

# Conceptual Framework CoCOS



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*CoCOS*

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# Introduction

Co-creation has become a hot topic in higher education, especially because of its potential to solve a number of challenges in the current higher education setting. In a society characterised by globalisation, digitalisation, and constant change, educational institutions – higher education institutions (HEI) as well as other education institutions – must think beyond today and provide students with the skills to shape tomorrow’s society. 21st century skills such as digital literacy, sustainability, entrepreneurship, global citizenship and research competencies must be achieved by introducing a New Generation curriculum design and – importantly – a Self- Directed curriculum. These are catalysts for a more student-centred learning approach, smarter use of ICT, and tighter links between educational institutions and employers as well as social enterprises. Co-creation of course content by a broad range of stakeholders can be a powerful tool in realising this new and self-directed curriculum, and has therefore received much attention in higher education. In the case of co-creation with students, the contributing students naturally bring their individual learning needs and qualities to the table, allowing for increased course diversification and student engagement, leading to better learning processes and outcomes; in other words, deep-level-learning. Whereas, current course material typically starts from the educator, and fails to engage the diverse capabilities of its students, many of which have prior work and learning experiences. Unlocking their potential through co-created course content – also in a blended and distance learning context – greatly contributes to the quality and richness of the course, and to the development of critical thinkers. Co-creation can also involve colleagues from related disciplines or experts from the professional field. Incorporating their input will not only aid the educator in providing the most up-to-date course material in a rapidly changing environment, it also assures that students pick up on interdisciplinary knowledge and skills indispensable for their future careers. Unfortunately, learning platforms often fail to strike a balance between free input by students and experts from related professional fields on the one hand and sufficient control and feedback facilities for the educator on the other hand. Furthermore, educators – especially those lacking in digital literacy – often get bogged down by administration and coordination, leaving insufficient room for creativity, inspiration and research. The time bottleneck is especially present in higher/adult education settings where educators are faced with a wide variety of roles and large numbers of students. The main objective of the CoCOS project is therefore to apply the mindset, methods and tools gleaned for open source development to the co-creation of easy-to-study study materials. In a number of diverse pilot courses, we tested out and evaluated our experiences with open educational resources (OERs), open source platforms and freely available web tools explicitly designed to reduce course management during co-creation. Using version control technology – typically used in software development – these co-creation tools keep track of what content was created by whom at what point in time. Furthermore, it provides a hierarchical control structure, allowing the educator to keep editorial control over the final course. This conceptual framework describes 4 aspects that are related to the co-creation of open study materials:

- What is co creation

· Easy-to-study study materials

· Open Educational resources

· Didactical approach towards co creation The first section of this conceptual framework describes the process and core principles of co-creation and provides a clear distinction between the concept of co-creation and collaboration. The second section will describe what is to be understood by easy-to-study study materials and what are the criteria that need to be met to be able to classify educational resources as being 'easy-to-study'. Creating Open Educational Resources (OER) requires a full understanding of its concept. This document will provide a clear description in the third section and will formulate guidelines to be able to publish resources as OER via Creative Commons. Finally, the fourth section will bring together section 1, 2 and 3 in a clear methodology related to the didactical approach towards co creation.

# DEFINING CO-CREATION

Co-creation has, as mentioned in the introduction, become a promising topic in education, especially because of its promising potential to leverage the input of students, fellow educators and experts in the professional field to provide up-to-date course material in a rapidly changing environment. Sanders and Simons (2009) define co-creation as a (...) “very broad term with a broad range of applications. We define co-creation as any act of collective creativity that is experienced jointly by two or more people. How is co-creation different from collaboration? It is a special case of collaboration where the intent is to create something that is not known in advance. The concept of co-design is directly related to co-creation. By co-design we refer to collective creativity as it is applied across the whole span of a design process. By these definitions, co-design is a specific instance of co-creation.” Co-creation moreover starts from the idea that there is a concrete problem. Together with various stakeholders, we can then work together to find a solution. Specifically, for these study materials, the assurance of quality can be a big concern. This design requires the involvement of teachers, students and of course the professional field. Co-creation between these actors can ensure that the quality of study materials (see section 3) can be closely monitored.

