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SCHOOL TOMORROW - CHALLENGES AND VISIONS – A "JOURNEY" TO THE FUTURE OF SCHOOLS

Abstract. The article deals with the challenges that schools worldwide are bound to face in the future and with visions that can be helpful in overcoming these challenges.

The content of this article derives both the author's own reflections and experiences based on his almost 40 years of working in different types of schools, in different functions and in different countries, and a selection of new approaches already practiced worldwide for the design of future-oriented forms of teaching and learning as well as internal and external school organization.

In the first main part of this article, the author describes the challenges that all groups of people involved in schools, i.e. students, teachers, school headmasters, school administrators and parents, will face in the future. In the second main part, he lists six visions that can lead to overcoming these challenges and backs them up with innovative concepts that are already being practiced around the world today.

Keywords: Future visions, challenges, school, teaching, school concepts, education, future-oriented, teachers, students, parents,

Introduction. This article was created in preparation of an online conference in March 2022, carried out by the Dulaty University in Taraz, Kazakhstan, on the subject of "***School Tomorrow - Challenges and Visions***".

For this reason, the status quo in schools, even if it is the basis of all forward-looking considerations, was only mentioned in passing, especially since it is, of course, very different in different countries. It is assumed that any reader interested in this article is well aware of the school and teaching situation at his/her respective location.

The article is limited to essential aspects of the challenges facing "School Tomorrow" and the author's visions for the future of schools, illustrated by some projects already implemented around the world in some special, forward-looking schools.

Since the field of "school" covers many different groups of people and also many age groups, the following four terms are used in this article:

- **Students** (This refers to children, young people and adults in the process of training.)
- **Teachers** (This term covers educators in kindergartens as well as teachers in all possible school levels up to trainers in all professions and university professors.)
- **Headmasters** (This includes all persons who are "teaching organisers" in the broad sense, including nursery manager, middle school coordinators, general headmasters, training officers, school supervisors, to name but a few.)
- **Administration** (This includes all those who are responsible for the spatial, financial and other organisational framework conditions under which schooling and teaching can take place.)

Note on the language: This article was originally written in German. For the publication a translation into English was made by the author. If the corresponding quotations were in German, they were also translated into English for the better understanding of the English-speaking reader of this essay.

For the translation the following Internet translation programs were used:

- www.DeepL.com/Translator
- https://translate.google.com
- https://de.pons.com/text-übersetzung

However, an absolutely error-free translation cannot be guaranteed. The author apologizes in advance for any possible errors, inaccuracies or ambiguous formulations in English; if necessary, the author can be contacted directly for clarification of any questions.

Research methods and conditions. This article is an analytical study by the author. It attempts to examine the current conditions in schools worldwide in terms of their future viability. In the author's opinion, the challenges that arise from this for all groups of people involved in school life can be met with different visions.

All the information for this analysis is based, on the one hand, on the various schools he has personally encountered and, in some cases, managed during his 38 years of experience. On the other hand, he uses many other schools known to him as well as documents from the Internet on future-oriented plans and projects and processes them in this article.

Results.

1. Introductory Preface:

Vision and reality are often contradictory terms, especially in connection with the subject of "school." But without visions, further developments, progress or even necessary adjustments do not appear possible or become disoriented hustle and bustle introduced by people with overzealous and excessive desire for action. The current challenges arising from this will be discussed in the following section – and these challenges do not relate to a specific school type, specific age group or country-specific framework conditions. It will be about general challenges, valid in 2021, which should be the task of everyone with education and training to address.

A number of visions that can help to meet these challenges in the near future are identified and described in greater detail in the following section. It will not be a matter of submitting recipes that can solve all the problems associated with school. These visions can only encourage those in charge (and this includes all persons from the four groups mentioned above) to come up with new solutions to develop neglected options and perhaps to abandon the "classic" and well-trodden paths...

2. Challenges for the "School Tomorrow"

"New ways will only be possible if free spaces are opened for schools and for intensive experiencing and working in them. " ([1], p. 10)

This demand by J. Keuffer and M. Kublitz-Kramer from 2008 seems comprehensible at first glance and easy to understand for everyone. However, upon a somewhat closer look, it immediately becomes obvious what huge challenges the very intention of creating corresponding "free spaces" in schools entails. It is the aim and content of this section to examine these challenges to the various people in the school environment in more detail.

Visions are not nonsensical fantasies only if they are based on assumptions that are close to reality or at least rudimentarily probable, but to do so, one must first try to answer both of the following questions, especially in the area of schools - or at least come as close as possible to suitable answers:

1. The future is unknown to all of us, and thus, of course, to all those working in and with schools - so how should we adequately prepare today's children and future adults for this future that is unknown to all of us?

2. All groups of people involved with school today (whether directly in the classroom or in connection with leadership or administration) were trained at the beginning of this century - most even in the last century - for and with methods and contents that could be obsolete in the near future or may already be obsolete now. But how can we know today which of these methods and contents are still appropriate, contemporary and adequately preparing the future?

