learning in higher education at local, national, and international levels.

Organised networks

Organised networks offer another mechanism for operationalising functional and sustainable communities of practice. Two examples chosen for this paper are the United Kingdom Subject Centres and the German Network for Higher Education Teaching. Both encourage distributed expertise and effective ways to capitalise on limited experts and resources.

The United Kingdom Subject Centres were in operation from 2000 until 2011 when they were disbanded due to budget cuts and controversies surrounding leadership. Funded by the Higher Education Funding Council of England (HEFCE), they operated under the auspices of the Higher Education Academy (now Advance HE (Higher Education)). They were established to foster education for sustainable development and to this end, had three objectives: (a) to build capacity and professionalise the development of academics, (b) to conduct research and provide support by sharing best practices in higher education teaching and learning, and (c) to assist in the coordination and dissemination of policy, research and practice (Chalkley and Sterling, 2011^[26]). In all, twenty-four subject centres were established, dispersed in different higher education institutions. Each served as a resource hub for one discipline, providing leadership and support to sister institutions in areas related to innovative pedagogies, curriculum innovations, and research on teaching and learning in that subject area. The subject centres collaborated with discipline-based communities and thus had the added advantage of understanding and being able to align with the culture, expectations and needs of individual disciplines.²

Another community of practice model, similarly based on distributed expertise, is exemplified by the German Network for Higher Education Teaching (The Hochschulforum Digitalisierung (HFD)). Established in 2014, this Network, sponsored by the Federal Ministry of Education and Research, is a joint initiative of CHE Centrum für Hochschulentwicklung, Hochschulrektorenkonferenz (HRK) and the Stifterverband. The Network facilitates exchange across disciplines and universities, aiming specifically to develop skills for digital teaching and learning that can then be disseminated widely.³ The beneficiaries are all institutions that wish to provide remote learning.

² A detailed evaluative perspective on the strengths and weaknesses of the Subject Centres can be found in the Interim Evaluation of the Higher Education Academy, conducted by Oakleigh Consulting. This document is available from the United Kingdom National Archives.

³ Further information about this Network can be found on its [website](#).

2.2. What the literature says about academics' professional learning

To date, at least six scholarly reviews⁴ have been conducted on academics' instructional and professional learning, capturing the nature of interventions (e.g. knowledge dissemination as well as practice-oriented interventions for skills development), goal(s), duration, and impact. Combined, these reviews cover the empirical literature on academics' professional learning from 1960 to 2008 and provide a valuable, evidence-based resource for planning such interventions within institutions.

2.2.1. Organisation

Duration and structure

From these reviews, we know that professional learning interventions typically include: (a) short, one-time workshops and seminars; (b) longer intensive workshops, mini-courses or fellowships; (c) practice-based feedback (e.g. *in situ* practice, consultation, micro-teaching); (d) student feedback + consultation; (e) alternative formats (peer to peer-mentoring; instructional grants; resource materials, action research) (Stes et al., 2010_[4]), or (f) a hybrid version that combines an alternative format with one of other types of intervention.⁵

Goals

As to the goals of interventions for professional learning, Amundsen and Wilson's (2012_[3]) organisation of the literature is useful. Having reviewed 137 articles, they identify six clusters, each representing a particular focus and goal. These include (a) skill focus (e.g. development of observable teaching behaviours such as presentation skills), (b) method focus (e.g. mastery of a particular teaching method such as problem-based learning), (c) reflection focus, intended to change conceptions of teaching, (d) institutional focus which includes coordinated institutional initiatives to enhance teaching, (e) disciplinary focus with the view to develop the disciplinary understanding to develop pedagogical knowledge, and (f) action research or inquiry focus, capturing faculty investigation of their own teaching and students' learning.

Evidence of impact

Collectively, the reviews point to the range of data sources, including self-reports, observations, documents, and questionnaires, collected from both academics and their students to determine impact on change in attitudes, perceptions, knowledge and skills⁶. The reviews also point to issues related to the validity of some types of data.

With respect to impact, the converging message from the reviews is that:

⁴ Chronologically, these reviews include: Levinson-Rose and Menges (1981_[13]); Weimer and Lenze (1991_[123]); Prebble et al., (2004_[124]); Steinert et al (2006_[125]); Stes et al. (2010_[4]); Amundsen and Wilson (2012_[3]). Only the review conducted by Steinert et al. (2006_[125]) is limited to medical education.

⁵ See Annex B for a consolidated visual representation of educational development interventions in one university in Canada.

⁶ The model used most frequently in the reviews to classify and analyse impact is Kirkpatrick's (1994_[58]) model of educational outcomes. A reproduction of this model can be found in Annex C.

- One-time, short workshops and seminars have limited impact. They are useful for motivating and disseminating information about institutional policies and raising awareness about a certain aspect, for instance, the importance of fostering creative and critical thinking skills. But most workshops and seminars, even those with specific goals, are unlikely to produce lasting changes in teacher behaviour or lasting impact on students unless participants continue practicing the skill and receive critical feedback from a credible consultant or peer on their actions.
- Intensive interventions that extend over a period of time and offer *in situ* practice-teaching, can lead to significant and sustained improvements in teacher behavioural change as well as in student learning.
- End-of-course feedback from students can positively affect subsequent teaching, particularly if ratings are accompanied by consultation with a TLC staff or a peer.
- The impact of discipline-specific instructional development interventions is comparable to the impact of discipline-general interventions. The differences between these two can be best understood by an appreciation of their underlying assumptions. Discipline-specific interventions assume that because the structure of knowledge of disciplines vary, only academics in a given discipline would be able to draw on the most salient forms of representation, the most powerful analogies, illustrations, examples, explanations, and demonstrations to build on students' pre-existing conceptions or to rectify their misconceptions (Shulman, 1986_[27]). They further assume that academics identify best with their own disciplinary culture, knowledge, and practices and, therefore, are likely to find discipline-specific interventions more relevant and useful (Amundsen and Wilson, 2012_[3]). Discipline-general interventions focus on general pedagogical principles that apply to all disciplines and are easily transferrable from one context to another. As such they are typically open to participants from different disciplines. An assumption is that mixing participants from disciplines puts everyone on a level-playing field and diverts focus from content to pedagogy (Saroyan and Amundsen, 2004, p. 21_[28]).

2.2.2. *Participation and uptake*

Professional learning interventions have the potential of being effective only when academics participate and when there is uptake. Participation in organised professional learning activities can be mandated, voluntary but conditional for career advancement, or completely voluntary with no apparent consequences other than personal gain. For example, pedagogical certification is mandatory in Norway and Sweden (Kolmos, 2004_[29]) while in Denmark, for academics to apply for promotion from Assistant to the Associate level (which is a permanent position), evidence of having completed 175-200 hours of pedagogical training is required (Kolmos, 2010_[30]). In other countries (or institutions), while participation is voluntary, it is taken-into-account in annual evaluation of academic performance and may even have consequences on calculating salary increase (e.g. McGill University, Canada). Many factors can encourage or impede individuals to embrace opportunities for professional learning, participate in activities, and more importantly, change their practices as a result of professional learning interventions. This is especially true when participation is completely voluntary and has no apparent extrinsic motivational value.

It is important to keep in mind that pedagogical development often involves the adoption of new ideas and practices, sometimes at the cost of discarding well-established beliefs and habits. Shifts of this nature do not come easily to adults. As Fullan (1993_[31]) has rightly pointed, change cannot be mandated. However, it can be facilitated by attending to certain

psychological factors which encourage participation in professional learning and this can eventually lead to change (Saroyan and Trigwell, 2015^[1]). In this regard, theories of achievement, motivation, and self-determination (Bandura, 1989^[32]; Eccles [Parsons] et al., 1983^[33]; Ryan and Deci, 2000^[34]) as well as transformative adult learning (Mezirow, 1991^[35]) provide the following insights for structuring successful professional learning interventions:

- Academics are likely to put effort in acquiring new knowledge (e.g. pedagogical knowledge) if they see a gap in their personal understanding and feel that it is necessary to redress it;
- Academics must value and appreciate the relevance of the learning opportunity and feel that what they can potentially gain is worth the resources they invest in the acquisition process (e.g. time, money);
- Individuals who promote change through professional learning activities must have credibility in their community, and especially in the eyes of academics who are to benefit from their intervention;
- An element of motivation such as personal satisfaction (intrinsic motivation) or external rewards (extrinsic motivation) is necessary to facilitate change in academics' pedagogical practices. Of the two, intrinsic motivation leads to superior learning achievements (Rawsthorne and Elliot, 1999^[36]) compared to the “carrots and sticks” approach used when the intervention is built on extrinsic motivators (Knight, Tait and Yorke, 2006, p. 330^[15]).

In addition to enabling psychological factors, it is equally important to recognise potential factors that may hinder uptake of professional learning (Saroyan and Trigwell, 2015^[1]). Windschitl (2002^[37]) refers to these hindering factors as dilemmas and outlines them as the following:

1. *Conceptual*, i.e. reconciling personal beliefs with a promoted idea that is different. For example, not believing that creativity and critical thinking are important when they are promoted by the institution or having a different understanding of what they mean.
2. *Pedagogical*, i.e. not knowing how to apply newly gained conceptual knowledge. For example, not knowing how to foster creativity or critical thinking in actual teaching.
3. *Cultural*, i.e. not daring to contradict traditional routines. For example, not daring to replace didactic lecturing with active learning approaches in traditional institutions and programs where lecturing is the dominant teaching method.
4. *Political*, i.e. not knowing how to promote the value of new pedagogical innovations to stakeholders. For example, not knowing how to promote the value of creativity and critical thinking or pedagogical activities that are oriented toward active student engagement in institutional and cultural contexts where the instructor is considered the “sage on stage” and the accepted dominant instructional approach is didactic lecturing.

Beyond these, other hindering factors also exist. Among them are institutional priority and push for research productivity and a lack of formal recognition, valuing, and rewarding teaching-related endeavours, unavailability of resources to support academics' professional development and learning, and time constraints.

In summary, a few considerations can render professional learning interventions more effective. One is that change in beliefs, knowledge, and practices related to teaching and learning in general is more likely to happen if personal, psychological, and contextual conditions are met. It is important to also pay attention to potential hindering factors and to know that top-down approaches which dictate change will not work unless certain other conditions are met. Another is that apart from the individual efforts of academics, institutions can also play an important role in encouraging academics to embrace professional learning. For example, they can raise awareness about the importance of capacity building, provide credible support resources to facilitate professional learning and change, and introduce policies to motivate and reinforce participation in professional learning opportunities.

2.2.3. Practical considerations for planning and implementing professional learning

Extensive educational research carried out in the last few decades has generated a vast body of theoretical and empirical knowledge relevant to effective teaching and learning in general and to planning effective professional learning interventions in particular.

With respect to theoretical constructs three that are deemed as relevant to professional learning are highlighted below. The first is epistemic beliefs which pertains to the nature of knowledge and knowing and the way knowledge is constructed and evaluated (Hofer and Pintrich, 1997^[38]). Epistemic beliefs influence cognitive flexibility (Elen et al., 2011^[39]), metacognition, and self-regulation (Muis, 2007^[40]). They further influence the types of achievement goals individuals adopt, which in turn influence the types of learning strategies they use (Muis and Franco, 2009^[41]). Awareness of epistemic beliefs will afford a connection with the learner (academics, if the context is professional learning; students, if the context is a course) at their level. Knowing what conceptions as well as misconceptions the learners hold about teaching and learning will help set attainable learning goals, select appropriate teaching strategies to actively engage the learner, and trigger reflection in and on action (Schön, 1983^[42]).

The second, constructivism, is a learner-centred theory closely connected to epistemology. The primary tenet of this theory is that learning happens by “constructing” knowledge. That is, learners use their existing knowledge and experiences as a base to connect with and to appropriate new knowledge and experiences. The social and cultural context of the environment influence this knowledge construction. This perspective has significant implications on the way instruction and the instructional environment, including professional learning environments, are set up.