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# 1

## Co-creation and 21st century skills

The use of 21st century skills is becoming more and more essential within the educational field (Dienst Onderwijsontwikkeling & Internationalisering, 2016). It not only is related to the new skills of the student, but also to the teacher, the motivating learning environment and all partners within the educational institution. We live in a society that is characterized by many sources of information. What is essential for alumni? How can they, as a person, get started with their talents and their learning outcomes? Globalization ensures that colleges and universities increasingly start benchmarking and collaborating internationally. There is an increasing awareness of the proximity of another. Many concerns continue to be raised. Do we dare to share our precious know-how? Do we dare to question traditional systems? Are students able to take on a more active role? How do we deal with that? Which responsibilities can we include in order to offer a high-quality added value? In short, the students and educators get a new role. Today's society faces a challenge and it is the task of educational institutions to provide young people with the necessary tools to actively contribute to this 'new' society. The student is an active partner in his own educational learning process. How can institutions learn to deal with this? Are educational institutions a knowledge-transferring institute or a coaching institute? In addition to our core assignment, how do we ensure that students are digitally literate, that they develop a broad international and intercultural vision? That they act sustainably and have a sense of entrepreneurship? And that they have developed sufficient basis in research? Many institutions are therefore shifting their teaching and learning towards equipping students with knowledge, skills and dispositions that prepare them for learning in a complex and uncertain world (Buckingham Shun & Deakin Crick, 2016 in Demedts and Van Puyenbroeck, n.d.). This is especially the case in higher and adult education which is characterised by an increasingly diverse body of students with different backgrounds and insights, including learners with additional degrees and prior work experience. According to Voogt & Roblin (2010) more focus on 21st century skills is therefore needed within education.

## 2

# Co-creation of study materials

Involving students in the creation process of course materials not only actively engages them with the subject material, it also provides a learning opportunity for 21st century skills such as digital literacy, multidisciplinary collaboration and self-directed learning. Furthermore, co-creation also encompasses the input from fellow educators from related disciplines and stakeholders in the professional field, augmenting the diversity of perspectives offered through education. Creating course content often proves to be a highly time-consuming process for the educator, with a lot of time being spent on course management and hence reducing their focus on content. The time bottleneck is peculiarly present in higher and adult education where educators have a wide variety of roles and a large number of students. Involving different stakeholders in this field might enhance the quality of the resources and might be less time consuming since the quality and time spent on the design of the resources no longer depends on one person. Co-creating study materials becomes a shared responsibility.

## II

# EASY-TO-STUDY STUDYMATERIALS

The concept 'easy-to-study' refers to quality aspects of education. Wijnen et. al. (1992) indicated in their report that we talk about easy-to-study study materials if there are no study impeding factors. The ultimate aim of increasing this in higher education is to improve the chance for students to successfully complete a study within the 'normal' study duration. This depends on various aspects such as teaching style and working methods, test forms, but also, the variety of used study materials. When we talk about easy-to-study study material in this document, it concerns study materials that meet a number of quality criteria so that the potentially suitable students are able to achieve the intended objectives and competences. We distinguish written and digital study materials. By written study materials we mean the traditional syllabus that is used during educational activities and was written with the intention to allow students to independently process the learning content (articles, PPT, course books,...). Digital study materials are instruments that enhance meaningful and active learning via the use of educational technologies and tools (YouTube, learning paths, interactive assignments, MC, websites,...).

# 3

## Added value

As an educator, one can facilitate the learning process by developing varied study materials that activate, initiate self-study activities and / or cooperative learning. Every educator makes his course according to his or her personality and creative style. Lecturers are the pedagogical, didactical and subject-matter experts, who guarantee qualitative education. It is of utmost importance that they are capable of constructing knowledge with students and that they can coach them in their learning process. By cooperating with each other and continuing to work on their own professional, personal and social development they are a role model for their students and for the kind of education they strive for. Their personal engagement and commitment will continue to inspire future generations.