The use of "classical" curricula and teaching methods already represents a relic of the 20th century - at least in many countries around the world. We need only refer to the slow - often too slow - start of the use of modern information technologies in many schools and countries. But the acquisition and provision of computers, networks and Internet access alone will not bring about a change in thinking among teachers, school principals and administrators. Rather, criteria and methods must be developed at the same time to prepare students appropriately for the (let it be repeated: unknown to us!) future.

There is already general consensus today that it is higher-level abilities (competencies, skills) that need to be taught in school in order to prepare students adequately for the future. These include, among others (see e.g. [2]):

- Independent and critical thinking
- Creativity
- Research and questioning
- Empathy
- Adaptability
- Recognize different approaches and solutions
- Self-Organize
- Present online
- Mastery of different learning methods

The requirement that the development of such skills become the focus of school instruction results in different challenges for all groups of people involved with school:

Challenges for teachers? Teachers have to "exemplify" the skills beforehand as part of their role model function but this means that they would have to master these skills themselves - before they try to educate their students in this way. But can teachers teach themselves these skills at all (if necessary, in addition to their normal teaching and organizational workload), or are countless further training courses necessary for this, if it has not been done appropriately in the teacher's training beforehand?

In particular...

- ...teachers must be absolutely open to new ideas regarding their teaching methods, the learning content conveyed, and any form of unexpected change (e.g., when setting up "blended learning," a class that is partly online and partly face-to-face, [3], pages 136ff),
- ...teachers must be willing to continually question their own actions in terms of preparing their students appropriately for the future,
- ...teachers need to create and use new forms of teaching and teaching methods to enable, for example, "challenge-based learning" and "project-based learning" ([2a] and [2b]),

- ...teachers must be willing to leave the comfort zone of teacher-centered instruction and increasingly allow students more freedom to engage in their own activities within the classroom and also in out-of-school learning settings.

Challenges for school headmasters? School headmasters naturally only ever have an indirect influence on the teaching-learning process in the classroom. However, within the scope of their possibilities, which certainly vary greatly from place to place, they can support this process considerably by creating suitable framework conditions. This starts with the scheduling of teaching staff, then concerns the design of timetables as well as the provision of subject and classroom space, the distribution of flexible funding from school budgets, and the support of qualified further training for teaching staff. Two of the challenges to school leaders associated with all of these decisions will be singled out here because they have a direct impact on the future behaviors of teachers and the resources and methods they use. Thus, school leaders are faced with answering the following two questions, among others:

- What actions can support the process of molding a "collection" of individual teachers into a group of cooperative teacher teams?
- What training and/or continuing education measures are necessary and useful for teachers in order to bring them out of the old role of "Dr. Omniscient" - the teacher who always sees himself in the center of his lessons - and into the role of a "learning coach"?

Thus, from these and other perspectives, school headmasters are constantly faced with the challenge of deciding which educational plans and projects to initiate, endorse, or support.

Challenges facing school administrators? All decision-makers in school administrations in the broader sense will also face very great challenges in the future. And this group of people includes not only politicians, staff in the relevant ministries and school inspectors, but also the local school administrators and their staff who regulate the finances (in many schools there are "administrative directors" or "commercial directors"). Especially in connection with the possible implementation of visions, these challenges will certainly grow, and they will primarily include the following aspects:

- In addition to current expenditures (for renewal of school rooms and school buildings, furniture, equipment, personnel costs, etc.), funds must be available for investments that cannot be specifically planned in advance. Predicting an appropriate amount here is of course extremely difficult and requires above all the corresponding willingness and political decisions by the respective authorities and ministries.
- For the "blended learning" already described above, reliable and sufficient WLAN/Internet equipment must be available at schools and sufficient IT equipment must be available for the students in their homes.
- In addition to the necessary hardware and software components, school administrators must also provide human resources for the creation and implementation of digital rooms at schools and for their ongoing maintenance. Estimating the scope of these resources, especially in terms of one-time and ongoing costs, is certainly one of the biggest challenges facing decision-makers in school administrations. But only then, the associated objectives can be achieved, as described, for example, in "The digital building of school21":

"A digital building is the structure that performs the miracle of converting the schools21 into benchmark educational institutions, open 24 hours a day, seven days a week.

...

On designing a digital school that is open and available on any student's device, we are breaking down physical barriers. The personalization of learning is made possible through monitoring, whether this is done in large spaces, in choosing schedules and times, or the creation of adapted itineraries that are routed inside the digital building." ([3], p. 124ff)

Aids for the construction of such "digital buildings" already exist and can be found in the form of ten suggestions in [3], page 162ff; they can certainly help school administrations to cope more easily with the challenges involved.

...and the challenges for the students? The students are perhaps the ones who will face the least special challenges in connection with the possible implementation of visions. After all, they are the ones who always have to (hopefully want to) learn the "new" first anyway, whether it was learning factual knowledge in traditional frontal teaching or will be in the implementation of a new form envisioned by their school. For them, everything is new, and they will, as always, face the challenge of achieving the desired goal in the best possible way. Thus, in the context of vision implementation, at most, students in secondary education will face particular challenges if particular changes are expected in this regard. However, since it is well known how slowly any form of innovation takes place in school systems, there will hardly be any significant changes for these students, who will only spend three or four more years in school.