The third, motivation, is an essential ingredient of effective teaching and learning. Different models of motivation⁷ highlight important factors that influence learning including attention, autonomy, relevance and value, expectancy (ability to do task), confidence, satisfaction, and cost. These factors, if taken into consideration in preparing the learning environment and in selecting materials, and activities will go a long way in helping learners

⁷ A concise review of three motivation models (Expectancy-Cost-Value Model; ARCS Model of Instructional Design; Self-Determination Theory), including instructional recommendations is available from Vanderbilt University’s Center for Teaching <https://cft.vanderbilt.edu/guides-sub-pages/motivating-students/>

Similar information is available for UC Berkeley’s Graduate Student Instructor Teaching Resource Center <https://gsi.berkeley.edu/gsi-guide-contents/learning-theory-research/motivation/>.

in general and academics in particular retain, apply, and transfer gained knowledge to new contexts and situations.

In summary, principles emanating from contemporary educational theories and conceptual constructs that can inform planning a course, programme, or professional learning intervention are the following:

- Learning involves an active process of knowledge construction. It is reinforced if learners take ownership of their learning and apply their knowledge to authentic situations and tasks (also referred to as situated cognition) (Brown, Collins and Duguid, 1989^[19]).
- Learning is a social activity and is reinforced by collaborative and cooperative processes. The teacher and the learners are equally involved as contributors to the teaching and learning process (Sawyer, 2008^[43]).
- Knowing what students' and one's own pre-existing conceptions (epistemic beliefs), prior knowledge, and experiences will help establish the appropriate starting point of instructional activities and will facilitate knowledge construction.
- Using authentic problems and examples will motivate learners and will lead to meaningful learning. Giving learners choices and options and setting performance expectations at attainable levels will encourage them to actively engage in the learning process and take control of their learning.
- The environment will influence learning in many ways, especially through the scaffolds it provides. Cognitive apprenticeship and teaching methods associated with it (i.e. modelling, coaching, scaffolding, articulation, reflection, and exploration) (Collins, Brown and Duguid, 1987^[44]) can make targeted processes and skills explicit. This can help learners attain and apply cognitive and metacognitive strategies as well as social and emotional skills to manipulate new knowledge and experiences (Brown, Collins and Duguid, 1989^[19]).

With respect to other empirical findings on teaching and learning, two consolidated guidelines are useful resources for targeting the development of teaching competencies in professional learning interventions. One is Chickering and Gamson's (1987^[45]) *Seven Principles for Good Practice in Undergraduate Education* (see Annex D). The other is the American Psychological Association Guideline entitled *Learner-Centered Psychological Principles* (American Psychological Association, 1990^[46]) (see Annex E). Combined, these two guidelines emphasise the importance of interpersonal relationships between students and academics as well as between peers, active engagement of the learner in the learning process, and the importance of providing prompt feedback in developing higher-order thinking skills. They further underscore the mediating role that individual differences, context, and the developmental stage have on learning.

2.3. Relevant and useful professional learning interventions

Offering professional learning interventions that are perceived as relevant by academics can bolster both participation and uptake. To this end, interventions that help shift the focus from teaching to learning (i.e. the impact of teaching on learning) are most effective. Interventions can be oriented to: (a) help academics design or redesign their courses in a principled way, (b) enable versatility in teaching approaches that foster intended learning, (c) develop and or adapt appropriate activities to assess specified learning, including skills and processes, both formatively and summatively.

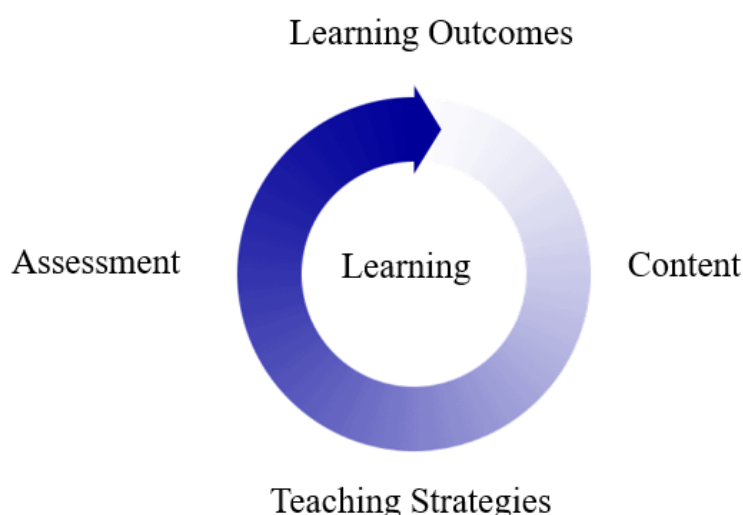
Course design

A basic and far-reaching professional learning intervention for academics is one that focuses on course and, by extension, curriculum design.

The design process reinforces three general principles: (a) explicit specification of learning outcomes, (b) use of learning outcomes as a guide for selecting content, teaching strategies, and the assessment scheme and ensuring alignment between these elements, and (c) a careful consideration of the instructional context, taking into account its affordances and limitations.

More concretely, one can imagine the design process as a circle (Figure 2.1.) and the specification of learning outcomes as the starting and reference point for selecting content, teaching strategies and assessment means. The circle conveys an unbroken alignment between the four elements and the necessity of iterative adjustments to each element, as frequently as required, for optimal design. (For a detailed elaboration of the course design process, see Saroyan & Amundsen (2004_[28]).

Figure 2.1. Concept map of course design and teaching process



Source: *Rethinking teaching in higher education*, 2004 (_[28]).

When student learning becomes the focal point of instruction, it often results in a shift in perspective from a teaching paradigm (i.e. what and how one teaches) to a learning paradigm (i.e. what the impact of one's teaching is on student learning) (Barr and Tagg, 1995_[47]). The process of articulating learning outcomes also forces individuals to confront their personal views of what meaningful learning is in their discipline and, through reflection, appreciate the evolving nature of their perspective over time and with a change in context. Relating and applying the principle of alignment to one's own course is a powerful mechanism to link teaching directly with student learning.

Versatility in teaching

Another relevant and useful professional development intervention is one that promotes versatility in teaching. This necessitates the development of certain teacher attributes, knowledge of a range of teaching strategies and which specific learning outcomes they

support, and the ability to appropriate and apply teaching strategies within the context of specific courses.

The important teacher attributes to develop are associated with targeted practice and experience. Among these attributes are a solid grasp of subject matter; alignment between beliefs (e.g. beliefs about teaching and learning), knowledge, particularly pedagogical knowledge, and actions; effective communication abilities; reflection; and respect for diversity in ways of learning (Hativa, Barak and Simhi, 2001^[48]; Kane, Sandretto and Heath, 2004^[49]; Saroyan et al., 2004^[50]; Sherman et al., 1987^[51]). Chickering and Gamson's Principles of Effective Teaching and the APA (American Psychological Association) Guidelines on Learner-Centered Psychological Principles (see Annex D and Annex E), referred to earlier, also highlight the ability to foster cognitive and metacognitive development of students and motivate them to actively engage in the learning process. Familiarity with developmental, social, and individual differences dimensions is also desirable.

As to knowledge of teaching strategies, it implies “knowing what” as well as “knowing how”. This means knowing not only which teaching strategies support which types of learning outcomes but being able to appropriate and use relevant strategies to meet instructional goals. Professional learning interventions on teaching strategies typically provide academics with the opportunity to practice teaching strategies in a safe environment and in the company of peers. The safe environment is an incentive to try practicing unfamiliar strategies, and in so doing, building a repertoire of options (Saroyan et al., 2004^[50]). This type of intervention typically includes micro-teaching, a technique that involves video-taping a short teaching episode and using the recording to prompt reflection on action as well as to elicit constructive feedback from peers. Feedback is then considered by the individual who did the micro-teaching and if judged appropriate, is incorporated in a subsequent iteration of the micro-teaching.

Assessment

Another hugely relevant and much needed professional learning intervention is one that addresses various aspects of assessment. Perhaps the most powerful prompt for student learning, the assessment scheme can communicate to students the kind of learning that is valued in a course or programme (Fenwick and Parsons, 2000^[52]) and can scaffold student learning as they progress towards achieving intended outcomes. Typically, academics equate assessment with grading but this does not need to be the case, especially if one agrees with Ramsden (1992, p. 191^[53]) that “...*assessment is for learning first and grading second*”. Knowing also when and how much feedback to provide on assignments and performance on course related tasks, whether they are graded or not, are skills that can be acquired. Professional learning interventions on the topic of assessment could, therefore, focus on assessment purposes (i.e. formative and summative), types (e.g. norm and criterion referenced), mechanisms to evaluate student learning and performance associated with specified learning outcomes (e.g. assignments, tests, projects, presentations, group work, etc.), and types, frequency, and amount of feedback given to students to facilitate learning. To help participants internalise this knowledge, they can be given the chance to apply acquired concepts to a course of their choice by developing an assessment scheme comprising a variety of ways and means of assessment with a mix of graded and not-graded components.

Additional take-away goals of a professional learning intervention on assessment would be the following:

- The assessment scheme in a course (combination of assignments, quizzes and exams, term papers, projects, presentations, participation, mid-term and final examinations, etc.) should be aligned with the learning outcomes specified in the course outline or syllabus.
- As learning outcomes are expressed in terms of what students will know and be able to do at the end of the course, the assessment scheme should measure not just content knowledge but also performance and other processes targeted as outcome (e.g. higher-order cognitive skills, attitudes, values, etc.).
- The weighting allocated to each type of assessment and what it intends to assess should correspond and be commensurate with the emphasis placed on it during class activities (e.g. content, processes and cognitive skills, attitudes, values, etc.) (Weston and McAlpine, 2004^[54]).
- Clear and transparent assessment criteria and standards of expected performance should be communicated to students in advance. For assessments that are not considered ‘objective’ (i.e. where there is a right or wrong answer, for example, multiple choice exams), rubrics are useful to delineate specific expected criteria as well as standards of performance.
- Validity and reliability⁸ are important attributes of robust assessment. Content validity⁹ and intra- and inter-rater reliability¹⁰ are particularly important in planning various types of assessment for a course. These should be attended to in designing assessment tasks.
- Timely and frequent feedback provided to students based on their academic performance in a course can effectively scaffold their learning and direct them to attain specified learning outcomes. This is an important consideration at the time when assessment tasks are selected and/or designed so that sufficient resources and time are set aside.

In summary, professional learning interventions on topics that are most relevant to academics include course design, teaching strategies, and assessment. These interventions will be of greater value to participants and will be better internalised if they get a chance to apply it to a course of their choice.

For those who are responsible for planning interventions on these topics, the consistent message in all interventions should reinforce:

- An awareness of the significance of epistemic beliefs in teaching and learning.
- The significance of specifying learning outcomes as a first step in the design of instruction and ensuring that other elements (content, teaching strategies, and assessment) are aligned.

⁸ Validity refers to how well a test or assessment scheme measures what it is purported to measure. Reliability is the extent to which a test or assessment scheme consistently and accurately measures learning.

⁹ Content-validity addresses the question of how well questions, tasks, other evaluation means correspond to what is taught.

¹⁰ Intra-rater reliability is the consistency of the professor in marking across students. Inter-rater reliability pertains to consistency between the judgement of multiple individuals. This is particularly important in courses with high enrolment where multiple teaching assistants might share the responsibility of marking assignments.

- The value of relevant and authentic activities that offer opportunities for learners to construct knowledge and invoke their curiosity and intrinsic motivation.
- Choices to enable learners to take control of their learning and set their own learning goals.
- Group work where collaboration and peer interaction can be practiced and where diverse points of views are encouraged.
- Assessment schemes comprising various components, each accompanied with clear criteria and standards of performance to effectively guide students to attain intended learning outcomes and scaffold their learning in a timely manner.

Box 2.1. McGill University's Course Design and Teaching Workshop

An example of an enduring and infinitely successful professional learning intervention is the Course Design and Teaching Workshop that was developed at McGill University in 1990. It has been offered at that institution since then and has been adopted by more than a dozen other universities around the world. The principles on which this programme is based correspond with those described in the sections above. The programme fosters knowledge about and application of principles of instructional design and teaching, the significance of the concept of alignment in the course/curriculum design process, reflection, and peer-mentoring.