From within the Offices for Study Counselling and Educational Development and Internationalization at Artevelde University College (Dienst Onderwijsontwikkeling & Internationalisering, 2016b), however there is a recommendation to use a fixed framework because:

- it offers a recognizable and consistent structure of the study materials and this saves the students a lot of effort and therefore provides a secure and transparent learning environment
- it offers a recognisable and consistent construction of resources;
- and therefore, provides structure to the students, which is crucial for some to be able to succeed.
- It also ensures a higher level of efficiency regarding the creation of study materials.
- Finally, a fixed framework can optimally support the learning process. For example, less extra supervision of the student will be required.



# 4

## Quality criteria

Educational resources are easy-to-study when those resources meet the 13 minimal criteria for quality within the following four categories:

1. Structure
2. Language and Spelling
3. Embedded Support Devices
4. Diversity

# 5

## Structure

### *Structured Introduction*

Make sure to provide a structured introduction of the whole and the separate parts in preparation of the learning process.

Use the quick part 'Introduction' in the template 'huisstijlgids' (office applications - Office templates) to fill out the following sections:

- Competence-oriented objectives
- Initial requirements
- Practical arrangements for the courses
- Evaluation
- Study materials
- Assignments

### *Well-Organised Structure*

- Spacing of at least 12 points between the lines.
- Better to use many short paragraphs instead of a few long ones (minimum 6, maximum 10 lines per paragraph).
- Formulate one thought per paragraph.
- Use linking words like: first of all, additionally, as well, etc.

Read more on linking words in the manual 'Easy-to-Study Study materials'. Manual 'Studeerbaar Studiemateriaal' via <http://studeerbaarstudiemateriaal.weebly.com>

### *Text Structure Markers*

- Make use of non-textual elements, like photos, drawings, graphs, cartoons, diagrams or tables.
- Use extra examples for:
  - Ø concepts, principles or specific terms
- Use the following text structure markers:
  - Ø Key words: **bold** (stands out) or *italic* (retardant effect).

- Ø Header and Footer: add the title in the footer, page number centred, © year, Name of the institution (see template).
- Ø Footnotes numbered consecutively.

In the template - menu 'Quick Parts' you can find icons, e.g. to mark important sections , links , self-tests , etc.

## *Table of Contents, Consistent Numbering and Uniform Headings*

- Use a decimal hierarchic arrangement, (for instance 1.; 1.1.; 1.1.1.) and limit the number of levels of titles (maximum three levels).
- Use consistent and continuous page numbering that starts at the introduction of the syllabus.
- Number your images, tables and figures continuously.
- Titles are concise word groups that represent how the content of the section is organised.
- Use the same font (Calibri) for all titles and mark them in bold. Titles of the same level get the same point size.

In the Word syllabus template, this is done automatically, provided that you use the predefined styles.

# 6

## Language and Spelling

### *Legible Font*

At Artevelde University College Ghent, it is agreed that the font Calibri 11 is used for all publications. This is an economic font that is easy to read on paper as well as on the screen.

### *Correct Language*

Make sure to use correct English. There are many online sources that will provide an answer to any language question you may have.

You can find a list of useful links on the Artevelde University College [English translations](#) page (bottom of the page).

### *Official Spelling*

Follow the official spelling rules and use a consistent spelling if different spelling options exist for the same word.

Use a dictionary if you have any doubts, for example [Cambridge](#) or [Oxford](#).

## 7

# Embedded Support Devices

## *Concrete and Clear Objectives*

- Always start from the competences and the related competence level.
- Describe in detail what your expectations are concerning knowledge, skills and attitudes, and coordinate this with the testing methods.
- State the objectives that describe what result the student must achieve.
- Objectives are teacher-independent. Be creative when you write these objectives by using teaching didactics, activities and content.

Make sure to use active verbs to describe objectives. You can find many lists of active verbs on the internet, for example: [Sample verbs](#), [List of verbs](#) or [Blooms Taxonomy](#).