...and not to forget: In addition to these challenges, there is, of course, a number of others that are difficult to think about today, or at best only rudimentary. These include, for example, the still unanswered question of which communication technologies will be invented and become established in the next five, ten or twenty years. Just think back twenty years, when no one could foresee the potential applications and performance of smartphones, iPads or WLANs. And so, technologies that are still unknown today could also influence the realization of possible visions, support and accelerate them as well as hinder or even completely prevent them - but of course no statement can be made about this at this point in ignorance of the developments.

Equally hardly predictable is the development of the human psyche with all its own as well as interpersonal sensations, feelings, reactions. But such possible developments cannot be dealt with here - they have already been examined and discussed in detail by other authors, e.g. by Vera King in [6].

Visions set up here and now can therefore actually only be based on the status quo with regard to these possible changes in the human psyche – so, they also must be continuously adapted to the corresponding developments, the observation of which must therefore also take place very carefully and permanently in the school sector.

As an example, we will only briefly mention the consequences of media addiction among young people, which are only just beginning to become apparent, and whose learning behavior has already changed considerably in terms of their ability to absorb information. No evaluation of this will be made here, as it is not the subject of this article. Therefore, we will only refer to two sources that deal with this topic in more detail:

- Olivier Steiner, Prof. PhD, sociologist, from the University of Applied Sciences Northwestern Switzerland deals with the topic "Adolescents and computer-related addictions" in a dossier in 2015 [7].
- A longitudinal study of the "DAK-Gesundheit" and the "Universitätsklinikum Hamburg-Eppendorf (UKE)" (published on 4th of November, 2021, in the Berlin newspaper "Der Tagesspiegel", Germany, [8]) draws attention to the effects of increased use of modern communication technologies among children and adolescents, which can already be observed especially in connection with the Corona pandemic.

3. Visions for the "School Tomorrow"

Preliminary remarks:Vision - the word comes from the Latin *visio* and means "sight, appearance". It is used today in various contexts of meaning (according to [9]):

(1) supernatural appearance, revelation
(2) dream image, mirage
(3) desired image, draft of the future

For the use in this article, following the definition by Dennis Streichert, "vision" shall be used as an*"aspirational* **image and blueprint for the future, i.e. an overall state that one would like to achieve at some point.***"* [10].

For many people, the use of the term "vision" leads to associations such as "pure fantasy", "can't be done anyway" or, with a smug expression, "well, let him dream a little". But Albert Einstein already saw a way in which visionary thoughts could be realised realistically:

"Everyone knew it was impossible, until a fool who didn't know came along and did it." [11].

And in this sense, "visions" should also be considered here as something that is feasible, if only it is actually implemented by someone at some point. And as will be shown in many places, these "visions" have already become concrete projects or even realities in some selected places and schools.

The visions listed below have primarily emerged during and after my almost forty years of teaching and leadership at various schools in Germany, Spain and Argentina. In the course of this time, I have already been able to implement some of my visions at "my" schools and they are now already an integral part of the teaching or school organisation there. So, they have already become reality, and if I still list them here as "visions", it is only because in many schools around the world they still belong to a seemingly visionary body of thought that could at best be thought about in the distant future. But as has been shown (and as the reader can see below), many schools worldwide have already set out to implement their visions - and their concepts, approaches and realisations are also listed below, also to show that visions do not have to remain in the realm of the imaginary.

A very comprehensive collection of visions already realised today in innovative schools worldwide can be found in the collection published in 2015 by the "Fundación Telefónica" under the title "A Journey to the 21st Century Education" by Alfredo Hernando Calvo:

"Throughout the world, several pioneers are currently paving the way for education's future. A 'Journey to the 21st Century Education' is an explorer's guide in which Alfredo Hernando helps us discover the newest paths taken in education. By focusing on the world's most innovative schools, we can understand new teaching methods that will be the key to the challenge of transforming education. ([3], p. 3)

This comprehensive collection, as well as several other sources,

complements the author's own visions and shows that almost all of the visions listed below are actually already being implemented somewhere in this world.

Vision 1: Teaching and learning are no longer focused on content, but on the acquisition of skills.

As already mentioned in chapter 2, the times when the "curricula" of the Ministries of Education and the corresponding authorities are exclusively concerned with the teaching of technical content should be a thing of the past. Instead, general competences, so-called "skills", should be at the centre of school education and training. Unfortunately, there are still many teachers today (especially in Gymnasium) who see their main task in imparting as much subject knowledge as possible - but precisely this activity can and should no longer be the focus of the "learning coach's" activity in the future (see also Vision 2).