We create a comfortable environment where faculty can begin to understand teaching as a scholarly activity and are given the opportunity to engage in intellectual discussions on teaching with colleagues. We have discovered that cross-disciplinary groupings of instructors create a particularly effective dynamic for these discussions because everyone is placed on a level-playing field. The change process – from teaching- to learner-centered – is further facilitated through peer group interaction and with sufficient time to turn thoughts into action (...) Workshop activities themselves are deemed by participants to be meaningful, relevant and valuable, and our credibility as facilitators is recognized. There is both intrinsic and extrinsic motivation for change: intrinsic because of personal gain; extrinsic because of the potential to meet university expectations for teaching performance (Saroyan et al., 2004, p. 21_[50]).

The following excerpts are from chapters written by three participants of this intensive workshop about their experiences.

Myron Frankman, Professor of Economics

The most significant aspect of the Workshop was that we were engaged in a common discourse with colleagues who would be available to consult with, and not with a group that would disperse when the event concluded (...) On the final day, we had the opportunity to share our reactions about the week's activities. Mine took the following form of poem, "The Learner Hat."

I know you won't believe this, But it actually happened. Teachers speaking with each other about their craft. Teachers suspending judgement, Teachers willing to take risks, to consider change. In fact, teachers wearing the hat of learners. The Learner Hat is a magical, transformative adornment. Would you believe, these erudite, authoritative, loquacious scholars were actually listening? Yes,

not merely pausing to catch their breath, But truly listening, hearing, reflecting. Meeting as equals and accepting critical judgements. How did such a thing happen? Thanks go to the gang at CUTL. Sure there were all preparatives: Rounding up the unusual suspects, worrying about one thousand logistical details. No intention of minimizing the worth of all that, but the secret was in the mix of structure and freedom. They set the tone, created the framework. They modelled the very things that we were asked to consider. To help us learn and to learn with us. And learn we did. Outcomes however preliminary, were there for all to see. The seeds have been planted. The next crop is likely to bring the first in a succession of curious, learning-friendly hybrids. (Frankman, 2004, pp. 155-156^[55])

Ralph Harris, Professor Mining and Metallurgical Engineering

I went from a place of inexperience to a place of confidence...In contrast to my early teaching experiences, I am now much more at ease with my classes and feel that I was successful in having students learn something that they will find of value. My course content has become stable compared with my former annual reinvention, and I now prepare enthusiastically for classes since I know where I want to go and have a wide range of strategies to use to get there.... (Harris, 2004, p. 133 & 151^[56]).

Richard (dik) Harris, Professor of Physics

[The workshop] was not at all what I expected. My more than 20 years of experience as a physics instructor had not prepared me for the context, the conflict, and yes, the challenge of the week. (...) I found the starting point so unexpected, the discourse so alien to that of my own discipline, that merely staying engaged was a challenge (...) Not only did I have to learn a new language, but I had to unlearn my own. The challenge pre-empted my energy for the week (...) Looking back, however, the week was the beginning of an adventure. A number of other serendipitous factors conspired to enrich the journey – not least my five years as a member of Quebec’s education think-tank, Conseil supérieur de l’éducation- to bring me where I am today. As I write this, I am on sabbatical leave (...) exploring the world of faculty development, of educational research, and of cognitive science (...) My personal challenge has been to unlearn the traditional language that in my discipline of physics is used to address the issues surrounding teaching. To unlearn was necessary for me as a prerequisite to re-evaluating and reworking my commitment to teaching in terms of a commitment to the quality of my students’ learning (Harris, 2004, pp. 169-170^[57])

2.4. Summary of good practices

In summary, successful professional learning interventions take into account the following:

- *Alignment between institutional vision, policies and practices and teaching enhancement:* When there is a clear alignment between institutional policies and practices, support infrastructure, academic performance evaluation metrics, and reward systems, partaking in professional learning becomes more desirable. Conversely, conflicting institutional goals (e.g. priority given to research, teaching development seen as an individual’s responsibility, career advancement trajectories

that exclude teaching performance) can hinder academics from embracing professional learning opportunities to enhance their teaching.

- *Optimal duration and timing:* Intensive interventions that extend over a period of time and offer *in situ* practice-teaching have greater impact than short, one-time interventions for changing teacher behavioural outcomes as well as student learning. The timing when interventions are offered is also important given the demands of various academic responsibilities. The period immediately preceding an academic term can incentivise individuals to engage in their course preparation with guidance and support. Similarly, a break period following an academic term can make it more feasible for academics to partake in interventions. Having the feedback from student course ratings on a course that they have just completed teaching can also incentivise them to make improvements to their course with the help of their community of practice.
- *Cascading model of diffusion:* In keeping with the principle of agency and given that where available, most TLCs have limited staff, a cascading or distributed intervention model can optimise diffusion. In this model, individuals who partake in professional learning interventions out of sheer personal interest can subsequently act as champions and change agents by collaborating with their TLC colleagues or by creating an informal community of practice to propagate professional learning and pedagogical innovations in their respective units. Hearing from peers who have experimented with new pedagogical ideas in their own courses and with their own students conveys a very powerful message for academics and its impact is much more profound than learning about abstract ideas from TLC staff who may be detached from students. This approach also reinforces the creation and sustainability of functional informal communities of practice.
- *Motivational factors:* Interventions that appeal to academics because of their intrinsic or extrinsic motivational value will have greater impact on inducing change in their pedagogical beliefs, knowledge, and actions than those that have no motivational load.
- *Monitoring and evaluation of impact:* Learning about robust evidence of impact of professional learning interventions, especially effects on student learning, can influence academics positively and encourage them to partake in interventions. Collecting data using multiple data sources and from all four levels of educational outcomes (i.e. reaction, learning, behaviour, results) as outlined by Kirkpatrick (1994^[58]) will be useful for this purpose and for systematic monitoring and evaluation.

3. Professional learning to foster the development of creativity and critical thinking

Whereas the previous section was oriented toward a general discussion on academics' professional learning for effective teaching, this section offers more specific insights on professional learning interventions for pedagogies specific to teaching and assessing creativity and critical thinking skills (hereafter referred to as CCT skills). There is abundant literature on the value of CCT in the 21st century and specific teaching approaches that can foster these skills in the higher education context. There is however, very little empirical literature on professional learning interventions that target capacity building in teaching CCT. This section highlights salient findings of the empirical research as well as addresses hesitations that academics may have in explicitly targeting CCT outcomes in their courses.

The information provided herein will have implications for designing effective professional learning interventions to develop pedagogical skills related to teaching CCT.

3.1. Relevance of creativity and critical thinking to higher education

It would be hard not to come across the term ‘creativity’ and ‘critical thinking’ in any discussion about the goals of higher education, particularly with respect to the ideal of developing responsible citizens.

Much has been said about why these skills should be targeted as explicit learning outcomes in higher education curricula and programmes (Bloom and Watt, 2003^[59]; Brünig and Mangeol, 2020^[60]; NACE, 2018^[61]; Vincent-Lancrin et al., 2019^[62]; World Economic Forum, 2020^[63]). Among forwarded arguments in support of cultivating CCT in higher education, three resonate strongly in light of calamities facing the world today. One has to do with the ever increasing situations of volatility, uncertainty, complexity and ambiguity (also referred to as VUCA¹¹). COVID-19 is one example but there are plenty of other examples - wildfires, tsunamis, earthquakes, wars, famine, refugee migrations, persecution of minorities, etc. – which are happening with greater intensity and frequency around the world. VUCA situations are complex. They require multi-dimensional, evidence-based, and creative approaches to solving problems and deploying scarce resources to redress situations. This is one important reason why CCT skills need to be intentionally targeted for development at every educational level to equip citizens and current and future leaders with necessary skills to make sound decisions.

A second reason is the significance that employers place on CCT as two of the most essential skills they value in graduates (NACE, 2018^[61]; World Economic Forum, 2020^[63]). However, while critical thinking is widely accepted as a desirable outcome in almost every discipline in higher education, creativity is less so, notwithstanding its relevance to the world of work. The World Economic Forum has repeatedly highlighted creativity as one of the top five desirable learning outcomes in all fields and the projection going forward is no different (World Economic Forum, 2020^[63]). These projections underscore the labour market need for an educated workforce that is armed with requisite technical and subject knowledge, social and behavioural skills, as well as creativity and critical thinking capacity (OECD, 2016^[64]; Vincent-Lancrin et al., 2019^[62]).

A third reason has to do with the abundance of information, misinformation, and disinformation, readily available to anybody who has access to the internet and social media. Navigating through this sea of information and being able to decide what to believe or reject in order to make sound decisions requires well-honed critical and creative thinking capacities (Cormier, 2020, November 12^[65]; Ennis, 1989^[66]; Renaud and Murry, 2008^[67]).

When these reasons are taken in combination with reports asserting inadequate levels of students’ CCT capacity (Gube, 2019^[68]; Pascarella and Terenzini, 2005^[69]; Sola et al., 2017^[70]), self-reports of teachers on how infrequently their teaching specifically targets critical thinking (Paul, Elder and Bartell, 1997^[71]), and the limited emphasis on creativity beyond disciplines involving the arts, intentional targeting of these skills becomes even more urgent.

The arguments presented above provide justifications to address academics’ “conceptual dilemma”, a notion that was discussed in the previous section (Windschitl, 2002^[37]). On the other hand, addressing the “pedagogical dilemma” and to some extent, the “political

¹¹ VUCA was first introduced by the US Army War College in 1987 and was based on Bennis and Nanus’ (1985^[127]) theories of leadership.

dilemma” in fostering CCT skills requires targeted professional learning to help academics (a) know which specific skills and dispositions to aim for, (b) know about and be able to use appropriate teaching strategies to foster these skills, and (c) know how to assess both the achievement of specified competencies as well as the trajectory of their development. An effective starting point that can circumvent potential learning barriers, as elaborated in the previous section, involves reflection on personal epistemic beliefs about CCT as well as those of their students.

3.2. Fostering creativity and critical thinking through instruction

Instruction, in the broadest sense, includes course design, delivery, and assessment. It also involves thoughtful consideration of the design of the environment within which teaching and learning takes place. As outlined earlier, the effectiveness of instruction is determined by the extent to which it leads to the acquisition of intended knowledge and skills. Logical questions that may arise for academics whose goal is to effectively foster CCT are:

- Are CCT skills domain-general or domain-specific?
- What specific skills, subskills, and dispositions to target for fostering CCT in courses/programs?
- What specific teaching approaches to support the development of targeted CCT skills, subskills, and dispositions?
- What kinds of assessment schemes scaffold student learning of CCT and how to evaluate the acquisition of these skills and dispositions?

These are briefly addressed in the following section.

3.2.1. Domain-specific or domain-general

Two varied views have persisted in the literature with regards to whether skills such as creativity and critical thinking are domain specific or domain-general (Ennis, 1989^[66]; Mayer, 1999^[72]; Plucker and Beghetto, 2004^[73]). With regard to critical thinking, supporters of the domain-specific view argue that its application in a particular domain requires specific knowledge of that domain. They assert that this knowledge is the product of “research programs”¹² that are bound by common theories and methodological rules shared by members of that discipline but not by those outside the discipline. The recommendation from domain-specific proponents is that the development of critical thinking (CT) skill should be targeted as a learning outcome within the context of teaching subject content.

In contrast, supporters of the domain-general view argue that since there are clearly identifiable cognitive skills associated with critical thinking, they can be taught independently and reinforced by encouraging students to apply them in various every day contexts (Halpern, 1998^[74]; Perkins and Salomon, 1988^[75]).

Yet others have highlighted general limitations associated with both views:

A risk of teaching a specific aspect of thinking only in a “content-free” way is that the student will acquire some understanding of that aspect but fail to connect that knowledge to many situations in life in which it could be useful. The risk of teaching the same aspect of thinking only within the context of a course is that the student will fail to abstract from

¹² See (Kuhn, 1962^[128]) and (Lakatos, 1965, 1970^[129]) for further elaboration of paradigms and research programs.

the situation what is really content independent and again will not transfer what has been learned to other contexts (Nickerson, 1988, p. 34_[76]).

