Description & Theoretical foundation of the Tablio-Concept Map

Contents

1. Definition

In the most general description, **differentiation** can be defined as taking into account differences between students in the educational practice in order to maximize each student's chances to obtain the learning objectives.

In educational literature, we see several definitions on differentiation. Via some of these definitions we want to illustrate the different description levels and accents of the authors :

- Chandler (2015) uses a very general definition of differentiated curricula: *'"Modified courses of study designed to make the schools more responsive to the educational needs of learners".*

- Tomlinson (2015) emphasises the research-aspect of differentiated instruction: *"Differentiated instruction is a research-based model of classroom practice intended to support teachers in developing curriculum and instruction likely to maximize the capacity of a diverse group of learners. The ultimate aim of the model is to support maximum feasible heterogeneity in classrooms that provide equity of access to excellence for the broadest possible range of learners."*

- Morgan (2014) gives more details about the type of differences and also addresses the need for learner agency: "*Differentiated instruction is a way of recognizing and teaching according to different student talents and learning styles. That strategy includes consideration of different needs, stresses student responsibility, flexible grouping and choices. Using this kind of instruction, all students should be successful."*

The Tablio-definition of differentiation and the related concept map was created by combining desk research on the topic of differentiation (including the previously mentioned authors), focusgroups with teachers and teacher trainers and discussions with the international Tablio-project team in February 2017. The Tablio-definition and concept map give both a grip as inspiration to teachers and school leaders to organize the continuous process of differentiation in their classrooms and schools. The Tablio-definition and concept map are also a guide to evaluating practices on both the classroom-level as the school level when it comes to differentiating with tablets. We aimed to develop a very complete definition of the concept 'differentiation'.

The Tablio-definition of differentiation:

"Differentiation" *aims for* the inclusion of all students, for a higher motivation to learn and to participate in life-long learning and for achieving learning outcomes more efficiently. On a more general level, the objectives of differentiation are self-realisation and self-actualisation on both the cognitive, emotional and social level and the striving for harmonious and pluralistic citizens for society and humanity. For these reasons, differentiation should be considered as a necessary aspect of all education.

Differentiation can be considered to be *qualitative* when it meets the following characteristics: pro-active, goal-oriented, structured, varied and transparent. Qualitative differentiation also *requires cooperation from* stakeholders on both the micro-level (classroom-level), meso-level (school-level) and macro-level (policy-level).

Differentiation can appear in *two main types*: organisational differentiation and educational differentiation.

Organisational differentiation (also: structural differentiation) can be operationalised in various ways: the grouping strategy of the classroom, individualized programs for special needs, extra-curricular acceleration programs and remedial programs.

Educational differentiation (also: classroom differentiation) happens within the context of the classroom. It can be more learner oriented when it focuses on differences in student's readiness, interests and learning profile. It can also be more teacher oriented when it focuses on content-differentiation, process-differentiation and/or product-differentiation. There as a mutually influence of teacher oriented and learner oriented differentiation techniques.

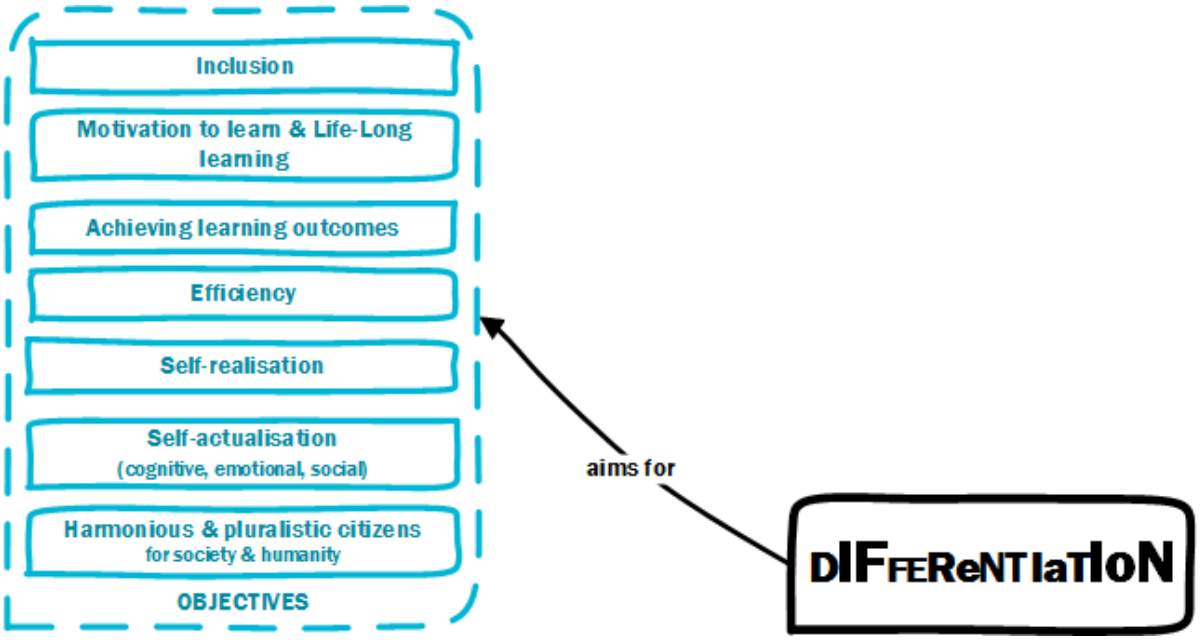
Differentiation may appear to be very complex and unreachable goal, but this is a misconception: differentiation is above all a *feasible and achievable* educational approach.

We synthesised this definition into six general design principles on differentiation:

1. Differentiation has to be a pro-active teaching procedure.
2. Involve many stakeholders in order to differentiate successfully.
3. Be student-centred and be aware of the many differences in the group in order to achieve inclusion of all students.
4. Differentiation is more about quality than quantity.
5. Differentiation provides multiple approaches to content, process and product.
6. Differentiation is an organic process.

The continuation of this article focuses on the several parts of this definition.

2. Aims of differentiation



The aim from differentiation is to create a learning environment which encourages students to engage their abilities to the greatest extent possible, including taking risk and building knowledge and skills in what they perceive as a safe, flexible environment. Differentiated instruction is important for all students, not only those who have specific learning needs or disabilities.