## *Quotations and References*

Use the APA formatSee APA Citation Style for quotations and references consistently, as the students are to use this for their Bachelor's thesis as well. Best refer to an up-to-date reading list (e.g. sources from 2007).

## *Up-to-Date and Relevant Content*

Write your study materials as a team, or have your colleagues or experts from the professional field review it. That way, the content of your study materials can be drawn up in function of the competences aimed at.

## *Guided Self-Study*

- Test your study materials for guided self-study against all minimal quality requirements.
- Include tips for study and evaluation in the syllabus as well.
- Pay particular attention to examples and assignments that allow to process the learning contents on a deeper level. Provide correction keys and/or feedback moments.

Find tips on [www.arteveldehogeschool.be/spotlight](http://www.arteveldehogeschool.be/spotlight).

### *Digitally Available*

Use the appropriate digital media tool for the objectives aimed at. Make sure this information is easily accessible for all students (De Zitter et. Al., 2008).

# 8

# Diversity

## *Respect for Diversity*

- If possible, represent the diversity of society in your examples, illustrations, cases etc.
- Make the study materials accessible concerning language, cost and sustainability (print recto/verso).
- Provide a digital version of your study materials. Artevelde University College provides free text-to-speech software Sprint for students with reading difficulties.

# 9

## Module about easy-to-study study materials

In the framework of the CoCOS-project, Artevelde University College developed an English version of its module about the criteria to create study materials that are compliant to the above mentioned criteria. This module can be accessed via the following link: <https://www.cocos.education>



### III

# OPEN EDUCATIONAL RESOURCES

One of the CoCOS project objectives is to develop educational resources in co-creation with the professional field, educators and learners. In order to give everyone and the community access to this developed content, it is necessary to publish the developed content as Open Educational Resources (OER).

This section will further describe what OER are, based on the Guidelines for Open Education that were developed by the Commonwealth of Learning (2011; 2015). Furthermore, we will explore how a publishing licence can be used in order to share the developed resources with the community to limit the restrictions towards the use of these resources.

# 10

## What are Open Educational Resources?

Open Educational Resources (OER) are defined by the Commonwealth of Learning (2011; 2015) as

*“...teaching, learning and research materials in any medium that reside in the public domain and have been released under an open licence that permits access, use, repurposing, reuse and redistribution by others with no or limited restrictions.”*

The Commonwealth of Learning (2011; 2015) continues its definition by adding the following:

*“The use of open technical standards improves access and reuse potential. OERs can include full courses or programmes, course materials, modules, student guides, teaching notes, textbooks, research articles, videos, assessment tools and instruments, interactive materials such as simulations and role plays, databases, software, apps (including mobile apps) and any other educationally useful materials. The term ‘OER’ is not synonymous with online learning, eLearning or mobile learning. Many OER — while shareable in a digital format — are also printable. (...) Open Educational Resources (OER) provide a strategic opportunity to improve the quality of education as well as facilitate policy dialogue, knowledge sharing and capacity building.”*

Using OER means wanting to provide free and open access to high-quality educational resources on a global scale. OER can be, as described in the above definition, any educational materials (lectures, textbooks, streaming videos,...) aimed at all educational levels (primary to third level, lifelong learning). These resources are freely available via open digital repositories and are produced by educators and organisations. OER are intended for students and teachers/trainers alike, to be used in their teaching & learning activities. OER furthermore exist within the wider ‘Openness’ movement, based on the idea that knowledge should be disseminated and shared freely through the Internet for the benefit of society as a whole (Commonwealth of Learning, 2011; 2015). This means that OER should be available for free and that there should be as few restrictions as possible on the use of the resource, whether technical, legal or financial.