Similar arguments have been forwarded with regards to domain-specific or general aspects of creative thinking. The middle-ground view captured by Plucker and Beghetto (2004_[73]) is that “*creativity is a developmental construct (...) exhibiting both domain-specific and domain-general characteristics (...) [and] can be viewed as both context-free and context-dependent*” (Plucker and Beghetto, 2004, p. 156_[73]).

Clearly there is considerable overlap in the processes associated with CCT regardless of the discipline in which they are manifested. Yet it is the contextualisation within a subject matter that anchors the processes and gives them meaning and relevance. With respect to pedagogical implications, subscribing to a given view will determine the way course and programme content are conceptualised, designed, delivered, and assessed. A domain-general frame of reference would necessitate the inclusion of independent courses on CCT in a given programme. In contrast, the domain-specific frame would encourage targeting CCT as learning outcomes in every course.

3.2.2. Creativity and critical thinking related skills and dispositions to target in courses/programs

The existing literature is rich and informative insofar as specifying relevant skills and general dispositions associated with CCT. For example, with respect to critical thinking, from established surveys such as the original Delphi study conducted with the participation of 46 experts, we know that cognitive skills such as (1) interpretation, (2) analysis, (3) evaluation, (4) inference, (5) explanation and (6) self-regulation are fundamental (see Annex F). These skills are further elaborated in the 4th output of the CRITHTINKEDU European project entitled *Promoting Critical Thinking in European Higher Education Institutions: Towards an educational protocol* (Elen et al., 2019_[77]).

As to creativity, we know that it involves a mental process or a product that is both novel and valuable (Mayer, 1999_[72]) and invokes both divergent and convergent thinking which enable individuals to generate multiple original ideas and solutions and select and pursue those that are most appropriate (Donnelly, 2004_[78]; Ward, Smith and Vaid, 1997_[79]). The work of Sternberg and colleagues (Sternberg, 1985_[80]; 1990_[81]; Sternberg and Lubart, 1995_[82]; Sternberg and Williams, 1996_[83]) in this area is both illuminating and helpful in planning professional development interventions to help academics orient their courses accordingly. They have described creativity in terms of balancing between synthetic (i.e. ability to generate new ideas and make connections), analytical (i.e. critical thinking ability, enabling an individual to differentiate between good and bad ideas), and practical abilities (i.e. capacity to translate ideas into actions).

It is worthwhile to remind the reader that with the exception of self-regulation, the cognitive dimensions of critical thinking are similar to those that have been promoted for decades by educators, going back to as early as 1956 when Benjamin Bloom and colleagues introduced the taxonomies of educational objectives. Interestingly, the revised version of the taxonomy related to cognitive objectives includes “creation” as the highest level in the hierarchy of cognitive abilities (Anderson et al., 2001_[84])¹³.

A more recent evidence-based guideline for targeting specific subskills related to creativity and critical thinking and for tracking the trajectory of their development over time, is the conceptual rubric developed by the Centre for Educational Research and Innovation at the

¹³ These include: (a) creation, (b) evaluation, (c) analysis, (d) application, (e) understanding, and (f) remembering.

OECD (OECD/CERI) and used within the context of its project on [Fostering and assessing students' creative and critical thinking skills in higher education](#). This rubric specifies four processes – inquiring, imagining, doing, and reflecting –invoked in creativity and critical thinking (Vincent-Lancrin et al., 2019^[62]) (Annex G).

A summary of the skills and dispositions associated with CCT is presented below. These can inform the explicit articulation of learning outcomes if the intent is to foster CCT.

- Interpretation, analysis, evaluation, and inference, explanation and justification with evidence (Elen et al., 2019^[77]; Facione, 1990^[85]; Lipman, 1988^[86]; Sternberg and Williams, 1996^[83])
- Logical inductive and deductive reasoning (Behar-Horenstein, Schneider-Mitchell and Graff, 2009^[87])
- Metacognition and intellectual functioning in meta-components (Davis, 1991^[88]; Fasko, 2000-2001^[89]; Sternberg, 1990^[81])
- Self-regulated learning and self-regulatory judgement (Behar-Horenstein, Schneider-Mitchell and Graff, 2009^[87])
- Inquisitiveness, curiosity, flexibility and insightful thinking (American Psychological Association, 1990^[46]; Facione, 1990^[85]; Vincent-Lancrin et al., 2019^[62])
- Originality (Donnelly, 2004^[78]; Mayer, 1999^[72])
- Ability to process and think through systematically (Facione, 1990^[85]; Plucker and Beghetto, 2004^[73])
- Problem finding, ideation, and evaluation (Vincent-Lancrin et al., 2019^[62]; Runco and Chand, 1995^[90])
- Analytic and synthetic skills and convergent and divergent thinking (Ward, Smith and Vaid, 1997^[79])
- Persistence and diligence (Facione, 1990^[85]; OECD, 2016^[64])
- Ability to transfer (Halpern, 1998^[74]; Nickerson, 1988^[76]; Perkins and Salomon, 1988^[75]; Tiruneh, Verburch and Elen, 2014^[91])
- Motivation (Giancarlo and Facione, 2001^[92]; Halpern, 1993^[93]; Hennessey and Amabile, 1987^[94]; Runco and Chand, 1995^[90])
- Reflection (Sternberg and Lubart, 1991^[95]; Vincent-Lancrin et al., 2019^[62])

3.2.3. Teaching approaches that support the development of creativity and critical thinking

Review articles provide invaluable insights into teaching strategies that are effective in fostering CCT. With regard to critical thinking, the most comprehensive and informative review about specific instructional strategies are two meta-analyses conducted by Abrami, et al. (2008^[96]; 2015^[97]). General findings of the more recent publication that pertains to higher education affirm that indeed, both general and content-specific critical thinking skills and dispositions can be developed by using effective instructional strategies.

Other conclusions of this review include the following:

- The most promising teaching approaches that foster critical thinking (CT) appeared to be dialogue and authentic or anchored instruction. The former involves teacher-

led whole group or small group discussions and debates. The latter involves exposure to applied problem-solving, case studies, simulations, role-playing, and game playing.

- Duration of the instruction did not have an effect on outcome.
- Content-specific critical thinking outcomes¹⁴ produced a higher average effect size compared to generic critical thinking outcomes.
- Regardless of whether the measure used to assess critical thinking was standardised or not, the average effect sizes for CT instruction was significant in educational level, subject area, duration and type of instruction.

Behar-Horenstein and Niu (2011^[98]) and Tiruneh et al.'s (2014^[91]) reviews also yielded results along the same lines although neither of these were meta-analysis. Both reviews concluded that embedding CT within subject matter was more promising, and that direct and explicit explanation of CT principles was more effective than implicit strategies. Additionally, both reviews were critical of methodologies reported in the studies their searches had yielded, highlighting lack of specificity about the way the instructional approaches were actually enacted, the inadequacy of information about the learning environment (whether they were resource-rich or resource-poor environments as this would have likely yielded different results), and instructor and/or student related factors (experience, training, etc.).

A more recent report for fostering critical thinking conducted by the CRITHINKEDU project (Critical Thinking Across the European Higher Education Curricula) (Elen et al., 2019^[77]) reinforces the ideas forwarded in the Facione (1990^[85]) Delphi Study Report and elsewhere (e.g. (De Corte, 1996^[99]; Perkins, 1993^[100]; Sternberg and Lubart, 1991^[95])). This report advocates for the following sequence of steps in instruction:

- a) *modelling* – by providing evidence of critical thinking in all institutional dimensions from course design and delivery to academic programs outcomes to management structures;
- b) *inducing* – through exposing students to complex and authentic real-world problems and ill-structured tasks, and encouraging them to question assumptions and evaluate presented evidence;
- c) *declaring* – by explicitly stating the intent regarding the development of critical thinking and specifying achievement criteria as well as indicators of the development trajectory;
- d) *surveilling* – through monitoring the critical thinking development trajectory and providing feedback to scaffold progress (Elen et al., 2019, p. vii & viii^[77]).

A similar sequence of processes has been recommended for teaching creativity. As in critical thinking, engaging students in active learning, modelling and explicating processes, fostering self-regulation and metacognition, creating a learning environment that is respectful of differing ideas, promotes divergent and convergent thinking, and invokes intrinsic rather than extrinsic motivation is seen as effective for promoting creative thinking.¹⁵

¹⁴ These include skills that are assessed using measures specifically designed to related thinking skills to the content that is being taught in the course (Abrami et al., 2015^[97]).

¹⁵ See Annex H and Annex I for two sets of recommendation.

A consolidated summary of recommended teaching strategies is provided below:

- *Dialogue* – facilitated by teacher-led discussion, student led discussion, debates (Abrami et al., 2015^[97]; Parkinson and Ekachai, 2002^[101]).
- *Authentic or anchored instruction* – promoted by applied problem-solving, case studies, simulations, role-playing, and game playing all of which can help sustain motivation (Abrami et al., 2015^[97]; Ahern et al., 2019^[102]; Fasko, 2000-2001^[89]; Sternberg and Lubart, 1991^[95]; Treffinger, 1980^[103]).
- *Problem-based learning approach* – supported by a suitable environment (Jonassen, Strobel and Ceng Lee, 2006^[104]) which reinforces the processes involved in scientific inquiry: identifying problem and related assumptions; specifying hypotheses and selecting methods to test the hypotheses; rendering a decision based on evidence (Adair and Jaeger, 2016^[105]; Halpern, 1998^[74]; Hmelo-Silver, Duncan and Chinn, 2007^[106]; Tiruneh, Verburgh and Elen, 2014^[91]).
- *Simulation, serious games, case studies, real clinical experience and guidance from clinical instructors* have shown to stimulate critical thinking and clinical reasoning as well as creative thinking in an array of disciplines including the health professions (James, 2013^[107])¹⁶ and (Wong and Kowitlawakul, 2020^[108]).
- *Cooperative and collaborative learning, group work* (Davis, 1991^[88]; Davis and Rimm, 1991^[109]; Sawyer, 2008^[43]).
- *Design thinking and wicked problems* which require a collaborative methodology to resolve complex and multi-dimensional problems, challenge assumptions, and identify solutions which are outside the box (Grove-White, 2011^[110]; Rittel and Webber, 1973^[111]; Simon, 1984^[112]).
- *Brainstorming* – and other ideation techniques that stimulate both convergent and divergent thinking – in both individual and group activities (Kirjavainen and Hölttä-Otto, 2021^[113]).
- *Visual representation (e.g. concept-mapping, argument mapping) and other similar types of assignments and activities* help build student tolerance towards ambiguity (Sternberg and Lubart, 1991^[95]) and foster their ability to consider a range of alternative opinions including their own and to associate opinions with supporting evidence (Pithers and Soden, 2000^[114]).
- *Flipped classroom* improve self-rated learning ability and social awareness, greater satisfaction, and higher scores on skills exams in several medical fields (Zhu, Lian and Engström, 2020^[115]; Rodriguez et al., 2019^[116]).

Specific details about how to implement these and other appropriate strategies are available from university teaching and learning centre websites. Sites with significant repositories include:

- McGill University, Teaching and Learning Services: www.mcgill.ca/tls/instructors/strategies
- Vanderbilt University, Center for Teaching: <https://cft.vanderbilt.edu/guides-sub-pages/motivating-students/#intrinsic>

¹⁶ See also <https://engagingimagination.com>.

- Berkeley, Teaching and Resource center: <https://gsi.berkeley.edu/gsi-guide-contents/learning-theory-research/motivation/>
- University of Amsterdam, Teaching and Learning centre: <https://tlc.uva.nl/en/>
- Lingnan University, Teaching and Learning Centre: <https://www.ln.edu.hk/tlc>
- Tampere University, Teaching and Learning centre: <https://www.tuni.fi/https://www.tuni.fi/tlc/en/home-en/tlc/en/home-en/>

3.2.4. *Assessing creativity and critical thinking*

By far, the most challenging aspect in the attempt to foster CCT skills and target associated skills and dispositions as learning outcomes is assessment. Part of the complication arises from the dearth of standardised measures and the predominant use of teacher-made measures with unknown psychometric properties (Abrami et al., 2015^[97]; Tiruneh, Verburgh and Elen, 2014^[91]). For assessing critical thinking, one recommendation is to use both a holistic and an analytic approach (Elen et al., 2019^[77]). An example of a holistic approach to assessing critical thinking is to ask students to read and provide a critique of a text. An example of an analytic approach is to assess each of the subskills and dispositions of critical thinking separately, assuming that combined, these subskills and dispositions provide a robust measure of the construct.