Differentiation aims for:

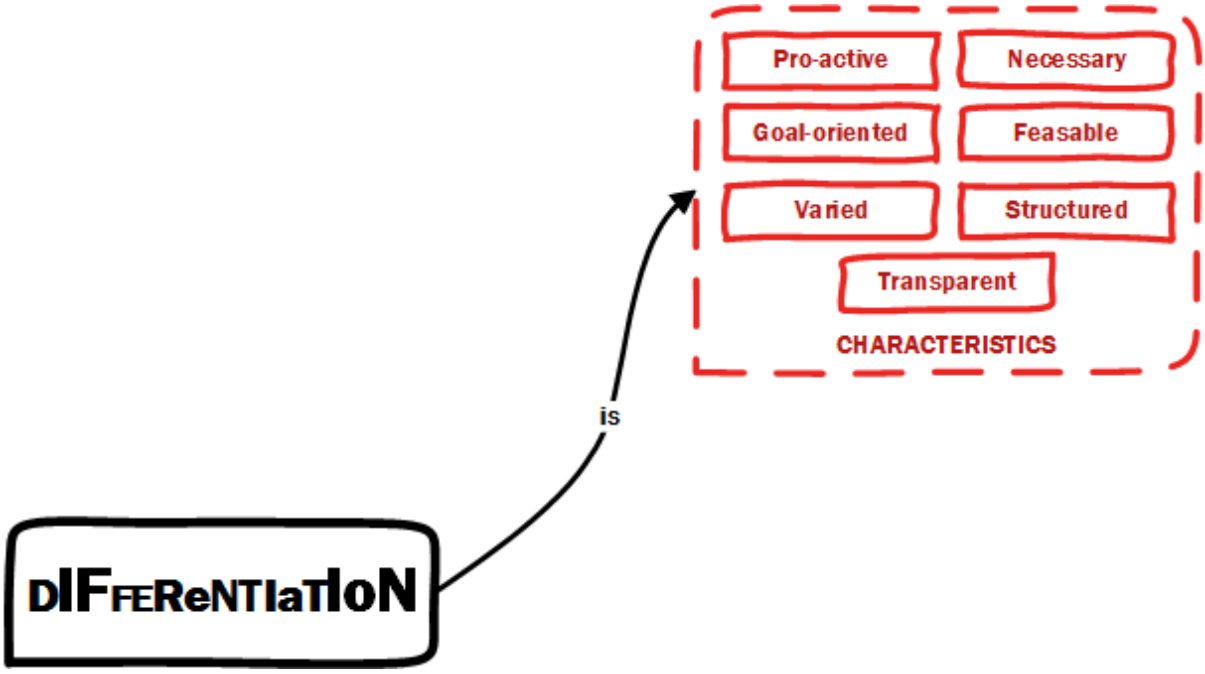
- *Inclusion:* teachers adapting teaching methodologies to students' needs favour the inclusion of each student into the learning and teaching process. According to Leicester (2008), school practices are inclusive when they cover a broad range of schooling experiences and succeed in helping children with diverse backgrounds and abilities to be effective learners.
- *Motivation to learn:* the purpose of differentiated instruction should be to bring each student to learning and to enhance 'the learning match' between the students and the curriculum. Thus, teachers should develop products that reflect students' capability to facilitate learning for students of different readiness levels and with different interests and learning profiles; all features that can affect the construction procedure of new competences.
- *Life-long learning:* the positive outcomes of differentiation strategies will encourage learners to participate in learning activities during their entire professional career and private life.
- *Achieving learning outcomes (effectiveness):* differentiated and inclusive pedagogy is directly linked to effective learning as it aims at connecting to the individual's learning profile and finding teaching styles through which they can learn more effectively and gain maximum benefit. According to Crawford (2008), the key to effective differentiation is to adjust the curricular components of content, teaching strategies and assessment continuously in response to adolescents' interests, readiness levels and learning profiles, in order to encourage the development of a classroom of full inclusion. In a differentiated classroom students are active at their learning: they take responsibility for their learning process. This

will lead to a higher ownership of learning and will increase the chances of achieving the learning outcomes. Learning outcomes could also become richer and more diverse as students get more openness (ag. open-ended problem tasks) in the learning process.

- *Efficiency:* in a differentiated educational context, chances are more likely that students spend time to learning tasks that match their zone of proximal development. Less time is wasted to learning tasks that are either too difficult, to easy or that aren't adapted to their learning profile. Using ICT-devices (eg. the tablet) can also increase the efficiency as learning progress can be shared and monitored automatically.
- *Self-realisation:* by introducing differentiation, teachers could facilitate opportunities for talented students to produce a product that reflects their potential.
- *Self-actualisation:* differentiated instruction helps in maximizing students' opportunities for personal learning and growth. Teachers should differentiate education in order to encourage the development of the whole person: a mean to teach students differently, to take them out of the classroom and into society.
- *Harmonious and pluralistic citizens for society and humanity:* differentiation aims at having a learning environment that provides confidence to students to enhance their capabilities and building knowledge and talent in a flexible, safe environment. It should encourage independence and ensuring student performance and overall wellbeing to grow as responsible and active citizens in their society.

According to Anderson, Klassen & Georgiou (2007) the key role of teachers in "giving birth to and maintaining a truly inclusive classroom is unquestionable, but such an important mission also requires that suitable, effective and barrier-free educational means should be included". In this project we will argue and illustrate that a tablet is an educational means that answers these criteria.

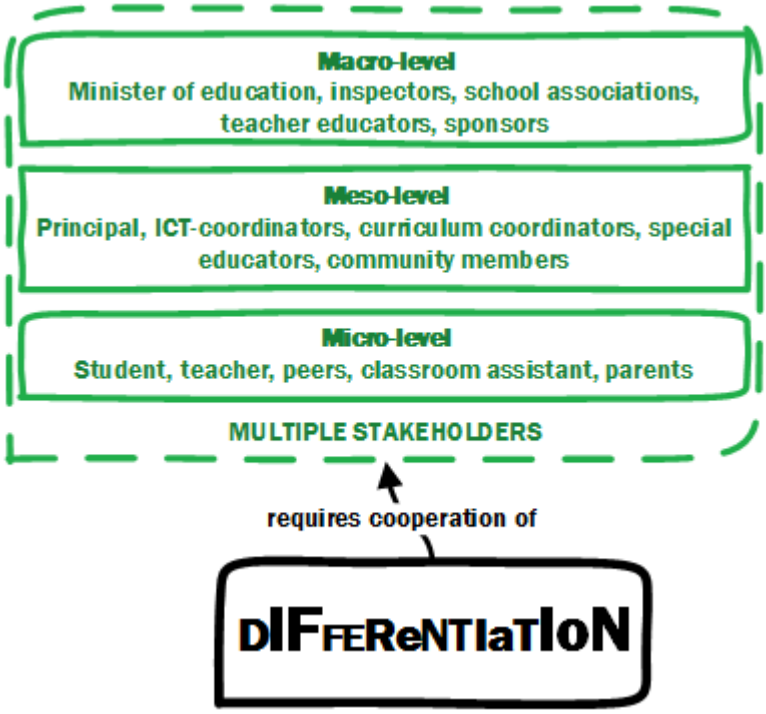
3. Characteristics



What are the key characteristics for effective and efficient differentiation?