The growth of ICT possibilities and available technology in education created unique challenges in a period of financial restriction. The Commonwealth of Learning (2011; 2015) stipulates that therefore it is important for educational institutions to support, in a planned and systemic matter, the following set of elements:

- Development and improvement of curricula and learning materials;
- Ongoing programme and course design;
- Organisation of interactive contact sessions with and among students;
- Development of the quality of teaching and learning materials;
- Design of effective assessment tools for diverse environments;
- Links with the professional field. □

The use of OER can contribute to the processes mentioned above. However, the Commonwealth of Learning (2011; 2015) states that the transformative educational potential of OER depends on:

- Improving the quality of learning materials through peer review processes;
- Reaping the benefits of contextualisation, personalisation and localisation;
- Emphasising openness and quality improvement;
- Building capacity for the creation and use of OER as part of the professional development of academic staff;
- Serving the needs of particular student populations such as those with special needs;
- Optimising the deployment of institutional staff and budgets;
- Serving students in local languages;
- Involving students in the selection and adaptation of OER in order to engage them more actively in the learning process; and
- Using locally developed materials with due acknowledgement.

It is clear to say that in order to comply with the above-mentioned elements that describe the potential of OER, a co-creative approach is needed. Developing resources should be done in close collaboration with the professional field, where many stakeholders can review and improve its quality. Involving students in this process creates opportunities to make these resources more personal and closely linked to the context of the institution and its programmes. Involving students in this co-creative approach will, according to The Commonwealth of Learning (2011; 2015), also engage them more actively in the learning process.

# 11

## Creative commons

Publishing resources on the internet should be done providing a reference and information regarding the re-sharing of the published materials. Creative commons are a “*a global non-profit organization that enables sharing and reuse of creativity and knowledge through the provision of free legal tools*” (Creative Commons, 2018). This organisation provides tools that can be used to help educational designers putting a sharing license on their developed educational resources.

Licences generated by Creative Commons enable collaboration, growth and generosity in a variety of media. This means that Creative Commons and the tools they provide make it legally possible to co-create with different stakeholders without having to worry too much about copyright issues. It is clear to say that the resources being developed throughout CoCOS will be made available to the public as OER using a licence that was generated by Creative Commons.

Creative Commons distinguishes the following license types:

## Attribution (by)

All CC licenses require that others who use your work in any way must give you credit the way you request, but not in a way that suggests you endorse them or their use. If they want to use your work without giving you credit or for endorsement purposes, they must get your permission first.

## ShareAlike (sa)

You let others copy, distribute, display, perform, and modify your work, as long as they distribute any modified work on the same terms. If they want to distribute modified works under other terms, they must get your permission first.

## NonCommercial (nc)

You let others copy, distribute, display, perform, and (unless you have chosen NoDerivatives) modify and use your work for any purpose other than commercially unless they get your permission first.

## NoDerivatives (nd)

You let others copy, distribute, display and perform only original copies of your work. If they want to modify your work, they must get your permission first.

Figure 1: Creative Commons License Types

These licences than then be combined to create a set of six CC licenses:

- CC Attribution
- CC Attribution Share Alike
- CC Attribution Non-Commercial
- CC Attribution Non-Commercial Share Alike
- CC Attribution No Derivatives
- CC Attribution Non-Commercial No Derivatives

Within the CoCOS-project we opt to use the license *CC Attribution Non-Commercial Share Alike*. This means that others who would want to use, reuse and/or adapt the resources, which is necessary

in the co-creation process, have to refer to the original materials. The (adapted/re-shared) resources cannot be used for commercial activities and the (adapted/re-shared) resources should be distributed and modified under the same terms as the original resources were published.

## IV

# TOWARDS A DIDACTICAL FRAMEWORK OF CO-CREATION

A framework for a didactical approach towards co-creation is needed in order to be able to engage students, fellow educators, and the professional field in this process. It is also needed to understand what co-creation can mean in a traditional teaching context, in a blended learning context and in distance programmes. Since learners differ from each other, it is also important to know how the process of co-creation can take place in a context with varied types of students. This section will cover the mentioned topics in order to create a didactical framework for co-creation of easy-to-study study materials.

# 12

## A co-creative learning environment

According to Artevelde University College's Educational Concept (2015), a learning environment that aims at co-creation invites students to lifelong and meaningful learning. Co-creation occurs when different parties (students, lecturers, staff members, the business world and society) jointly look for solutions for complex problems. This has a positive influence on the motivation of all parties involved as they can contribute in their own way and with their own talents and specialisation to achieve a mutual valued outcome and really make a difference. Co-creation stimulates the creativity and the initiative of these parties as they are challenged to spot opportunities, to approach problems from a different angle and to come up with innovative alternatives.