A more recent trend supports the use of authentic tasks as stimulus and rubrics with specified criteria (Vincent-Lancrin et al., 2019^[62]). Rubrics explicitly specify the criteria by which attainment is to be measured and standards which can be used to follow the trajectory of development. They are a useful learning tool to share with students at the outset of the instructional event and an indispensable reference for academics, not just for assessing CCT but also for designing instruction that targets CCT.

One important dimension of the OECD project on “Fostering and assessing students’ creative and critical thinking skills in higher education” is to further tweak the developed rubric for reliable, efficient and user-friendly application in the higher education context.

3.3. **Practical implications for institutions in designing professional learning interventions for creativity and critical thinking**

Published empirical studies of effective professional learning interventions specifically designed to develop pedagogical capacity related to CCT are rare. However, there are descriptive renditions of interventions and university-wide initiatives intended to promote a particular philosophy, for example creative inquiry, across academic disciplines (see for example (Brown et al., 2020^[117])).

Notwithstanding the paucity of specific references, the guidelines associated with best practices described earlier will be useful in designing interventions on pedagogical approaches that foster CCT. These interventions, could for instance, be oriented towards: (a) skills such as course design - guiding academics in selecting and articulating appropriate CCT learning outcomes in their syllabi and ways to ensure alignment in the selection of content, teaching strategies, and assessment as well as taking into account the limitations and affordances of the context, (b) teaching strategies - allowing to practice teaching approaches that foster specific CCT skills, subskills, and dispositions, and (c) assessment – designing tasks and evaluative schemes and rubrics and using them to assess CCT.

An additional insight that can inform the planning of successful interventions in this area is to anticipate the concerns that academics may have about CCT. Generally, most academics consider critical thinking as a relevant outcome for courses in higher education

even though they may not be sure how it differs from other higher-order skills such as problem-solving and reasoning. Because of this inherent interest, they are likely to show greater curiosity in learning about ways to incorporate critical thinking in their courses. Academics' view, typically, is not the same about creativity. They are often not sure what this construct means and wonder about its relevance to certain disciplines and courses. They further wonder whether pre-existing conceptions that they or their students hold about creativity can be changed and whether it would be possible to incorporate creativity in their courses without jeopardising disciplinary rigour (Donnelly, 2004^[78]). This will have consequences on efforts they will subsequently deploy to incorporate CCT in the design of their courses and learning environments (e.g. (Renzulli, 1992^[118]; Runco and Chand, 1995^[90])). Assessment of CCT is also a murky area for most academics.

These ambiguities suggest that interventions targeting CCT need to have built-in time for academics to discuss these constructs, reflect on and externalise their personal beliefs about them, and develop an appreciation for their relevance in their respective courses before they can fully embrace their promulgation. Those who plan for and deliver interventions to academics ought to be prepared to address these queries and to allay associated concerns. By doing so, they will have taken a huge step in removing potential barriers that may inhibit academics to incorporate CCT in their instructional planning and delivery.

4. Concluding remarks

Creativity and Critical thinking are essential abilities for surviving and thriving in a world that is faced with increasingly complex and ambiguous problems and is burdened with disproportional amounts of misinformation and disinformation. Educational institutions are fertile grounds for cultivating these abilities and reinforcing their application in different contexts and disciplines. There is a plethora of empirical research on the value of creativity and critical thinking, the skills and dispositions associated with them, and pedagogies that support their development. The challenge that remains is to convince all educators, especially those associated with higher education, to embrace these constructs and target them as learning outcomes in their courses. This can be achieved through thoughtful professional learning interventions and opportunities, designed specifically to assist academics navigate through the “conceptual”, “pedagogical”, “cultural”, and “political” dilemmas they may encounter. Providing models and evidence of successful interventions, including artefacts resulting from them, can go a long way in ascertaining a broader promulgation of creativity and critical thinking in higher education courses and programs.

Changing conceptions of teaching and learning is a slow process even when the “ground is prepared and the seeds are sowed”. The significance of professional learning endeavours is best captured in this quote from Ursula Franklin.¹⁷ The ensemble of all ‘communities of practice’ are the “earthworms” that prepare the soil (Frankman, 2004, p. 166^[55]).

Social change will come through seeds growing in well prepared soil—and it is we, like the earthworms, who prepare the soil. We also seed thoughts and knowledge and concern. We realize there is no guarantees as to what will come up. Yet we do know that without the seeds and the prepared soil, nothing will grow at all (Franklin, 1992, p. 121^[119])

¹⁷ Ursula Franklin was a German born Canadian scientist and humanitarian and first woman to be granted full professorship at the University of Toronto in Canada in 1973.

References

- Abrami, P. et al. (2015), “Strategies for Teaching Students to Think Critically”, *Review of Educational Research*, Vol. 85/2, pp. 275-314, <https://doi.org/10.3102/0034654314551063>. [97]
- Abrami, P. et al. (2008), “Instructional interventions affecting critical thinking skills and dispositions: A stage one meta-analysis.”, *Review of Educational Research*, Vol. 78/1102. [96]
- Adair, D. and M. Jaeger (2016), “Incorporating Critical Thinking into an Engineering Undergraduate Learning Environment.”, *International Journal of Higher Education*, Vol. 5/2, pp. 23-39. [105]
- Ahern, A. et al. (2019), “A literature review of critical thinking in engineering education.”, *Studies in Higher Education*, Vol. 44/5, pp. 816-828. [102]
- American Psychological Association (1990), *Learner-centered psychological principles: A framework for school reform and redesign.*, <https://www.apa.org/ed/governance/bea/learner-centered.pdf> (accessed on 20 October 2020). [46]
- Amundsen, C. and M. Wilson (2012), “Are we asking the right questions? A conceptual review of the educational development literature in higher education”, *Review of Educational Research*, Vol. 82/1, pp. 90-126. [3]
- Anderson, L. et al. (eds.) (2001), *A taxonomy for learning, teaching, and assessing: A revision of Bloom’s taxonomy of educational objectives*. New York, Longman, New York, NY. [84]
- Argyris, C. (1990), *Overcoming organizational defenses. Facilitating organizational learning*, Allyn and Bacon, Boston, MA. [12]
- Bandura, A. (1989), “Human agency in social cognitive theory.”, *American Psychologist*, Vol. 44, pp. 1175-1184. [32]
- Barr, R. and J. Tagg (1995), “From teaching to learning: A new paradigm for undergraduate education.”, *Change*, Vol. 27/6, pp. 13-25. [47]
- Bédard, D., M. Clement and K. Taylor (2010), “Validation of a conceptual framework: The meaning and scope of educational development”, in Saroyan, A. and M. Frenay (eds.), *Building teaching capacities in higher education: A comprehensive international model*, Stylus, Sterling, VA. [25]
- Behar-Horenstein, L. and L. Niu (2011), “Teaching Critical Thinking Skills In Higher Education: A Review Of The Literature”, *Journal of College Teaching & Learning*, Vol. 8/2. [98]
- Behar-Horenstein, L., G. Schneider-Mitchell and R. Graff (2009), “Promoting the teaching of critical thinking skills through faculty development”, *Journal of Dental Education*, Vol. 73/6, pp. 665-675. [87]

- Bennis, W. and B. Nanus (1985), *Leader: The strategies for taking charge.*, Harper & Row, New York, NY. [127]
- Bergquist, W. and S. Phillips (1975), "Components of an effective faculty development program", *Journal of Higher Education*, Vol. 46, pp. 177-211. [7]
- Bess, J. (ed.) (2000), *Teaching alone/teaching together*, Jossey-Bass, San Francisco. [17]
- Bloom, M. and D. Watt (2003), *Solving Canada's innovation conundrum: How public education can help.*, Conference Board of Canada, Ottawa, ON, Canada. [59]
- Brown, J., A. Collins and P. Duguid (1989), "Situated cognition and the culture of learning", *Educational Researcher*, Vol. 18/1, pp. 32-42, <https://doi.org/doi:10.3102/0013189x018001032>. [19]
- Brown, J. and P. Duguid (1996), "Stolen knowledge", in McLellan, H. (ed.), *Educational technology publications*, Englewood Cliffs, Bergen, NJ. [20]
- Brown, J. and E. Gray (1995), "The people are the company", *Fast Company*, Vol. 1/1, pp. 78-82. [22]
- Brown, S. et al. (2020), "How Do You Do Creative Inquiry? Integrating Research and Practice into Campus Culture.", *Journal on Excellence in College Teaching*, Vol. 31/2, pp. 63-93. [117]
- Brüning, N. and P. Mangeol (2020), "What skills do employers seek in graduates?: Using online job posting data to support policy and practice in higher education", *OECD Education Working Papers*, No. 231, OECD Publishing, Paris, <https://dx.doi.org/10.1787/bf533d35-en>. [60]
- Centra, J. (1978), "Types of faculty development", *Journal of Higher Education*, Vol. 49, pp. 2151-163. [2]
- Chalkley, B. and S. Sterling (2011), "Hard Times in Higher Education: The Closure of Subject Centres and the Implications for Education for Sustainable Development (ESD)", *Sustainability*, Vol. 3/4, pp. 666-677, <https://doi.org/10.3390/su3040666>. [26]
- Chickering, A. and Z. Gamson (1987), *Seven principles for good practice in undergraduate education*. AAHE Bulletin, 3-7., <https://files.eric.ed.gov/fulltext/ED282491.pdf> (accessed on 20 February 2021). [45]
- Cohen, M. and L. Sproull (1996), *Organizational learning*, Thousand Oaks, CA: Sage. [10]
- Collins, A., J. Brown and P. Duguid (1987), *Cognitive apprenticeship: Teaching the craft of reading, writing and mathematics (Technical Report No. 403)*., Centre for the Study of Reading, University of Illinois, BBN Laboratories, Cambridge, MA. [44]
- Conference Board of Canada (2018), *Innovation.*, <http://www.conferenceboard.ca/hcp/provincial/innovation.aspx#ftn5-ref> (accessed on 2 December 2020). [126]
- Cormier, D. (2020, November 12), *Teaching inclusively in 2020: COVID-19, remote learning and universal design for learning [Webinar]*., University of Windsor, CA. [65]
- Davis, G. (1991), "Teaching creative thinking.", in Colangelo, N. and G. Davis (eds.), *Handbook of gifted education*, Allyn & Bacon, Boston, MA. [88]
- Davis, G. and S. Rimm (1991), *Education of the gifted and talented.*, Prentice Hall, Englewood Cliffs, NJ. [109]
- De Corte, E. (1996), "New perspectives on teaching and learning in higher education.", in Burgen, A. (ed.), *Goals and purposes of higher education in the 21st century*, Jessica Kingsley, London, UK. [99]