- *Pro-active:* Teachers will have to learn how to develop a classroom routine and not to ignore variance in students' readiness, interest and learning profile. Such routines may be defined as differentiating curriculum and instruction. It is a pedagogical, not organizational approach, in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom. (Tomlinson, Brighton, Hertberg, Callahan, Moon, Birmijoin, Conover & Reynolds, 2013). The reactive approach would be that a teacher plans one lesson for the whole classroom and adapts his approach when a problem arises. This is not desirable.
- *Goal-oriented:* in a differentiated educational context the learning goals are central to the learning and teaching. A discussion can rise whether all students should acquire the same learning goals. For regular education, this would certainly be the case. Only in specific cases of inclusive education, it may be possible that some students aren't required to achieve all goals.
- *Varied:* key to differentiation is the aspect of variety. This can be teacher-driven what would mean that the teacher varies in his educational offer of learning tasks and objects. Variation can also be student-driven when the educational context stimulates autonomy and ownership of the student. The student has the freedom to choose which learning tasks or learning objects he chooses to accomplish the learning outcomes.
- *Transparent:* transparency should be offered in terms of learning objectives and outcomes. A rubric is an interesting way to give transparency to the student. The students should have a clear image of the expectancies at the very beginning of the learning process. In more open ended learning processes, the student may have the opportunity to formulate the learning outcomes themselves. This should also be discussed transparently. Another aspect of transparency in differentiation is that teachers dare to express the differentiation process openly in the classroom. All students should be aware of the differentiation techniques and should take it for granted as well.
- *Structured:* the method of the differentiation should be clear to all persons involved.
- *Feasable:* Though teachers support the idea of inclusive classroom via differentiation, they tend to resist to adapting materials, planning lessons for individuals, changing evaluation procedures and instructional practices, make long-range plans or adapt scoring and grading criteria (Tomlinson, et al. 2003). Although there may be a learning process involved for the teacher, we believe differentiation to be feasible, especially when using tablets in the educational differentiation process.
- *Necessary:* for realizing truly inclusive classrooms with respect to everyone's learning needs and talents.

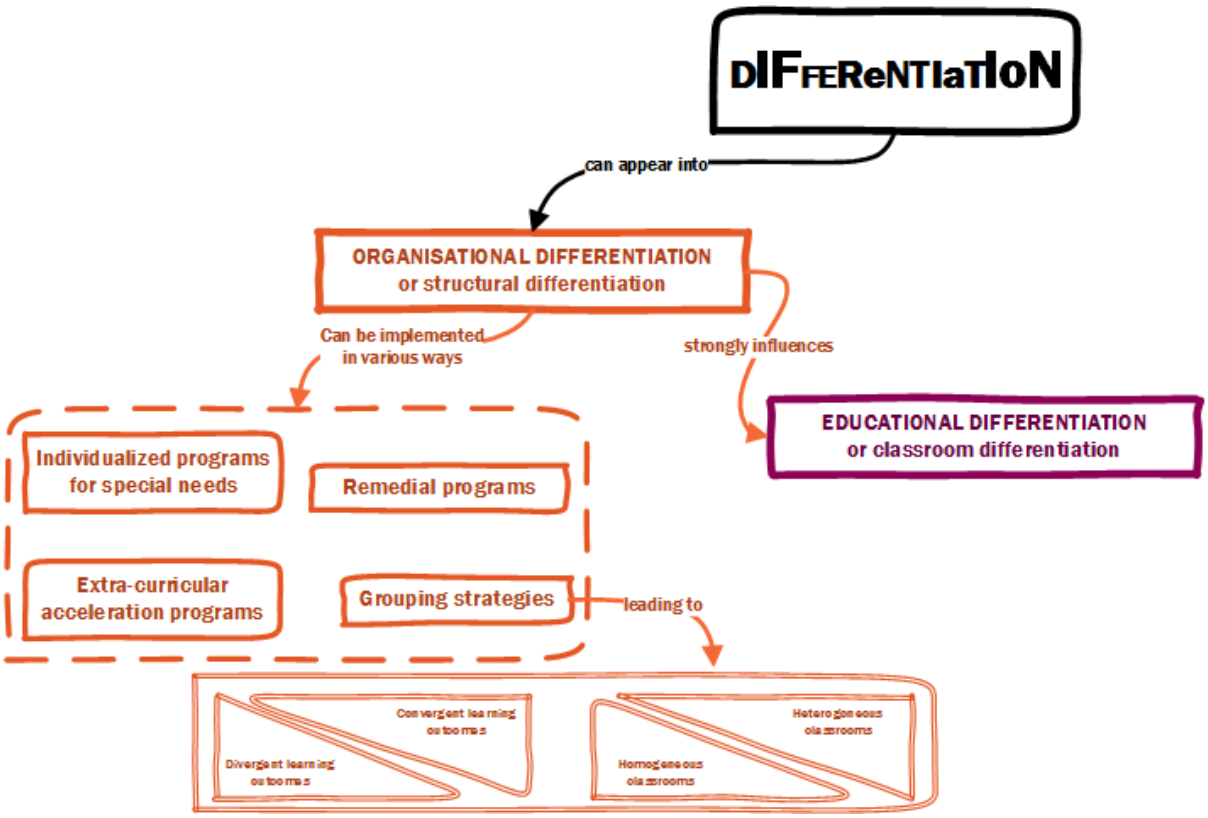
4. Stakeholders



In order to make differentiation a structural, pro-active, systemically integrated aspect of education, stakeholders on three levels should invest energy in it and cooperate with each other.

- *Macro-level:* European, national and regional policy makers should emphasize the aspect of differentiation in their educational policy documents (eg. national curricula). School inspectors and teacher educators can be an important vehicle for transferring this policy into local schools and classrooms.
- *Meso-level:* school policies should incorporate and explicit the need for differentiation. Intra- and inter-school collaboration and exchange between teachers on differentiation should be promoted.
- *Micro*-level: not only the teacher and the student, but also other classroom assistants and most importantly the parents should be engaged in the process of differentiation. This starts with informing each stakeholders but can evolve to participation and negotiation.

5. Organisational differentiation



Organisational or structural differentiation covers the differentiation actions on a school level or a program level (curricular level). It can be implemented in four main ways.

1) *Individualized programs for special needs:*

Special education is the practice of educating students with special educational needs in a way that addresses their individual differences and needs. Ideally, this process involves the individually planned and systematically monitored arrangement of teaching procedures, adapted equipment and materials, and accessible settings. These interventions are designed to help individuals with special needs achieve a higher level of personal self-sufficiency and success in school and in their community that may not be available if the student were only given access to a typical classroom education.

Common special needs include learning disabilities, communication disorders, emotional and behavioural disorders, physical disabilities, and developmental disabilities. Students with these kinds of special needs are likely to benefit from additional educational services such as different approaches to teaching, the use of technology, a specifically adapted teaching area, or a resource room.

Teachers who provide special education services in schools must be certified to do so and will focus on his strengths as well as his challenges. The services and supports they receive may differ. It's all about individualization. What is important is giving kids the resources they need to make progress in school. Usually special needs students are removed from their regular classroom and taught in another setting.