In Germany, for example, this vision corresponds in the field of mathematics to the further development of the "Winter basic experiences" [12] already called for in the 1980s according to the German mathematics didactician and professor at the RWTH Aachen, Heinrich Winand Winter:

- *"He coined the term **discovering learning** in mathematics education, which is also the title of his major work, and was of great influence on mathematics curricula in German schools, for example by formulating **general learning objectives**." ....*
- *"According to Heinrich Winter, mathematics education should strive to contribute to **general education by** enabling three basic experiences:*
- *"perceiving and understanding phenomena of the world around us, ... in a specific way".*
- *"to get to know and understand mathematical objects and facts, ... as a deductively ordered world of its own kind", and*
- *"to acquire problem-solving skills, ... (heuristic skills) in dealing with tasks".* [12].

The fact that the path from the idea of such changes to their implementation can often be long and time-consuming one can be seen, for example, in the "Hamburg education plans" from 2011/2018, where the following statements can be found as the "General Part of the City District School Education Plan":

- *"...training maturity includes, on the one hand, basic technical knowledge and skills....*
- *On the other hand, training maturity includes interdisciplinary competences from the areas of self-competence, social-communicative competence and competence in learning methods (...). With regard to training maturity, the following are particularly relevant:*
  - *Endurance,*
  - *Determination and motivation to achieve,*
  - *Self-confidence/self-efficacy/self-concept,*
  - *Frustration tolerance,*
  - *Communication skills,*
  - *Ability to cooperate,*
  - *Conflict skills,*
  - *Ability to accept rules,*
  - *Willingness to take on responsibility and*
  - *Reliability"* ([13], p. 4ff)

In the special educational plan for mathematics which had already been prepared seven years earlier, the following overarching objectives are first mentioned:

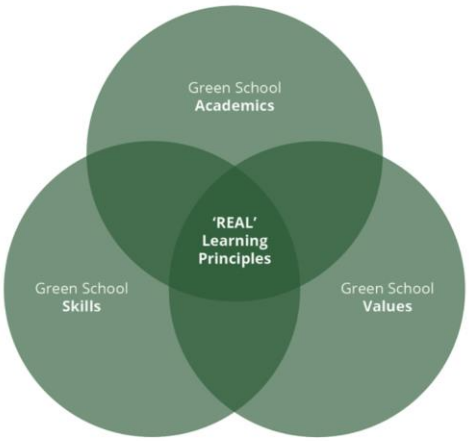
- *"Pupils should acquire generic competences in three areas:*
- *In the area of **self-concept and motivation** .... Confidence in one's own abilities ... learning to be self-critical ... learning to hold one's own opinions ... setting and pursuing one's own goals.*
- *In **social competences** ... the skills to communicate, to cooperate, to show consideration, ... to provide help ... to behave appropriately in conflicts.*
- *In the case of **learning methodological competences** ... ability to learn in a systematic, purposeful way ... use of strategies and media to obtain and present information."* [14], p. 12.

In the following, no specific learning content is mentioned at first, but rather "mathematical competence areas":

- *"...The concept of competence in mathematics can be structured according to process-related **general mathematical competences** and **content-related mathematical competences**, arranged according to **five guiding ideas** (number, measurement, space and form, functional relationship, data and chance)..."* [14], p. 14.

And only after a more detailed consideration of the topic "Didactic Principles: On the acquisition of competencies in mathematics", the third section (of a total of four sections) is followed by more concrete, also content-related statements on the "requirements in the subject of mathematics", but always in connection with the "guiding ideas" explained earlier.

Another current example of trying to implement this vision of skill-focused teaching are the "Greenschool" in Bali, New Zealand, South Africa and Mexico. At these schools, the following objectives for teaching can be found, especially with regard to the teaching of the targeted skills and abilities. In particular, the formula "REAL Learning Principles = Academics + Skills + Values" shows the importance of skills within the overall teaching/learning culture, illustrated by the following graphic and corresponding core sentences of the school concept:



- *"We learn how to solve problems!*
- *We experiment.*
- *We innovate.*
- *We're building models for the future.*
- *Inspiring*
- *Creativity*
- *Community"* [15].

And especially in the "Middle School curriculum":

- ***"Relationship Centred & Holistic Relationship→ centred and holistic***
- ***Experiential & Evolving Exchange→ of experience and development***
- ***Authentic & Action Oriented Authentic→ & Action Oriented***
- ***Local to Global: Think globally, learn locally!" ([15a])***

Vision 2: Teachers no longer act as "lone warriors" but as part of a team. Only a few years ago (and even today, presumably, in many regions of the world) it was unthinkable that anyone, except one's own students, could attend and observe a teacher's lessons. Even school administrators were (are?) not allowed to observe a teacher's lessons unannounced. This secrecy, however, meant that no teacher was able to receive additional suggestions and impulses for his or her own teaching practice. What fears, anxieties or other motives were behind this is not the focus of these observations. It will therefore not be examined further here. Instead, here are some suggestions on how this situation can be improved for the benefit of students and teachers in the future (and thus for the benefit of the entire teaching-learning process).