- Dominguez, C. and R. Payan-Carreira (eds.) (2019), *Promoting critical thinking in European higher education institutions: Towards an educational protocol*, Vila Real: UTAD. [77]
- Donnelly, R. (2004), "Fostering of creativity within an imaginative curriculum in higher education", *The Curriculum Journal*, Vol. 15/2, pp. 155-166, <https://doi.org/10.1080/0958517042000226810>. [78]
- Eaton, S. (2020), "Teaching and learning centres are academic heroes of COVID-19", *University Affairs*, https://www.universityaffairs.ca/opinion/in-my-opinion/teaching-and-learning-centres-are-the-academic-heroes-of-covid-19/?utm_source=University+Affairs+e-newsletter&utm_campaign=9d23075e8d-EMAIL_CAMPAIGN_2020_06_30&utm_medium=email&utm_term=0_314bc2ee29-9 (accessed on 4 November 2020). [24]
- Eccles [Parsons], J. et al. (1983), "Expectations, values, and academic behaviors", in Spence, J. (ed.), *Achievement and achievement motivation*, Freeman, San Francisco, CA. [33]
- Elen, J. et al. (eds.) (2011), *Links between beliefs and cognitive flexibility*, Springer Netherlands, Dordrecht. [39]
- Engeström, Y. (1987), *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*, Orienta-konsultit. [16]
- Ennis, R. (1989), "Critical thinking and subject specificity: Clarification and needed research.", *Educational Researcher*, Vol. 18/3, pp. 4-10. [66]
- Facione, P. (1990), *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction*, American Philosophical Association, Millbrae, CA, <https://www.qcc.cuny.edu/SocialSciences/ppcorino/CT-Expert-Report.pdf> (accessed on 2 November 2020). [85]
- Fasko, D. (2000-2001), "Education and creativity", *Creativity Research Journal*, Vol. 13/3 & 4, pp. 317-327. [89]
- Feldhusen, J. and D. Treffinger (1980), *Creative thinking and problem-solving in gifted education*, Kendall/Hunt, Dubuque, IA. [121]
- Fenwick, T. and J. Parsons (2000), *The art of evaluation: A handbook for educators and trainers*, Thompson Educational Publishing, Toronto ON. [52]
- Franklin, U. (1992), *The real world of technology. CBC Masi Lecture Series (Rev. ed.)*, Anansi, Toronto, Canada. [119]
- Frankman, M. (2004), "The developers' apprentices.", in Saroyan, A. and C. Amundsen (eds.), *Rethinking teaching in higher education*, Stylus, Sterling, VA. [55]
- Fullan, M. (1993), *Change forces: Probing the depths of educational reform*, Falmer, London, UK. [31]
- Gaff, J. (1975), *Toward faculty renewal*, Jossey-Bass, San Francisco, CA. [8]
- Giancarlo, C. and P. Facione (2001), "A Look Across Four Years at the Disposition Toward Critical Thinking Among Undergraduate Students", *The Journal of General Education*, Vol. 50/1, pp. 29-55, <https://doi.org/10.1353/jge.2001.0004>. [92]
- Grove-White, A. (2011), "All in the same direction, all at the same time: An approach to enhancing creativity.", *Collected Essays on Learning and Teaching*, Vol. 4, pp. 7-13. [110]

- Gube, M. (2019), *Higher ideation: Supporting creative thinking and adaptive expertise in undergraduate STEM students.*, Unpublished dissertation. McGill University. [68]
- Halpern, D. (1998), "Teaching critical thinking for transfer across domains. Dispositions, skill, structure training, and metacognitive monitoring.", *The American Psychologist*, Vol. 53/4, pp. 449-455. [74]
- Halpern, D. (1993), "Assessing effectiveness of critical thinking instruction.", *The Journal of General Education*, Vol. 42/4, pp. 238-254, <http://www.jstor.org/stable/27797197>. [93]
- Harris, R. (2004), "(2004). The challenge to unlearn traditional language.", in Saroyan, A. and C. Amundsen (eds.), *Rethinking teaching in higher education*, Stylus, Sterling, VA. [57]
- Harris, R. (2004), "Impact of the course design and teaching workshop.", in Saroyan, A. and C. Amundsen (eds.), *Rethinking teaching in higher education*, Stylus, Sterling, VA. [56]
- Hativa, N., R. Barak and E. Simhi (2001), "Exemplary university teachers: Knowledge and beliefs regarding effective teaching dimensions and strategies.", *The Journal of Higher Education*, Vol. 72/6, pp. 699-729. [48]
- Hennessey, B. and T. Amabile (1987), *Creativity and learning*, NEA Professional Library, Washington, DC. [94]
- Hmelo-Silver, C., R. Duncan and C. Chinn (2007), "Scaffolding and achievement in problem-based and inquiry learning: A response to Kirschner, Swelle, and Clark (2006).", *Educational Psychologist*, Vol. 42/2, pp. 99-107. [106]
- Hofer, B. and P. Pintrich (1997), "The Development of Epistemological Theories: Beliefs About Knowledge and Knowing and Their Relation to Learning", *Review of Educational Research*, Vol. 67/1, pp. 88-140, <https://doi.org/10.3102/00346543067001088>. [38]
- James, A. (2013), "Lego serious play: A three-dimensional approach to learning development.", *Journal for Learning Development in Higher Education*, Vol. 6/1, pp. 1-18. [107]
- Jonassen, D., J. Strobel and C. Ceng Lee (2006), "Everyday problem solving in engineering: Lessors for engineering educators.", *Journal of Engineering Education*, Vol. 92/2, pp. 139-151. [104]
- Kane, R., S. Sandretto and C. Heath (2004), "An investigation into excellent tertiary teaching: Emphasizing reflective practice.", *Higher Education*, Vol. 47, pp. 283-310. [49]
- Kirjavainen, S. and K. Hölttä-Otto (2021), "Deconstruction of Idea Generation Methods Into a Framework of Creativity Mechanisms", *Journal of Mechanical Design*, Vol. 143/3, <https://doi.org/10.1115/1.4048539>. [113]
- Kirkpatrick, D. (1994), *Evaluating training programs: The four levels*, Berrett-Koehler, San Francisco, CA. [58]
- Knight, P., J. Tait and M. Yorke (2006), "The professional learning of teachers in higher education", *Studies in Higher Education*, Vol. 31/3, pp. 319-339, <https://doi.org/10.1080/03075070600680786>. [15]
- Kolmos, A. (2010), "Danish faculty development strategies", in Saroyan, A. and M. Frenay (eds.), *Building teaching capacities in higher education*, Stylus, Sterling, VA. [30]

- Kolmos, A. (2004), "Staff development strategies and knowledge society", in Brendel, S., K. Kaiser and G. Macke (eds.), *Hochschuldidaktische qualifizierung: Strategien und konzepte im internationalen vergleich [Qualifications for university didactics: Strategies and concepts in international comparison]*, Bielefeld, Germany. [29]
- Kuhn, T. (1962), *The structure of scientific revolutions.*, University of Chicago Press, Chicago, IL. [128]
- Lakatos, I. (1965, 1970), *Falsification and the methodology of scientific research programmes. Paper presented at the International Colloquium in the Philosophy of Science, London, UK.* [129]
- Lave, J. and E. Wenger (1991), *Learning in doing: Social, cognitive, and computational perspectives. Situated Learning: Legitimate peripheral participation*, Cambridge University Press, <https://doi.org/10.1017/cbo9780511815355>. [21]
- Levinson-Rose, J. and R. Menges (1981), "Improving college teaching: A critical review of research", *Review of Educational Research*, Vol. 51, pp. 403-434. [13]
- Lipman, M. (1988), "Critical thinking and education.", *Inquiry: Critical Thinking Across the Disciplines*, Vol. 2/2, pp. 1-2. [86]
- March, J. (1991), "Exploration and exploitation in organizational learning", *Organization Science*, Vol. 2/1, pp. 71-87. [11]
- Mayer, R. (1999), "Fifty Years of Creativity Research", in *Handbook of Creativity*, Cambridge University Press, <https://doi.org/10.1017/cbo9780511807916.024>. [72]
- Mezirow, J. (1991), *Transformative dimensions of adult learning*, Jossey-Bass, San Francisco, CA. [35]
- Muis, K. (2007), "The role of epistemic beliefs in self-regulated learning", *Educational Psychologist*, Vol. 42, pp. 173-190. [40]
- Muis, K. and G. Franco (2009), "Epistemic beliefs: Setting the standards in self-regulated learning.", *Contemporary Educational Psychology*, Vol. 34, pp. 306-318. [41]
- NACE (2018), *Job outlook 2019*, <https://www.odu.edu/content/dam/odu/offices/cmc/docs/nace/2019-nace-job-outlook-survey.pdf>. [61]
- Nickerson, R. (1988), "On improving thinking through instruction.", *Review of Research in Education*, Vol. 15/1, pp. 1-55. [76]
- OECD (2016), *Education 2030: Key competencies for the future.*, <https://www.oecd.org/education/2030/E2030-CONCEPTUAL-FRAMEWORK-KEY-COMPETENCIES-FOR-2030.pdf>. [64]
- Parkinson, M. and D. Ekachai (2002), "The Socratic method in the introductory PR course: an alternative pedagogy", *Public Relations Review*, Vol. 28/2, pp. 167-174, [https://doi.org/10.1016/s0363-8111\(02\)00123-6](https://doi.org/10.1016/s0363-8111(02)00123-6). [101]
- Pascarella, E. and P. Terenzini (2005), *How college affect students: A third decade of research.*, Jossey-Bass, San Francisco, CA. [69]
- Paul, R., L. Elder and T. Bartell (1997), *Study of 38 public universities and 28 private universities to determine faculty emphasis on critical thinking in instruction*, <http://www.criticalthinking.org/pages/study-of-38-p> (accessed on 5 November 2020). [71]

- Perkins, D. (1993), "Teaching for understanding.", *American Educator*, Vol. 17, pp. 28-35. [100]
- Perkins, D. and G. Salomon (1988), "Teaching for transfer.", *Educational Leadership*, Vol. 46/1, pp. 22-32. [75]
- Pithers, R. and R. Soden (2000), "Critical thinking in education: a review", *Educational Research*, Vol. 42/3, pp. 237-249, <https://doi.org/10.1080/001318800440579>. [114]
- Plucker, J. and R. Beghetto (2004), "Why creativity is domain general, why it looks domain specific, and why the distinction does not matter.", in Sternberg, R., E. Grigorenko and J. Singer (eds.), *Creativity - from potential to realization*, American Psychological Association, Washington, DC. [73]
- Prebble, T. et al. (2004), *Impact of student of student support services and academic development programmes on student outcomes in undergraduate tertiary study: A best evidence synthesis*, New Zealand Ministry of Education. [124]
- Ramsden, P. (1992), *Learning to teach in higher education*, Routledge, London, UK. [53]
- Rawsthorne, L. and A. Elliot (1999), "Achievement goals and intrinsic motivation: A meta-analytic review", *Personality and Social Psychology Review*, Vol. 3/4, pp. 326-344. [36]
- Rege-Colet, N. (2010), "Faculty development in Switzerland.", in Saroyan, A. and M. Frenay (eds.), *Building teaching capacities in higher education*, Sterling, VA: Stylus. [6]
- Renaud, R. and H. Murry (2008), "A comparison of a subject-specific and general measure of critical thinking.", *Thinking Skills and Creativity*, Vol. 3/2, pp. 85-93. [67]
- Renzulli, J. (1992), "A general theory for the development of creative productivity through the pursuit of ideal acts of learning.", *Gifted Child Quarterly*, Vol. 36, pp. 170-182. [118]
- Rittel, H. and M. Webber (1973), "Dilemmas in a general theory of planning.", *Policy Sciences*, Vol. 4/2, pp. 155-169, <https://www.cc.gatech.edu/fac/ellendo/rittel/rittel-dilemma.pdf>. [111]
- Rodriguez, G. et al. (2019), "Flipped classroom: Fostering creative skills in undergraduate students of health sciences.", *Thinking Skills and Creativity*, Vol. 33/art. No. 100575. [116]
- Roth, W. and Y. Lee (2007), "'Vygotsky's neglected legacy': Cultural-Historical Activity Theory.", *Review of Educational Research*, Vol. 186-232, p. 77. [122]
- Runco, M. and I. Chand (1995), "Cognition and creativity.", *Educational Psychology Review*, Vol. 7, pp. 243-267. [90]
- Ryan, R. and E. Deci (2000), "Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions", *Contemporary Educational Psychology*, Vol. 25/1, pp. 54-67, <https://doi.org/10.1006/ceps.1999.1020>. [34]
- Saroyan, A. (2000), "Addressing the needs of large groups: The lecturer", in Bess, J. (ed.), *Teaching alone/ teaching together: Transforming the structure of teams for teaching*, Jossey-Bass, San Francisco. [18]
- Saroyan, A. and C. Amundsen (eds.) (2004), *Rethinking teaching in higher education.*, Stylus, Sterling, VA. [28]
- Saroyan, A. and M. Frenay (eds.) (2010), *Building teaching capacities in higher education*, Stylus, Sterling, VA. [23]