2) Remedial programs:

Remedial programs (also known as developmental education, basic skills education, compensatory education, preparatory education, and academic upgrading) are designed to close the gap between what a student knows and what he's expected to know. It is usually used to build basic skills and designed for any students, with or without special needs. They often target reading or math weaknesses and can help them catch up their peers. In many cases, students are removed from their regular classroom and taught in another setting.

Not all programs are effective. An effective remedial program is taught by a professional teacher with special training. Programs need to be implemented in small groups. The idea is to get more individual attention than is possible in a large class.

3) Extra-curricular acceleration programs:

Extracurricular programs are educational activities not falling within the scope of the regular curriculum. They are voluntary and could be organized at school or not. These types of activities include sports, music, arts, academic clubs and many other after-school activities.

Extracurricular activities have many positive effects on students. They help them gain new skills, learn to socialize, gain leadership ability and learn more about their own interests. At the same time participation in after-school activities is linked with better academic performance and higher self-esteem of students.

Many extracurricular activities, such as the school newspaper, photography, and drama, can lead to careers. Extracurricular activities also help to form the student's profile for consideration in college or job admissions.

4) Grouping strategies:

School systems have developed different ways to manage the diversity of the student population. They select and group students into education levels, grade levels, different schools, programs, and different groups within schools on various ways.

Grouping strategies on organizational level include *vertical stratification (by age), and horizontal stratification (between and within schools or programs).*

- *Vertical stratification* of students is a result of development. As student populations grew in size and diversity, schooling was increasingly differentiated "vertically". This vertical stratification resulted in the creation of different grades and education levels.
- *Horizontal stratification* on organizational level means adapting curricula to different groups of students, based on their ability. There are two main types of horizontal stratification:
  - *Between schools:* separating students into different schools based on ability, often involving a division into academic/general and vocational schools; often referred as "tracking".
  - *Within schools:* when providing different curriculum standards to different groups of pupils based on their ability; different ability groups can be placed in different classroom or in the same classroom; ability groups are typically implemented to teach core subjects; remedial groups and special needs program are also a case of such differentiation; also referred as "streaming".

The rationale behind using these differentiating mechanisms is to homogenize the student population so that its educational needs can be met more effectively. But there is some concern that horizontal stratification replicates existing social and economic inequities, as socio-economically disadvantaged students tend to be disproportionately grouped into low achieving groups.

Homogenous student groups are result of differentiation. Homogenous grouping began as a response to traditional classrooms, in which a single teacher is responsible for a number of pupils who are typically diverse in terms of their levels of educational attainment, language proficiency, cultural background, and other characteristics. However various studies have showed that this practice does not contribute to overall school success. Researches on readiness have showed that homogeneous grouping may have positive effects on students with good overall study results, but at the same time it has negative effects on students with lower overall study results. Various studies have demonstrated that homogeneous groups increase the differences in performance among pupils, and it does not improve their overall performance. In homogeneous classrooms, low achievers learn less because they spend less time on instructional activities, the material and content they are exposed to is less challenging, instruction is of lower quality and the pace of instruction slower. Finally, horizontal stratification on school level limits the opportunities for upward mobility between groups and reduces students' satisfaction with their group placement. It is highly likely that children belonging to vulnerable groups will be assigned to low-achieving groups, and this contributes to students being segregated, categorized, stigmatized, and socially stratified. The same is true for children with disabilities, whose attainment levels may decline even further.

Heterogeneous groups or mixtures in educational settings are groups that include students with a wide variety of instructional levels. Heterogeneous groups stem from the education precept that a positive interdependence can arise from students with varied learning levels working together and helping each other to reach an instructional goal.
For students of lesser abilities, there is usually an advantage in being included in a heterogeneous group rather than homogenous group. They don't have the risk of being stigmatized as part of a less-able group. A heterogeneous group gives advanced students a chance to be a mentor to their peers. All members of the group may interact more to help each other understand the concepts being taught.

Which teaching strategies teachers choose to use seems to relate to the implicit or explicit learning goals they have for their classroom as a whole. From a 'theoretical' point of view teachers can strive for *convergence or divergence*.

- Teachers aiming at *convergence* are mainly focusing on reaching a minimum performance level with all of their students, which implies they might have to dedicate additional time and effort to the low achieving children in order for them to reach that minimum performance level, even when this goes at the expense of the high ability children, who by consequence receive less attention.
- Teachers aiming at *divergence* mainly focus on helping all children to reach their highest potential, equally dividing attention between students with lower and higher ability. In practice though, most teachers will combine convergent and divergent goals and will try to reach a minimum performance level with the low ability students, while also offering high

ability children the opportunity to extend their knowledge without proceeding (too much) ahead of their peers in the classroom.

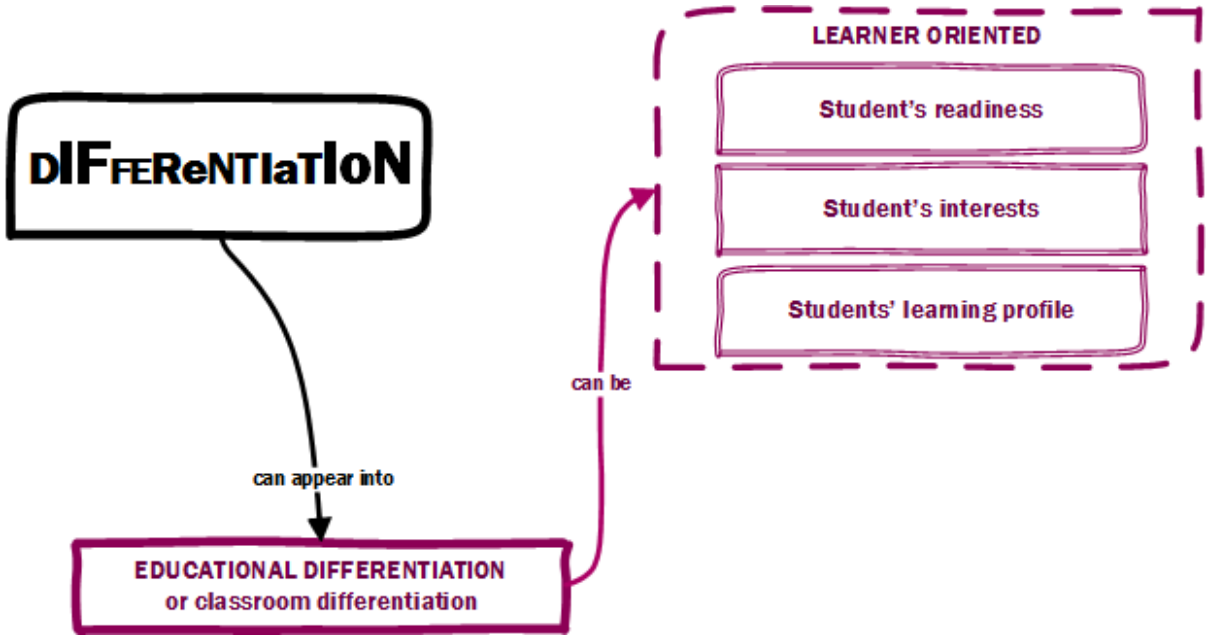
The potential convergent or divergent effects of varying differentiation strategies are not fully clear, as research shows mixed results, and therefore it is difficult for teachers to make explicit decisions on when to use which differentiation strategy, for what goal.