A first suggestion is to carry out "collegial observation". For this, two or more colleagues arrange to visit each other's lessons. They can (should) be supported by a suitable organisation of the school management by forming groups of two or three (interdisciplinary or subject-specific composition) and by making the respective observation and subsequent observation discussions possible through appropriate timetable management. This instrument not only leads to an expansion of the individual teacher's field of vision, but it also initiates the formation of teacher teams with many other possibilities (see below).

As an example, we would like to refer to the observation circle already introduced in 2007 at the German School Bilbao. As a conclusion, the first evaluation report of 2008 contains the following information:

- *"The colleagues have found the peer observations enriching.*
- *In the evaluation of the observations, many suggestions for improving the quality of teaching were derived.*
- *A further development of the observations could concern the implementation of these suggestions, either through joint specifications in the groups or through general specifications of focal points.*
- *In terms of organisation, a shorter time frame and voluntary nature should be considered."* [16], p. 3

Another way to promote teacher collaboration is to organise and implement "team teaching". There are different models for this, which are practised in different schools. An overview of six different models and strategies of team teaching systems can be found at study.com in the video "Collaborative Team Teaching Models & Strategies" [17].

A model for building team teaching in the teacher education phase is presented with relevant research in the publication "Team Teaching: A New Paradigm for Student Teachers". Rosenfeld, Givner and Tasimovicz (2013, as part of the Northeastern Educational Research Association (NERA) Annual Conference) examined the advantages and disadvantages of team teaching at Brooklyn College of the City University of New York [18].

Other schools are already practising models in which different teachers take joint responsibility for

- lesson contents (at least with regard to common focal points),
- all students from several classes,
- but also every single student from these classes, and
- teaching methods used.

At this point, we would like to mention a small tool that can make it easier for new colleagues to start in a college and give them a feeling of belonging to the team, the so-called "onboarding of new colleagues". More detailed information on this can be found in [19] with a link (QR code) to a "Padlet Onboarding Ideas at Schools", where a collaborative exchange padlet [20] is presented, which contains, for example, the following digital notes:

- Welcome goodie,
- First day at work,
- 100-Day Talk.

In any case, it can be assumed that the vision of "team teaching" will soon become the norm, as M. Kricke and K. Reich justify in their 2016 book "Teamteaching - a culture of teaching and learning":

"From our point of view, there are at least three reasons that will help team teaching, similar to team work, to achieve a breakthrough in the long term, also in the breadth of the education and training system:

(1) *Team teaching is more effective for learning: ...*
(2) *Team teaching is more professional: ...*
(3) *Teamteaching is more suitable for opportunities: ..."* ([21], p. 10ff)

Vision 3: Teachers, parents and students form a true school community who together want to continuously maintain and improve the quality of their school within the framework of the new understanding of their roles.

The basic idea of this vision is the fact that any form of school learning can best succeed in close cooperation of all persons involved, especially teachers, students and their parents. The "good" old tradition was that the teacher determined and was solely responsible for the entire teaching process, from planning of the current lesson to the evaluation of the students' performance (and the resulting "recommendations" for the further school/life career). In the future, however, all persons involved should jointly shape the learning, development and maturity process of the students, including the students themselves.

The fact that this does not have to remain a vision in a vacuum, but that it can be and has already been implemented in reality, is already shown by a number of examples that will be briefly explained here:

One measure affecting the entire school structure is the introduction of a "Pedagogical Quality Management" (PQM). Analogous to the qualification measures started in 2003 at the (approx. 140) German schools abroad to establish such a PQM, all schools could start with the following stages or, if these are already in place, build on them:

"The workshops resulted in the following tasks, depending on the school's

stage of development, which the school will work on in the following two years until a follow-up seminar:

- *Establishment of a steering group,*
- *Carry out a strengths and weaknesses analysis,*
- *Development of a mission statement and a school programme derived from it,*
- *Determination of priority measures for school development (especially in the area of teaching development) as well as*
- *Approaches to an internal school evaluation of these priority measures."* [22, p.494].

This process was even started much earlier in other countries:

"In Switzerland, for example, the project 'Quality Development at Secondary Level II' started in the 1990s on behalf of the Northwest Switzerland Conference of Education Directors, in which the participating schools worked out a feedback culture. In several steps, a system was developed that combines evaluation and development." [23, p.8].

In addition to the formation of a "steering group" consisting of teachers, parents and students, the establishment of the function of one or more "Quality Management Officers (QMB)" has proven to be very helpful in supporting the PQM process, if they have the appropriate support from the teaching staff. This was done, for example, at the German School Bilbao in 2005 with the following description of the QMB's tasks:

"The QMB

- *qualifies in QM issues,*
- *trains colleagues in this,*
- *advises and supports them,*
- *coordinates and moderates (if necessary) project groups set up for this purpose, in particular with regard to the formulation of objectives, process descriptions and evaluation possibilities,*
- *is responsible for setting up and maintaining QM documentation,*
- *develops and maintains an adequate information system to keep all school staff and external partners informed about the school's quality efforts,*
- *coordinates the customer satisfaction surveys,*
- *organises internal audits in cooperation with the process owners,*
- *periodically reports to the school management on the status of the QM development of the school and*
- *is the contact person for external partners on QM issues. "* (excerpts; [24]).