- Saroyan, A. and K. Trigwell (2015), “Higher education teachers’ professional learning: Process and outcome”, *Studies in Educational Evaluation*, Vol. 46, pp. 92-101, <https://doi.org/10.1016/j.stueduc.2015.03.008>. [1]
- Saroyan, A. et al. (2004), “The final step: Evaluation of teaching.”, in Saroyan, A. and C. Amundsen (eds.), *Rethinking teaching in higher education*, Stylus, Sterling, VA. [50]
- Sawyer, K. (2008), *Group genius: The creative power of collaboration.*, Perseus Books Group, Cambridge, MA. [43]
- Schön, D. (1983), *The reflective practitioner: How professionals think in action.*, Jossey-Bass, San-Francisco, CA. [42]
- Senge, P. (1990), *The fifth dimension: The art and practice of learning organizations*, Doubleday, New York, NY. [9]
- Sherman, T. et al. (1987), “The quest for excellence in university teaching.”, *Journal of Higher Education*, Vol. 58/1, pp. 66-84. [51]
- Shulman, L. (1986), “Those who understand: Knowledge growth in teaching”, *Educational Researcher*, Vol. 15, pp. 4-14. [27]
- Simon, H. (1984), “The structure of ill-structured problems.”, in Cross, N. (ed.), *Developments in design methodology (145-166).*, John Wiley and Sons, Chichester, UK. [112]
- Sola, E. et al. (2017), “An investigation of the state of creativity and critical thinking in engineering undergraduates”, *Creative Education*, Vol. 8, pp. 1495-1522, <https://doi.org/10.4236/ce.2017.89105>. [70]
- Steinert, Y. et al. (2006), “A systematic review of faculty development initiatives designed to improve teaching effectiveness in medical education: BEME Guide No. 8”, *Medical Teacher*, Vol. 28/6, pp. 497-526, <https://doi.org/10.1080/01421590600902976>. [125]
- Sternberg, R. (1990), “Thinking styles: Keys to understanding student performance.”, *Phi Delta Kappan*, Vol. 71/5, pp. 336-371. [81]
- Sternberg, R. (1985), *Beyond IQ: A triarchic theory of human intelligence*, Cambridge University Press, New York, NY. [80]
- Sternberg, R. and T. Lubart (1995), *Defying the crowd: Cultivating creativity in a culture of conformity.*, Free Press, New York, NY. [82]
- Sternberg, R. and T. Lubart (1991), “Creating creative minds.”, *Phi Delta Kappan*, Vol. 71/1, pp. 608-614. [95]
- Sternberg, R. and W. Williams (1996), *How to develop student creativity.*, Association for Supervision and Curriculum Development, Alexandria, VA. [83]
- Stes, A. et al. (2010), “The impact of instructional development in higher education: The state-of-the-art of the research”, *Educational Research Review*, Vol. 5/1, pp. 25-49, <https://doi.org/10.1016/j.edurev.2009.07.001>. [4]
- Taylor, K. and D. Bédard (2010), “Faculty development in Canadian universities”, in Saroyan, A. and M. Frenay (eds.), *Building teaching capacities in higher education*, Sterling, VA: Stylus. [5]

- Tiruneh, D., A. Verburgh and J. Elen (2014), “Effectiveness of Critical Thinking Instruction in Higher Education: A Systematic Review of Intervention Studies.”, *Higher Education Studies*, Vol. 4/1, pp. 1-17. [91]
- Treffinger, D. (1980), *Encouraging creative learning for the gifted and talented: A handbook of methods and techniques.*, Ventura County Schools/LTI, Ventura, CA. [103]
- Trigwell, K. and S. Shale (2004), “Student learning and the scholarship of university teaching.”, *Studies in Higher Education*, Vol. 29/4, pp. 523-536. [120]
- Trowler, P. and P. Knight (1999), “Organizational socialization and induction in universities: Reconceptualizing theory and practice”, *Higher Education*, Vol. 37, pp. 177-195. [14]
- Vincent-Lancrin, S. et al. (2019), *Fostering Students’ Creativity and Critical Thinking: What it Means in School*, Educational Research and Innovation, OECD Publishing, Paris, <https://dx.doi.org/10.1787/62212c37-en>. [62]
- Ward, T., S. Smith and J. Vaid (1997), “Conceptual structures and processes in creative thought”, in Ward, T., S. Smith and J. Vaid (eds.), *Creative thought: An investigation of conceptual structures and processes*, American Psychological Association. [79]
- Weimer, M. and L. Lenze (1991), “Instructional interventions: A review of the literature on efforts to improve instruction”, in Smart, J. (ed.), *Higher education: Handbook of theory and research*, Agathon, New York, NY. [123]
- Weston, C. and L. McAlpine (2004), “Evaluating student learning.”, in Saroyan, A. and C. Amundsen (eds.), *Rethinking teaching in higher education*, Stylus, Sterling, VA. [54]
- Windschitl, M. (2002), “ming constructivism in practice as the negotiation of dilemmas: An analysis of the conceptual, pedagogical, cultural, and political challenges facing teachers”, *Review of Educational Research*, Vol. 72/2, pp. 131-175. [37]
- Wong, S. and Y. Kowitlawakul (2020), “Exploring perceptions and barriers in developing critical thinking and clinical reasoning of nursing students: A qualitative study.”, *Nurse Education Today*, Vol. 95. [108]
- World Economic Forum (2020), *These are the top 10 job skills of tomorrow.*, <https://www.weforum.org/agenda/2020/10/top-10-work-skills-of-tomorrow-how-long-it-takes-to-learn-them/> (accessed on 10 December 2020). [63]
- Zhu, L., Z. Lian and M. Engström (2020), “Use of a flipped classroom in ophthalmology courses for nursing, dental and medical students: A quasi-experimental study using a mixed-methods approach”, *Nurse Education Today*, Vol. 85, p. 104262, <https://doi.org/10.1016/j.nedt.2019.104262>. [115]

Annex A. Structures and mandates of teaching and learning centres

Professional learning in post-secondary institutions occurs through various formal and informal structures and settings. Structures include:

- Centralised units that have a mandate to provide services related to promoting teaching, learning, and/or leadership to academics, academic leaders, and students in the university. Typically, these units report to the office of the rector (e.g. universities in French-speaking part of Switzerland), a provost or an associate provost or vice-president with a teaching and learning portfolio (most Canadian universities, most universities in Scandinavian countries). Its members typically have a professional rather than academic rank (Teaching and Learning Services at McGill University, Canada) although there are models where members are appointed or seconded from the disciplines (Create, Pontificia Universidade Católica do Paraná - PUCPR -, Brazil).
- Central units where some activities are sponsored by a Faculty or Department of Education or equivalent. These may consist of delivering academic courses related to teaching and learning in higher education, conducting educational research on behalf of the central unit, leading international projects related to teaching and learning, for example the OECD CCT project (Monash Education Academy, Monash University, Australia).
- Units housed primarily in a Faculty or Department of Education, which typically have a research as well as a service mandate and its members have academic rank, for example Aalborg University.
- Subject centres, located within academic units which have a mandate to serve only their constituents. Examples include Belgium's Katholieke Universiteit Leuven's Teaching and Learning Office of the Faculty of Medicine; Centre for Humanities and Centre for Natural Sciences in some Danish universities.
- Informal teaching and development activities including peer to peer-mentoring¹⁸ and through networks¹⁹ and communities of practice.

Formal structures, reporting lines, and mandates represent the vision of institutional administration which sometimes change with a change in direction. Two examples are most

¹⁸ For a research and pilot project see University of Toronto's Centre for Teaching Support and Innovation (CTSI). For guidelines, see [Penn State College of Mineral and Earth Sciences](#)).

¹⁹ See for example: the [Association Internationale de Pédagogie Universitaire](#) (AIPU); [Danish Network for Educational Development](#) (DUN); [Higher Education Research and Development Society of Australia](#) (HERDSA); [International Consortium for Educational Development](#) (ICED); [Professional and Organizational Development Network](#) (POD); [Society for Teaching and Learning in Higher Education](#) (STLHE).

illustrative. McGill University in Canada dropped the research mandate of its Centre for University Teaching and Learning – CUTL) which had over 35 years of history for pioneering faculty development in Canada and became a service unit (Teaching and Learning Services), staffed by individuals with professional rather than academic designation. Aalborg University of Denmark did the reverse. It moved its central unit to the Department of Learning and Education.

As to mandates, two are highlighted in a model of educational development which was validated with three groups of international educational development practitioners. These are (a) enhancing teaching and learning capacity, and (b) advocating for teaching and learning quality - see (Bédard, Clement and Taylor, 2010, pp. 168-187_[25]). These correspond with those cited in the literature (see for example, (Trigwell and Shale, 2004_[120])). Concrete activities associated with these mandates are oriented towards changing academics' conceptions and beliefs about teaching and learning, learning and applying new pedagogical skills, fostering reflection, developing a professional identity, engaging in the scholarship of teaching and learning, promoting policies to value and reward teaching, networking and community building (Amundsen and Wilson, 2012_[3]; Saroyan and Trigwell, 2015_[1]).

Mandates are typically determined by institutions. For example, in Norway, Sweden and Denmark, each institution determines what processes, content and outcomes to target. However, in some jurisdictions, a centralised strategy determines the scope of initiatives. For example, in Baden Württemberg, Germany, a centralised strategy involves a “universal certificate programme for all university teachers affiliated with universities in a region” (Kolmos, 2010, p. 63_[30]). Advantages and disadvantages of nationally centralised and decentralised strategies are further elaborated in the Kolmos chapter.

Annex B. An example of the scope of educational development practice in Canada.

Figure A B.1. An example of educational development practice in Canada

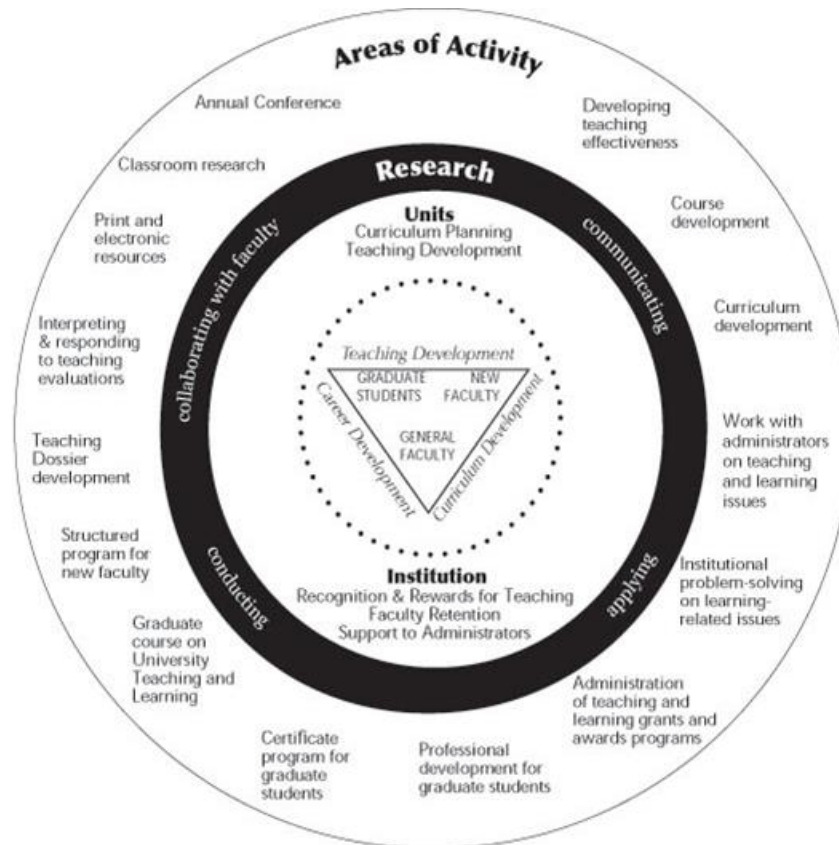


Figure 1: An example of educational development practice in Canada

Source: *Building teaching capacities in higher education*, 2010 ([23]).