The effect of differentiation is considered to be divergent when the effect size is largest for high ability students and convergent when the effect size is largest for low ability students.

Divergent thinking is the process to create several unique solutions intending to solve a problem. The process of divergent thinking is spontaneous and free-flowing, unlike convergent thinking, which is systematic and logical. When using convergent thinking, we use logical steps in order to choose the single best solution. By using divergent thinking, instead of only choosing among appointed options, we search for new options. Convergent thinking stands firmly on logic and less on creativity, while divergent thinking is mostly based on creativity. We use divergent thinking mostly in open-ended problems that creativity is a fundamental part.

Convergent thinking is the opposite of divergent thinking. Convergent thinking is the process of finding a single best solution to a problem that we are trying to solve. Many tests that are used in schools, such as multiple-choice tests, spelling tests, math quizzes, and standardized tests, are measures of convergent thinking.

6. Educational differentiation - Learner Oriented



From a learner oriented point of view, there are three categories of student characteristics that can be taken into account.

1. *Student's readiness:* Student readiness or initial situation is the knowledge or skill level that individual learners have already mastered with respect to a topic or task that is planned for them

to be engaged with (they are supposed / about to address?). Differentiation of curriculum and instruction as a response to student readiness: Individual learns in his or her zone of proximal development. Teacher has to be there for support and help students to become independent thinkers and problem solvers. Instruction must be in advanced, challenges at the proper level of difficulty.

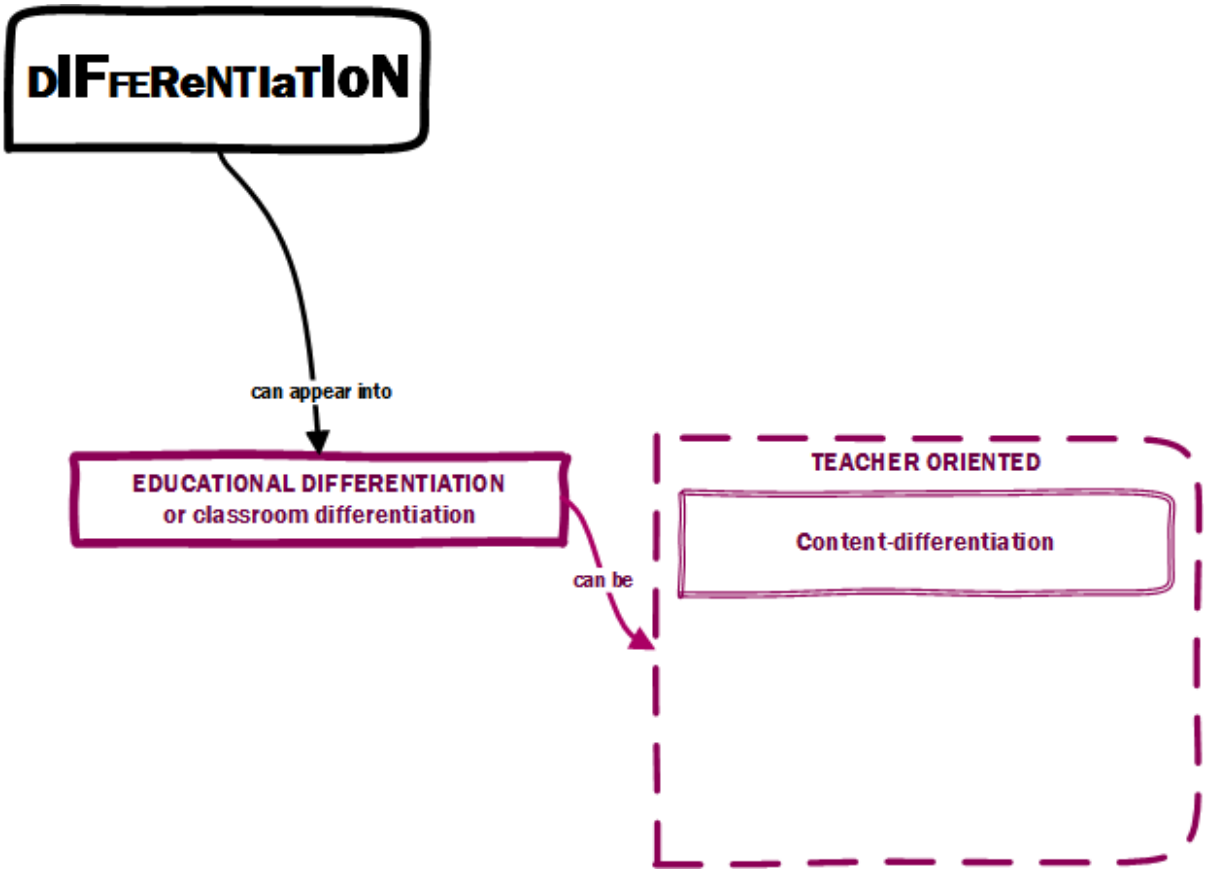
2. *Student's interests:* Tasks that are interesting to students increase their motivation to deal with it, they are more productive, creative, persistent and autonomous. Rather than "How can I motivate students?" a teacher should think about "What motivates this particular student and how do I design work that is responsive to these motivations?"
3. *Student's learning profile:* The term learning profile refers to a student's preferred mode of learning that can be affected by a number of factors, including intelligence preference, gender, and culture. Learners at primary, middle, and high school levels achieve better when instruction matches their preference.

Important note: learning styles are not an advised way to differentiate between students since they fail to challenge the students to use different ways of learning and don't lead to higher learning outcomes (De Bruyckere, Kirschner & Hulshof, 2015).

Design principles related to differentiation on STUDENT's characteristics:

1. Formulate high expectations for students. Be confident in learners' achievements.
2. Challenge students, provide different levels of learning materials to challenge them.
3. Involve students in the process of differentiation, e.g. group choice.
4. Routinely use consistent and meaningful assessment to get a good view of students' readiness, interests and meta-cognitive abilities.
5. Be aware of differences between students based on special needs, gender, culture, linguistic preferences, strengths and weaknesses; confidence; self-awareness; self-efficacy. (inclusion)
6. Learning styles are not an advised way to differentiate between students since they fail to challenge the students to use different ways of learning and don't lead to higher learning outcomes.
7. Take advantage of the availability of ict tools for assessment to enable easy and fast (self-) assessment of students.