The 'learning by developing'-concept contains a method to achieve co-creation. New skills and knowledge are developed in authentic research and development projects that aim at innovation and problem solving. The interdisciplinary cooperation between all parties involved is a crucial factor in this process.

The emphasis on the social and active process that learning involves automatically implies the importance of language in this process. Starting from the idea that language connects people, lecturers try to stimulate the linguistic development of the students in their classes. Certain course units, optional study tracks and programmes are taught in a foreign language. That way we provide our students with a better chance to study or work abroad. Incoming students and staff bring the world into our University College and next to that we stimulate international co-creation through education, research and services.

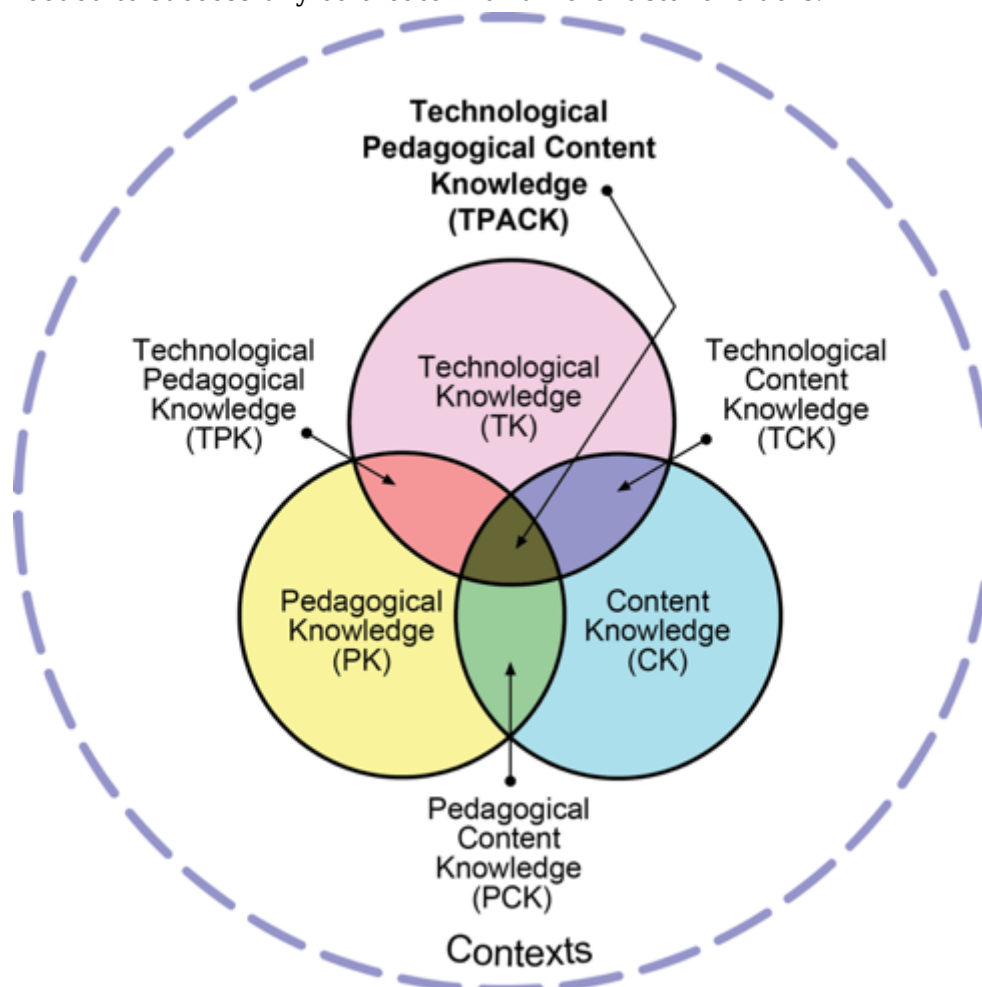
In a co-creative environment, the possibility to share knowledge gains importance. Therefore, it is needed to implement educational technology. Through blended learning students are offered more opportunities to a profound processing of knowledge, practicing skills, communication and cooperation with lecturers, fellow-students and partners nearby and abroad. This way graduates are able to participate actively in a fast evolving, highly technological, mediatised and networked knowledge society.