Of course, the work of this quality management officer is only feasible if he is appropriately and adequately relieved of his other tasks. The extent to which this should be done should be decided by the respective school on a case-by-case basis according to its size and other circumstances.

However, all persons involved in school life will only be able to form a "real school community" and grow in it if everyone can "slip into" their new role within this community:

"Parents, students and teachers play a democratic and egalitarian role in the school's decisions and organisation." [3, p.186].

This means rethinking, relearning from and in new tasks, adjusting to new responsibilities and new relationships - certainly not an easy and quick process.

What this means exactly for the individual persons will be looked at more closely here:

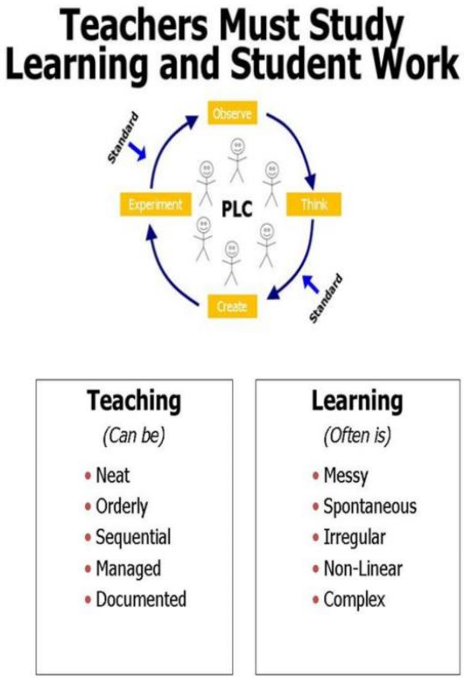
- Role of teachers:

Teachers no longer see themselves as mere imparters of knowledge, but as "learning coaches" in the sense of supporters of the teaching-learning process:

- Sir Ken Robinson:

"Farmers and gardeners know you cannot make a plant grow... The plant grows itself. What you do is provide the conditions for growth. And great farmers know what the conditions are, and bad ones don't. Great teachers know what the conditions for growth are, and bad ones don't." ([25], text and video)

- Alfredo Hernando:
- *"Teachers are designers of learning experiences in which they themselves participate, learn and enjoy….*
- *Teachers are specialists in their areas, but they also carry out roles as tutors, experts, personal guides, mentors and coaches. "* [3, p.186].
- Steve Barkley ([26], slides 7/12 and 9/12): Teachers learn (have learned) how student learning works:
- Role of students



Students, too, must be able to find their way in their new role as active participants in the whole school process, in the teaching-learning process as well as (hitherto all too common) in festive occasions or school performances. Their role is described in more detail by Alfredo Hernando:

"Students learn more through cooperative roles in groups and tutored activities. Students gain spaces, functions and time to become educators." [3, p.186].

And in the same source, the intended relationship between teachers and students is described in more detail:

"Students and teachers evaluate each other, as peers …" [3, p.186].

- Role of parents:

Parents will also play a changed role in the school community of the future. They will no longer be the mere recipients of feedback from teachers, but will also be involved in the planning of projects or lesson plans:

"Families participate in workshops, or directly in class projects." [3, p.187].

Vision 4: Flexibility is more important than the rigid implementation of plans, and it is

- **in class,**
- **in the organisation of lessons and**
- **in the construction and use of existing premises.**

Acting and reacting flexibly in the classroom should not actually be a new vision but should always have been part of everyday school life for all teachers. Only then it is possible to respond to students in a targeted way, to accompany the development process of lessons appropriately and to respond to new situations directly in the classroom by changing the methods or materials used.

This includes switching from frontal to group or individual teaching as well as the use of other media (handicraft materials, computers, musical instruments, etc.). For example, as is already practised in some schools, there could first be about 20 minutes of frontal teaching for two or more classes; then the students are divided into different groups in which they are supported by "assistants" (teachers, trainee teachers, students from university) if necessary. Changes in the composition of individual learning groups should also be possible in a flexible way, as well as the use of extracurricular learning places.

Further possibilities are offered by the flexible organisation between online and face-to-face teaching (so-called "blended learning", see [3], pages 136ff), which is just as suitable for school teaching as for teacher and school management training. The didactic approach underlying this change of teaching in the context of in-service training can be summarised as follows:

"The didactic approach results from the experience of previous training practice. The now further developed approach is based on the findings of current learning research that phases of continuous online learning, combined with accompanied practice and presence phases of "appropriation" - for example in the form of self-reflection and training - significantly promote the implementation in one's own routines of action and thus in everyday school life. Therefore, in the future, the blended learning offers shall

- *focus on the teaching of basic knowledge, in the online phases,*
- *and in the accompanied attendance and practice phases, focus on reflecting on one's own actions, reviewing the individual mental models guiding action and translating them into changed routines of action."* [27, p.29].