7. Educational differentiation - Teacher oriented - Content differentiation



Content differentiation is concerned with:

- providing students with information through a variety of sensory inputs e.g. audio, visual etc.;
- providing students with a variety access points to information and considers how they access the information and what they need to learn;
- assessment that directly influences instruction.

Content differentiation can include:

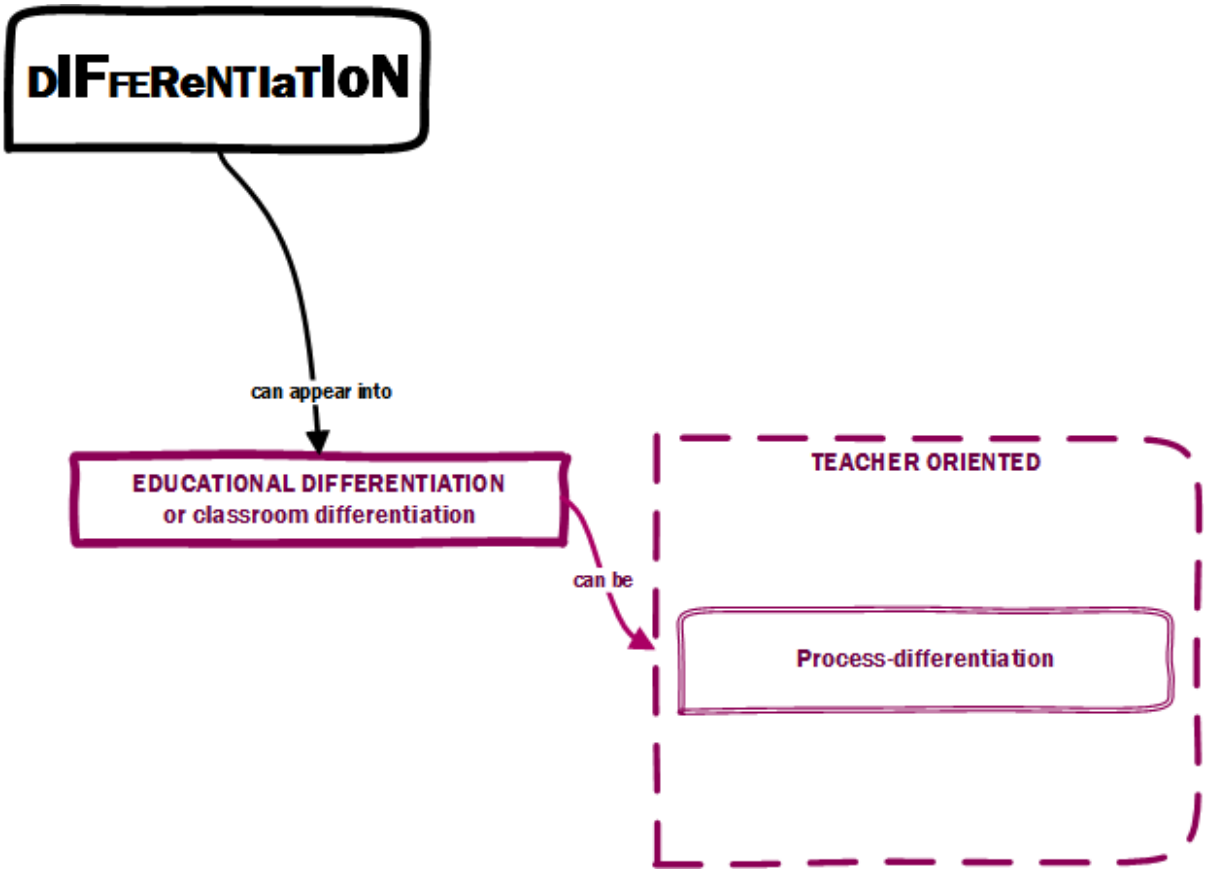
- variation in texts;
- accelerated coverage of material;
- assorted supplementary materials;
- varied visual information;
- independent study;
- tiered assignments -based on pre-assessments.

As technology has evolved, the identification of different learning methods associated with the use of technology has also changed. One such method that has influenced education is that of Mobile

Learning (M-Learning). Laouris and Eteokleous (2005) proposed a more meaningful definition of M-Learning i.e. learning that took place using a mobile technology device, was needed given the proliferation and ownership of mobile technology.
An opportunity to investigate M-Learning and the correlations that may exist between this pedagogy's ability to facilitate differentiated learning and differentiated assessment has not been fully explored. Facilitating responsiveness to the learner's needs brings with it the opportunity to facilitate a curriculum that adapts and is individualised to the needs of the learner. The creation of a curriculum that is individualised can be connected with the concept of differentiation where the differing skills and diverse needs of students' are accounted for in what has been termed 'instructional differentiation' Mills et al. (2014). It is both E-learning and M-Learning's ability to facilitate learning across various contexts and geographies that affords the opportunity for a personalised curriculum. However, M-Learning brings with it the opportunity to allow learners' to take ownership of their learning and individualise this according to their needs at a time and place that suits their lifestyle as Song et al. (2012) indicate. However, even the concept of M-Learning has not given rise to the consideration of both instructional differentiation and differentiated assessment. Therefore, the ecology between learners' and technology within education and the impact that one may have upon the other in relation to learning and both instructional differentiation and differentiated assessment is an area that requires investigation.

Currently, we have assessed that a number of gaps in the research are present and an opportunity exists to explore these gaps in more detail. For instance, no congruence has been found in relation to the role of M-learning in current teaching and learning practices. This includes investigating how M-learning can be exploited to facilitate a personalised education for students'. The affordances' presented by the technology associated with M-Learning are such that a variety of sensory inputs and outputs can be communicated and created. Therefore, exploring not only the proliferation of mobile technology within education but also how this technology is currently being used by both students' and lecturers' would offer insight into learning behaviours and patterns.

8. Educational differentiation - Teacher oriented - Process differentiation



To differentiate by process, teachers use sense-making activities with students to enable comprehension of content. Differentiation by process involves giving students opportunities to explore key concepts. It gives them the chance to come to grips with the material they've been learning, to play with it, twist it, experiment with it, and test it.
Process differentiation can take place according to each of the student characteristics mentioned before (readiness, interest, learning profile)

One way to differentiate by process is by using flexible grouping of students. Flexible grouping is a range of grouping students together. This can be as a whole class, a small group, or with a partner. Flexible grouping creates temporary groups that can last an hour, a week, or even a month. It's not permanent, but it is a temporary way for students to work together in a variety of ways and configurations depending upon activity and learning outcomes.

In differentiated instruction, teachers should ensure that their students have multiple options for taking in information and making sense of concepts.