Annex C. Adapted version of Kirkpatrick's model for evaluating outcomes of instructional development

Table A C.1. Adapted version of Kirkpatrick's model for evaluating outcomes of instructional development

LEVEL		DESCRIPTION
Change within teachers' learning	Change in attitudes	Attitudes towards teaching & learning
	Change in conceptions	Ways of thinking about teaching & learning
	Change in knowledge	Acquisition of concepts, procedures & principles
	Change in skills	Acquisition of thinking, problem-solving, psychomotor & social skills
Behaviour		Transfer of learning to the workplace
Instructional impact		Wider changes in the organisation, attributable to the instructional development intervention
Change within students	Change in perceptions	Students' perceptions of the teaching & learning environment
	Change in study approaches	Students' approaches to studying
	Change in learning outcomes	Improvement in students' performance as a direct result of the instructional development

Source: Author's adaptation of Stes, A. et al., *The impact of instructional development in higher education: The state-of-the-art of the research*, 2010 ([4]).

Annex D. Seven principles for good practice in undergraduate education

1. Encourage contact between students and faculty
2. Develop reciprocity and cooperation among students
3. Encourage active learning
4. Give prompt feedback
5. Emphasise time on task
6. Communicate high expectations
7. Respect diverse talents and ways of learning

Source: Chickering, A. and Z. Gamson, *Seven principles for good practice in undergraduate education*, in “AAHE Bulletin, 3-7”, 1987 ([45]).

Annex E. Learner-centred psychological principles: A framework for school reform and redesign.

Cognitive and Metacognitive Factors

1. Nature of the learning process
2. Goals of the learning process
3. Construction of knowledge
4. Strategic thinking
5. Thinking about thinking
6. Context of learning

Motivational and Affective Factors

1. Motivational and emotional influences on learning
2. Intrinsic motivation to learn
3. Effects of motivation on effort

Developmental and Social Factors

1. Developmental influences on learning
2. Social influences on learning

Individual Differences Factors

1. Individual differences in learning
2. Learning and diversity
3. Standards and assessment

Source: American Psychological Association, *Learner-centered psychological principles: A framework for school reform and redesign*, 1990 ([46]).

Annex F. List of cognitive skills, subskills, and dispositions associated with critical thinking

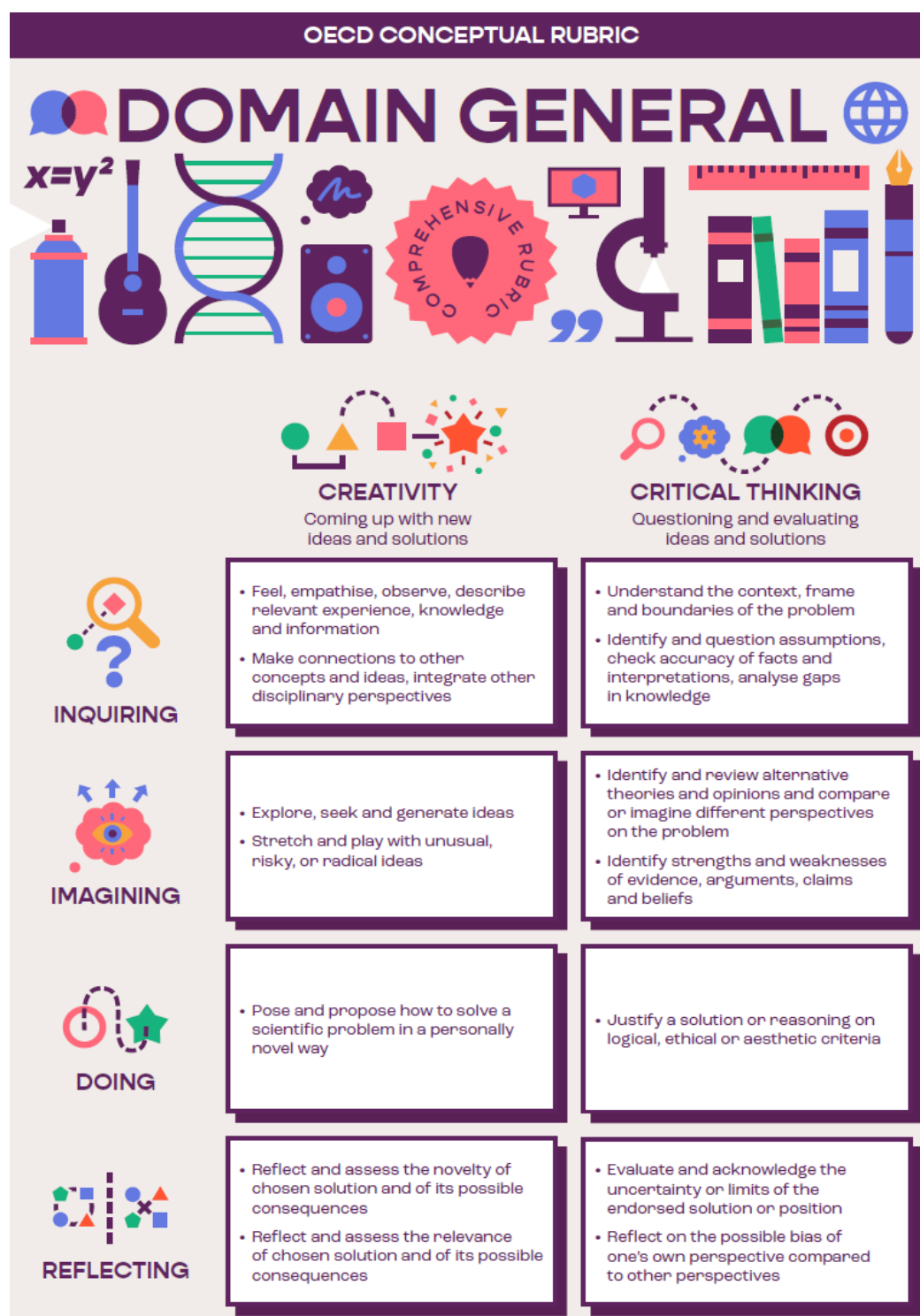
Table A F.1. List of cognitive skills, subskills, and dispositions associated with critical thinking

	SKILLS	SUBSKILLS
Cognitive Skills	Interpretation	Categorise; Decode significance; Clarify meaning
	Analysis	Examine ideas; Identify arguments; Analyse arguments
	Evaluation	Assess claims; assess arguments
	Inference	Query evidence; Conjecture alternatives; Draw conclusions
	Explanation	State results; Justify procedures; Present arguments
	Self-regulation	Self-examine; Self-correct
		DISPOSITIONS
Affective Dispositions of Critical Thinking	Approaches to life and living in general	Inquisitiveness with regard to a wide range of issues
		Concern to become and remain generally well-informed
		Alertness to opportunities to use CT
		Trust in the processes of reasoned inquiry
		Self-confidence in one's ability to reason
		Open-mindedness regarding divergent world views
		Flexibility in considering alternatives and opinions
		Understanding of the opinions of other people
		Fair-mindedness in appraising reasoning
		Honesty in facing one's own biases, prejudices, stereotypes, egocentric or sociocentric tendencies
		Prudence in suspending, making or altering judgements
		Willingness to reconsider and revise views where honest reflection suggests that change is warranted
	Approaches to specific issues, questions, or problems	Clarity in stating the question or concern
		Orderliness in working with complexity
		Diligence in seeking relevant information
		Reasonableness in selecting and applying criteria
		Care in focussing attention on the concern at hand
		Persistence through difficulties encountered
		Precision to the degree permitted by the subject and circumstances

Source: Facione, P., *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction*, 1990 (1851).

Annex G. OECD's conceptual rubric for creativity and critical thinking

Figure A G.1. OECD's conceptual rubric of creativity and critical thinking



Source: Vincent-Lancrin, S. et al., *Fostering Students' Creativity and Critical Thinking: What it Means in School*, 2019 (621).

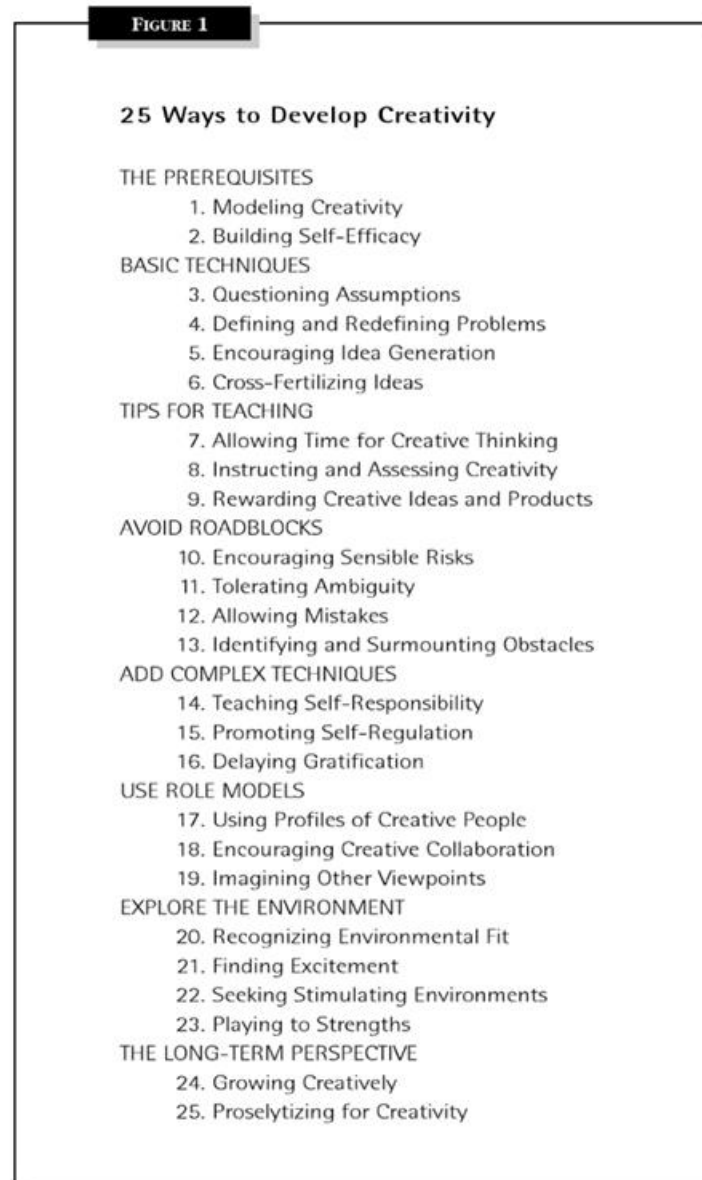
Annex H. Elements of a conducive environment to creative thinking

1. Support and reinforce unusual ideas and responses of students.
2. Use failure as a positive step to help students realise errors and meet acceptable standards in a supportive atmosphere.
3. Adapt to student interests and ideas in the classroom whenever possible.
4. Allow time for students to think about and develop creative ideas. Not all creativity occurs immediately and spontaneously.
5. Create a climate of mutual respect and acceptance between students and teachers, so that students can share, develop and learn together and form one another as well as independently.
6. Be aware of the many facets of creativity besides arts and crafts: verbal responses, written responses both in prose and poetic style, fiction and non-fiction forms. Creativity enters all curricular areas and disciplines.
7. Encourage divergent learning activities. Be a resource provider and director.
8. Listen and laugh with students. A warm, supportive atmosphere provides freedom and security in exploratory thinking.
9. Allow students to have choices and be part of the decision-making process. Let them have a part in the control of their education and learning experience.
10. Let everyone get involved, and demonstrate the value of involvement by supporting student ideas and solutions to problems and projects.

Source: Feldhusen, J. F. and D.J. Treffinger, *Creative thinking and problem-solving in gifted education*, 1980 (121).

Annex I. 25 ways to teach creativity

Figure A I.1. 25 ways to teach creativity



Source: Sternberg, R. J. and W. Williams, *How to develop student creativity*, 1996 (p. 5₍₈₃₎).