More detailed descriptions and considerations of the advantages and disadvantages of "blended learning" can be found in the "eCademy" of the textbook publisher Cornelsen in [28], although supplementary research results on "blended learning" so far obviously only exist for use in companies and businesses.

The flexible use of classrooms and entire school buildings can also support the further development of school-based teaching. This also includes the so-called "co-working spaces", which have long been used by companies.

The question of whether this should also provide adequate spaces for schools in the future is addressed in 2019 by Claire Johnson in her article "Are Coworking Spaces the Classrooms of the Future?" and is answered as follows:

"Education is now starting to embrace innovation by introducing augmented

reality into classrooms and creating lesson plans that focus on general topics rather than specific subjects. Coworking spaces offer alternative learning spaces to classrooms while providing students with a more collaborative mindset, making these spaces a fantastic incubator for student learning." [29], about "augmented reality" see [30].

The importance and possibilities of creating suitable teaching spaces is described in more detail by Alfredo Hernando Calvon in "A Journey to the 21st Century Education". He even refers to the space as the "third teacher":

"Intelligent space design is a new teacher in the 21st century. Spaces configure and define us. They are, alongside students and educators, the third teacher." [3, p.157].

On the following pages, he describes what the design of these new spaces could look like, gives helpful hints for the process of converting or redesigning classrooms and recommends, among other things, so-called "super classrooms":

"Super-classrooms are large learning spaces far bigger in size than traditional classrooms and are devoted to promoting autonomous and varied learning experiences." [3, p.159].

The so-called "Digital Spaces", as they are already realised today at "Khan Academy", USA [4], or at "Plan Ceibal", Uruguay [5], form another possible school structure of the future. This "school", which is open and available on every student's device, enables

- an opening 24 hours a day and seven days a week,
- personalisation of learning through monitoring and
- flexibility in the choice of schedules and times.

Vision 5: Teaching takes place predominantly as PBL ("project-based learning"). But what is meant by PBL? One (of many possible) definition can be found **at "PBLWorks - Buck Institute for Education" (Novato, Calif., USA):**

"Project-based learning is a teaching method in which students acquire knowledge and skills by working over an extended period of time to investigate and respond to an authentic, engaging and complex question, problem or challenge." [31].

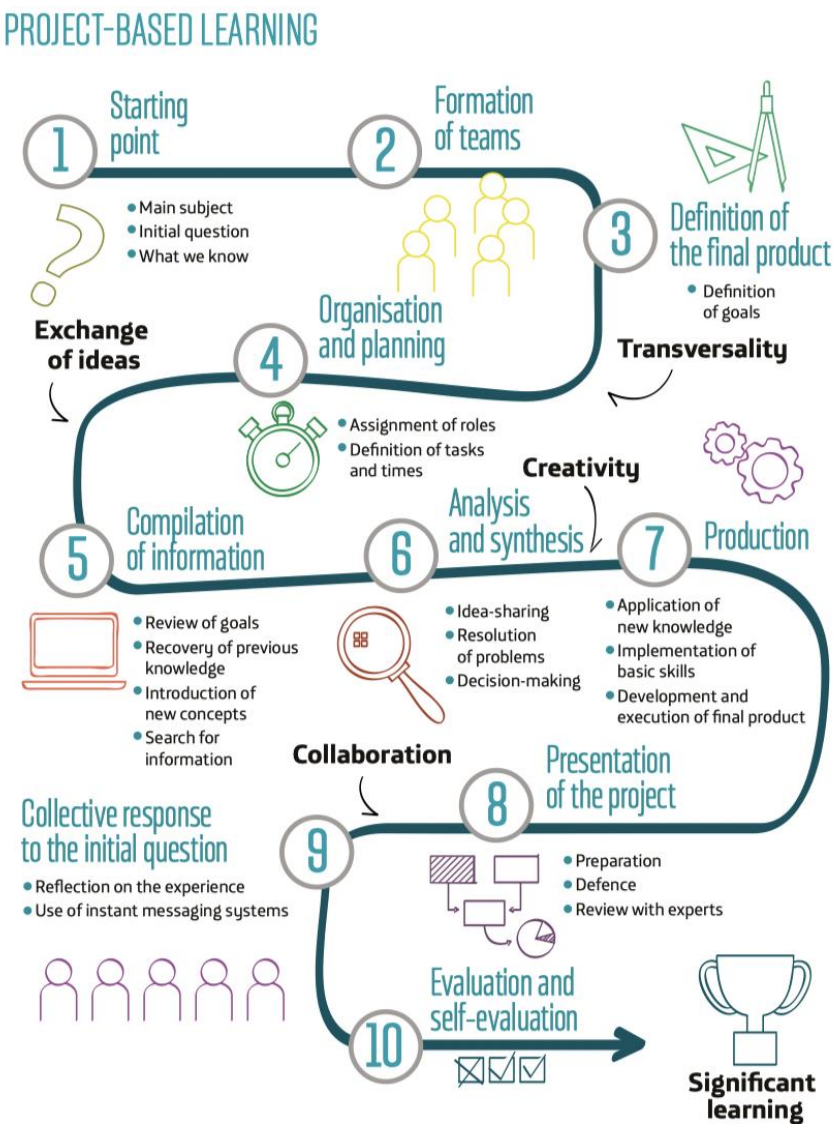
Alfredo Hernando Calvo explains the PBL in more detail:

"Project-based learning (PBL) is an educational methodology that integrates curricular content with problems and challenges based on real experiences and practices in the world, the school environment and daily life. This methodology is developed following a specific didactic sequence in the form of a project, planned in advance by the teachers; the students play the main role, actively working in teams.