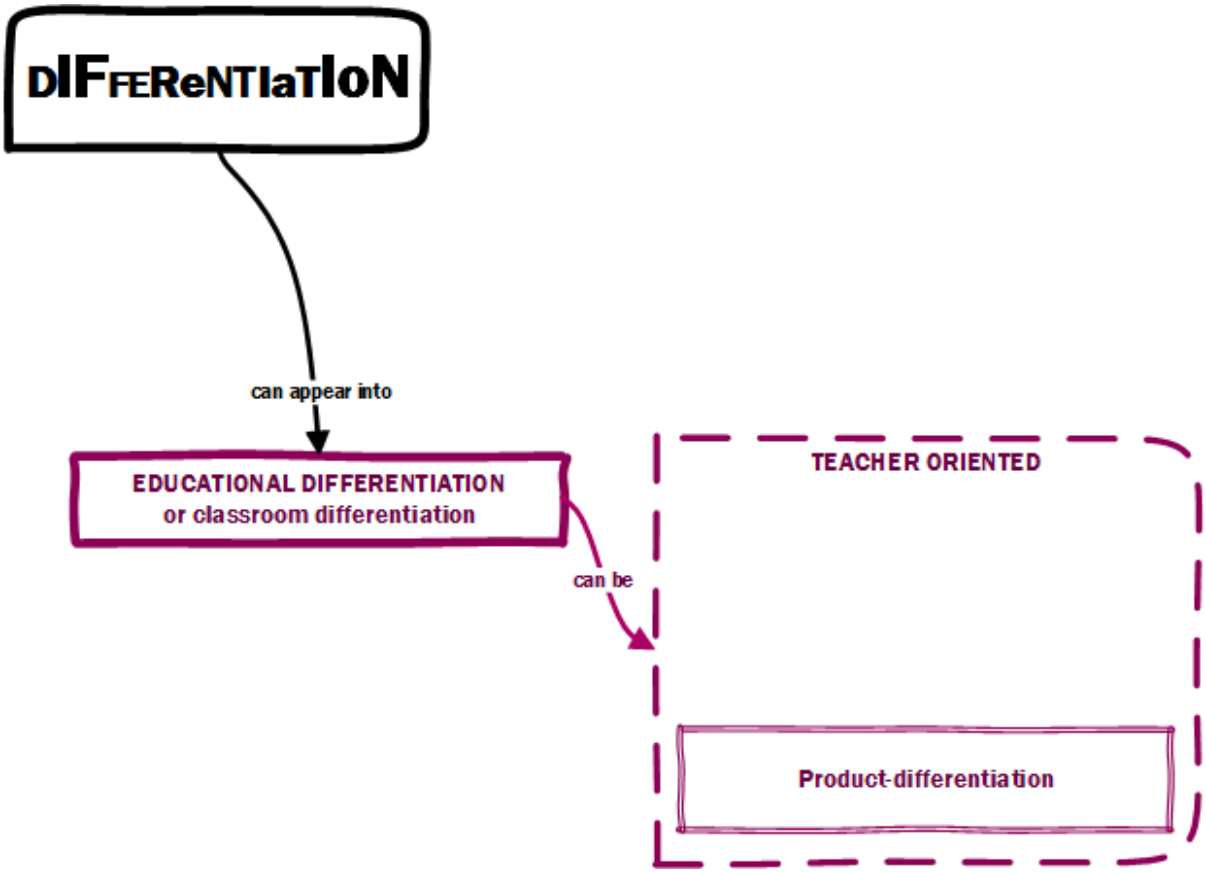
Educators should take the time to:

- get to know their students and understand who they are as individuals;
- invite them to be active participants of their learning process;
- offer various methods through which modify curriculum components;
- increase the possibility for students' success.

Design principles related to PROCESS differentiation:

1. Formulate high expectations, expect a serious effort and support students where needed.
2. Design differentiated tasks in combination with a coaching attitude of the teacher.
3. The teacher should be in favour of peer learning.
4. Variously use different grouping techniques: by interest, divergent, convergent,...
5. Build variation into your educational method; aligned with grouping strategies and learning contracts.
6. Build variation into the learning environment: school, classroom, real life environments, virtual environments.
7. Assessments should be developed from a growth mindset.
8. Stimulate your students to assess themselves and their peers.
9. Give quick and concrete feedback to students and herefore use ict tools as a smart catalyst.

9. Educational differentiation - Teacher oriented - Product differentiation



In order to evaluate your students' development better and clearly, alternative assessment techniques should be used, in addition to traditional assessment techniques. An alternative assessment is a student-centered approach and it concentrates on the level of the utilization of learning and abilities to actual life, taking the individual characteristics of the students into consideration. As traditional assessment just considers the practices in the intellectual zone, the alternative approach watches the improvements in emotional and psychomotor practices. Portfolio, project, performance assignments, concept maps, structured grids, descriptive branched trees, word association, self-evaluation and peer evaluation are accepted as the tools of alternative assessment and evaluation. Alternative assessment is more functional in defining the students individual needs, changes and differences.

Alternative instruments urge students to make up their minds on basic and complex issues, not at all like the traditional tools. While students give short answers, or select one of the numerous decisions in traditional instruments, with alternative assessment they frame and make answers from their own points of view on genuine living, and they introduce their answers in various ways. While traditional methods by and large evaluate remembered learning, alternative instruments attempt to uncover the perception and achievement of learners. In this specific situation, alternative assessment instruments have an integral element for learners with various learning styles and they give other options to the assessment of these learners (Llewellyn, 2003).

What are some possibilities of alternative assessment techniques?