## 13

## TPACK-model

In the TPACK framework, what teachers need to know is characterized by three broad knowledge bases - technology, pedagogy, and content - and the interactions between and among these knowledge bases. In this approach, technology in teaching is characterized as something well beyond isolated knowledge of specific hardware or software. Rather, technology that is introduced into teaching contexts “causes the representation of new concepts and requires developing a sensitivity to the dynamic, transactional relationship between all three components” (Koehler & Mishra, 2005a, p. 134). The TPACK-model was developed by Mishra and Koehler (2006) and is being used by many researchers and instructional designers as a model with regards to educational settings where teachers want to effectively teach while using technology. It is therefore of utmost importance to include the TPACK-model in this conceptual framework since within this approach, technology is needed to successfully co-create with different stakeholders.



### *Technological Knowledge (TK)*

TK includes an understanding of how to use computer software and hardware, presentation tools such as document presenters and beamers, and other technologies used in educational contexts.

Most importantly, TK covers the ability to adapt to and learn new technologies.

Technology knowledge (TK) is always in a state of flux—more so than the other two core knowledge domains in the TPACK framework (pedagogy and content). Thus, defining it is notoriously difficult. Any definition of technology knowledge is in danger of soon becoming outdated. That said, certain ways of thinking about and working with technology can apply to all technology tools and resources.

Acquiring TK in this manner enables a person to accomplish a variety of different tasks using information technology and to develop different ways of accomplishing a given task. This conceptualization of TK does not posit an “end state,” but rather sees it developmentally, as evolving over a lifetime of generative, open-ended interaction with technology (Mishra, P. and Koehler, M.J., 2006).

### *Content Knowledge (CK)*

Content knowledge (CK) is teachers’ knowledge about the subject matter to be learned or taught. Knowledge of content is of critical importance for teachers. As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches towards developing such knowledge. Knowledge and the nature of inquiry differ greatly between fields, and teachers should understand the deeper knowledge fundamentals of the disciplines in which they teach. In the case of science, for example, this would include knowledge of scientific facts and theories, the scientific method, and evidence-based reasoning. In the case of art appreciation, such knowledge would include knowledge of art history, famous paintings, sculptures, artists and their historical contexts, as well as knowledge of aesthetic and psychological theories for evaluating art (Mishra, P. and Koehler, M.J., 2006).

### *Pedagogical Knowledge (PK)*

Pedagogical knowledge (PK) is teachers’ deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This generic form of knowledge applies to understanding how students learn, general classroom management skills, lesson planning, and student assessment. It includes knowledge about techniques or methods used in the classroom; the nature of the target audience; and strategies for evaluating student understanding. A teacher with deep pedagogical knowledge understands how students construct knowledge and acquire skills and how they develop habits of

mind and positive dispositions toward learning. As such, pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom (Mishra, P. and Koehler, M.J., 2006).

### *Technological Content Knowledge (TCK)*

Technology and content knowledge have a deep historical relationship. Progress in fields as diverse as medicine, history, archaeology, and physics have coincided with the development of new technologies that afford the representation and manipulation of data in new and fruitful ways.

TCK is an understanding of the manner in which technology and content influence and constrain one another. Teachers need to master more than the subject matter they teach; they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of particular technologies. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa (Mishra, P. and Koehler, M.J., 2006).

### *Pedagogical Content Knowledge (PCK)*

PCK is consistent with and similar to Shulman's idea of knowledge of pedagogy that is

applicable to the teaching of specific content. Central to Shulman's conceptualization of PCK is the notion of the transformation of the subject matter for teaching. Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students' prior knowledge.

PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy. An awareness of common misconceptions and ways of looking at them, the importance of forging connections among different content-based ideas, students' prior knowledge, alternative teaching strategies, and the flexibility that comes from exploring alternative ways of looking at the same idea or problem are all essential for effective teaching (Mishra, P. and Koehler, M.J., 2006).

### *Technological Pedagogical Knowledge (TPK)*

TPK is an understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a

range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies. To build TPK, a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed.

An understanding of the affordances of technology and how they can be leveraged differently according to changes in context and purposes is an important part of understanding TPK.

TPK requires a forward-looking, creative, and open-minded seeking of technology use, not for its own sake but for the sake of advancing student learning and understanding (Mishra, P. and Koehler, M.J., 2006).

### *Technological Pedagogical Content Knowledge (TPACK)*

TPACK “underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge of all three concepts individually. Instead, TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones” (Koehler & Mishra, 2009).

The TPACK framework offers several possibilities for promoting research in teacher education, teacher professional development, and teachers’ use of technology. It offers options for looking at a complex phenomenon like technology integration in ways that are now amenable to analysis and development. Moreover, it allows teachers, researchers, and teacher educators to move beyond oversimplified approaches that treat technology as an “add-on” instead to focus again, and in a more ecological way, upon the connections among technology, content, and pedagogy as they play out in classroom contexts.

# 14

## Successfully organise co-creation of study materials

The following paragraphs describe different actors and aspects involved in the co-creation of study materials. The roles of the educator, student and stakeholder are described to clarify how each actor should act in order to limit restrictions to successfully organise the co-creation of study materials.

15

# Quality assurance

## 16

# Role of the educator

Apart from the TPACK-model, the educator needs to be acquainted with another yet important success factor for digital content co-creation of study material. The role that the teacher or lecturer will take on in this process is very important and should not be undervalued. The educator must be willing to take on a different role in the learning process of the students than he/she was taking on up to until now. An educator's beliefs about education should shift from the approach that education is about the *transfer of knowledge* to *constructing and creating knowledge together*. Educators must dare to let go of their perceived control and actively take on the role as coach in addition to that of a content expert. This clearly requires a different expertise and often requires extra professionalization and/or other accents in the teacher training since creating a mindshift in the thinking of teachers is a process that often is underestimated and that we should actively stimulate and support.

At the same time, educators must try to abandon the idea that education means '*I am in class with my students*'. Education is, as mentioned earlier, about creating knowledge together with more interaction with others; the professional field, databases, research centres, and many others.

17

# Role of the student



# 18

## Role of the professional field

# 19

## Pitfalls and concerns towards co-creation

There are some pitfalls and concerns towards the co-creation of study materials when involving students and the professional field. This section describes some of the concerns and pitfalls encountered during the pilots. It will also provide alternatives that might provide a solution for these pitfalls and concerns.

# 20

## Students need to be motivated to co-create

Both intrinsic and extrinsic motivation should be triggered within students. Intrinsic motivation can be achieved by explaining the value of co-creation to students. They have the opportunity to improve course material for their fellow students and themselves. They also learn the course material by evaluating, correcting and expanding it.

Experience shows that intrinsic motivation does however not suffice. This is not surprising if we know that intrinsic motivation within children becomes weaker by aging. Extrinsic motivators, such as grades, can be used to motivate students.

# 21

## Students need to see opportunities for co-creation

When confronted with perfect course material that has been meticulously prepared by a teacher, students fail to see how their input can be valuable. Also, students need time to thoroughly review the course material before they will feel comfortable to share annotations or corrections. Teachers can point out opportunities for co-creation and can give examples or take the first steps to break the ice. Different students have different talents so teachers can use this by triggering students with specific talents for specific tasks.

# 22

## Technology has to support co-creation, and must be easy to use

Technology plays an important role in teacher-student co-creation. However, creating course material is not a priority for students. Therefore, the technology they can give input with should be very easy to use, and should trigger them to use it. Also, for teachers it is important that technology helps them to process input from (large numbers of) students.

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