- *Self-assessment:* self-assessment is an assessment type which brings students into the assessment process by letting them evaluate and score themselves. Thus, it is assumed that students take responsibility for their development and they begin to internalize standards which increase autonomy (Hart, 1994)
- *Rubrics:* a rubric is a useful evaluation approach to judge the quality of a product or performance which includes related criteria and ratings based on those criteria. Rubrics enable descriptive informative and holistic characterization of students' work (Van-Tassel Baska, 2003).
- *Peer-assessment:* peer-assessment is an arrangement in which individuals consider the amount, level, value, worth, quality, or success of the products or outcomes of learning of peers of similar status. However, if obtaining helpful feedback is needed, students must have a clear understanding of what they are to look for in their peers' work. The instructor must explain expectations clearly to them before they begin (Topping, 1998).
- *Reflection paper:* reflections are pieces of writing that require students to articulate and review the process and/or products. They allow students time and space to analyse their achievement in relation to the class standards, evaluate their final products and determine growth as well as needs. Reflection papers, a critical component of the process/product, are vital tools in the learning process, for through reflection students learn to scrutinize their own performance, come to terms with what went wrong as well as what went well, contemplate strategies to enhance their success in future work and take responsibility for their learning. It is the job of the instructor to create and foster an effective reflection milieu (L. Fernsten & J. Fernsten, 2005).
- *Portfolio:* portfolios represent a form of authentic assessment. It is defined as "systematic collections by both students and teachers [that] can serve as the basis to examine effort, improvement, processes, and achievement as well as to meet accountability demands usually achieved by more formal testing procedures." (Tierney, Carter, & Desi, 1991, p. 41).
- *Learning Logs/Diaries:* a learning log is a particular format which connotes a running commentary in writing format. A learning log is not meant to be a polished piece of writing that is rewritten through many drafts. It is an opportunity for learners to communicate their ideas and to clarify, refine, and consolidate their thinking (McIntosh and Draper 1997).
- *Projects:* the interdisciplinary projects constitute innovative assessment method aimed at helping students cope with real-world problems. The project-based method involves both theoretical and practical aspects and has the potential to make assessment explicit and meaningful to students. Project-based assessment thus enhances higher order cognitive skills, including the ability to perform data analysis, problem solving, and decision-making, and develops the students' sense of responsibility for their physical and human environment (Dori & Tal, 2000).
- *Diagnostic Branched Tree (DBT):* DBT is an alternative assessment tools that can be used to identify what students have learned or what they have not accomplished in a given subject. Students are asked to select the right choice among true and false statements in an order from basic statements through complexed statements with more details. A branched tree is usually made up of 8 or 16 selected statements (Çelen, 2014).
- *Fishbone Technique:* fishbone chart diagram aims to specify the reasons of matters happen in a clear manner by indicating the relationship between qualitative attributes and their related factors. The problem is shown on the main bone and the causes of the problem are indicated on its main branches, respectively. This tool enables to prioritize actions considerably and can be effective in increasing creativity and to activating group thinking (Yazdani & Tavakkoli-Moghaddam, 2012).

- *Word association test (WAT):* this is a reliable technique used as a procedure for measuring number, direction and strengths of connections. WAT requires responses that are not restricted to any specific category or class of words. In tests of discrete word association, each participant is asked to produce only a single associate to each word, while in tests of continuous association, the stimulus word or the list of stimulus words is presented to the respondents only once and they are asked to give as many associations as they can in a pre-specified period of time (Kostova & Radoynovska, 2010).
- *Structured grids:* structural grid is one of the alternative assessment-evaluation techniques. A structured grid is a technique when a group of answers, elicited from a set of questions, are distributed to a numbered nine or twelve boxed table, and that students have to choose the options that logically order as well as find options that produce the correct answers to the questions. The most important feature of this approach is the measurement of meaningful learning, the lack of sight of partial information, and the fact that it is a diagnostic tool that reveals the deficiencies and inaccuracies of the student's cognitive structure (Bahar, Öztürk ve Ateş, 2002).
- *Mindmapping:* mindmapping can be defined as non-linear representations of ideas and their relationships. Mind maps comprise a network of connected and related concepts. However, in mind mapping, any idea can be connected to any other. Free-form, spontaneous thinking is required when creating a mind map, and the aim of mind mapping is to find creative associations between ideas. Thus, mind maps are principally association maps (Buzan and Buzan, 2000). It is different from concept map which only allows allows students to understand the relationships between concepts since mind-maps are for imagining and exploring new associations (Davies, 2011).

Higher level thinking skills aka 21st Century skills which are analytical, practical and creative thinking skills. These skills aim to equip students with the competencies necessary to reason about social affairs in a rapidly changing world and necessary to immerse in new information, display mental flexibility, innovation, complex problem-solving abilities, and productive collaborations with others. Teachers should enable students to use higher level thinking skills. We can distinguish several higher level thinking skills:

- *Creative thinking skills:* creativity can be defined as the production of work that is both novel (i.e., original, unexpected), of high quality, and appropriate to the task at hand (Kaufman & Sternberg, 2010).
- *Critical thinking skills:* critical thinking can be defined as reasonable and reflective thinking that is focused on what to believe or do (Ennis, 1987). In terms of this definition critical thinking skills are analysing and evaluating data, building explanations from evidence, engaging with scientific questions.
- *Practical thinking skills:* practical thinking skills mean to apply critical and/or creative abilities successfully to everyday, pragmatic situations (Sternberg, 2003).

We want to underline the importance of rubrics for realizing educational differentiation on the product-level. Rubrics describe simple criteria that identify whether or not the characteristic is present or absent, and also have some judgments regarding the qualities of the characteristics. The measurement scales in rubrics describe the characteristics of each point on the scale. The highest quality work generally receives more point values.

Teachers should detail the expectations for performance in the task description (and in the rubric). They should explicitly delineate the dimensions along which and how student performance will be evaluated and should clearly express the levels of performance quality (Renzulli & Callahan, 2008).

One of the critical characteristics of rubrics is to engage the student throughout the entire process. In this way, students understand the goals for learning, the particular characteristics
needed for high-quality work, the types of samples that will best showcase these characteristics and their progress, how to reflect on their best work and themselves as learners, and how to communicate their progress to others.
The use of rubrics becomes even stronger, when it's also offered in a visual and/or auditory way, besides the textual way.

Another important element in product differentiation, is using variety in creating the outcomes and the final products. This helps students to express themselves better and reach the students with different characters, needs, levels and preferences.

- Tangible products: tangible products are the products that can usually, or to some degree, be directly experienced—seen, touched, smelled, or tasted, as well as tested (Levitt, 1981). We refer to the 'content differentiation'-section to get ideas on the various types of tangible products.
- Daily problems: the concept of daily problem emphasizes the use and application of information (content) and thinking processes in an integrated, inductive, and a real-problem-oriented manner. The role of the student is being a first-hand inquirer instead of just a learner (Renzulli, 2005).
- Open ended problems / Non-routine Problems: open-ended or non-routine problems are the ones which require high-level thinking and problem solving, and put an emphasis on the process the student uses to come to an answer rather than on whether or not the student can quickly find the right answer.

It is important to integrate formative assessment in the learning process, in order to monitor progress and give feedback to your student. Qualitative and immediate feedback have an important positive impact on the learning progress (Hattie & Timperley, 2007). Summative assessments are obviously also in important source of information on students' progress. Teacher should consider the possibility of 'extra points' for students that want to accelerate. It's also possible to ask and discuss with students what grade they want to achieve.

Design principles related to PRODUCT differentiation:

1. Use Alternative Assessment Techniques in addition to Traditional Assessment Techniques to evaluate your students development better and to adapt it more to individual needs, changes and differences.
2. Enable your Students to use Higher Level Thinking Skills.
3. Use and share Rubrics with clear instructions.
4. Use Variety in creating the outcomes and the final product to help students express themselves better and reach the students with different characters, needs, levels and preferences.
5. Use Summative Assessment to decide on learning outcomes.
6. Use Formative Assessment to monitor the progress and give feedback to your students.
7. Be aware of the Process of Production and use alternative ways and resources to achieve the production.
8. Be aware of the Influences of the products on society, discipline and humanity
10. Provide Logistics and Materials, help students to prepare their products efficiently.

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