...

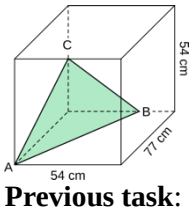
PBL is a methodology which places the student at the centre of their own learning, enabling them to face challenges, solve problems and work with their classmates in an autonomous, but organised, environment, with a teacher assessing and evaluating during the entire project." [3, p.88].

The planning and a possible procedure for the implementation of such projects is shown in the following diagram [3, p.91]:



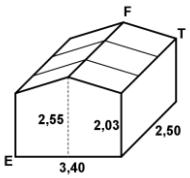
https://openlibra.com/es/book/download/a-journey-to-21st-century-education-this-is-how-the-worlds-most-innovative-schools-work, 2015, Alfredo Hernando Calvo, "A Journey to the 21st Century Education", Fundación Telefónica, en.fundaciontelefonica.com, [3, p.91]

The previous "learning contents" of the old learning curricula become, according to the objective of this vision, "projects", in the processing and solutions of which the necessary contents are then sought, found and worked out by the students themselves within the necessary framework. For example, "Pythagoras' theorem" will no longer be the "next" on the timetable, but rather the students (individually or in groups) will receive the application-oriented project tasks that are exciting and interesting for them, and for the solution of which they must or may largely work out the necessary basics themselves (but certainly also with the help of the "coach"). This can be briefly explained with an example from mathematics lessons:



Previous task:

There is a triangle in the cuboid. Point C lies on the centre of the rear, left edge. The back, lower edge is divided by point B in such a way that the left section is twice as long as the right section. Calculate the perimeter of the triangle.

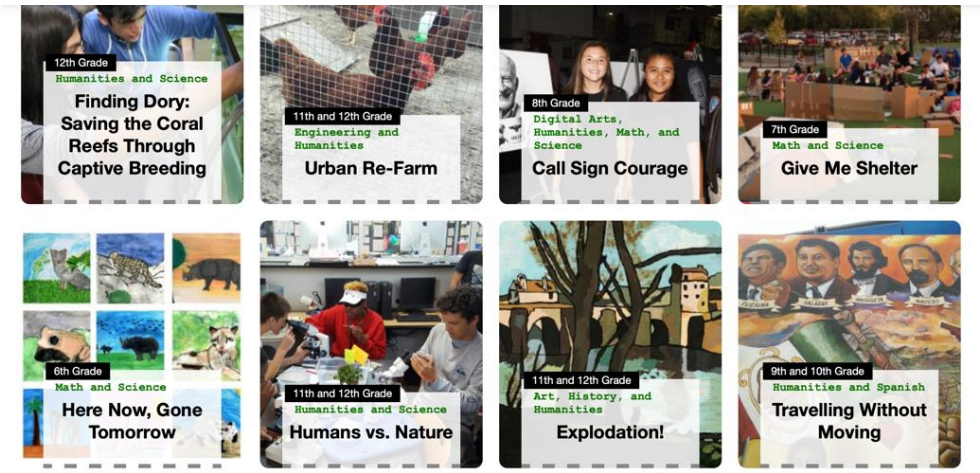


Project-oriented task:

A new greenhouse is to be built for the school garden. It is to have the shape shown opposite with the corresponding dimensions.

The roof is to be covered with 420mm x 330mm tiles. How many tiles are needed for the roof?

Several other examples of different projects can be found at the "High-Tech High School" in San Diego, USA, where PBL already occupies a very significant space [32]:



Vision 6: Society and the world of work are changing rapidly - appropriate preparation for the future is achieved through corresponding changes in the education system.

That the world of work will change very quickly is now beyond question, especially with regard to the following points:

- Loss of many jobs in the productive sector
- Loss of many jobs in the service sector
- Emergence of new, previously unknown professions
- Increasing demand for jobs in the social sector, especially in care for the elderly and the sick

The reason for these changes lies in the ever-increasing digitalisation of the world of work, even of society as a whole. Which occupations will definitely

disappear and which new ones will emerge is of course not yet predictable today; but there are already a few ideas about this, because these are already mentioned and described in the first approaches or at least in some planning scenarios. These include, for example, the "crowdworker" (definition e.g. in [33], p. 9). A "list of the 20 best occupations with a future for 2030" is given by M. Schimanski [34] as part of career tips for abroad, following the McKinsey Global Institute's 2017 report on the global development of occupations up to the year 2030 [35]. Some of these professions are listed here, as they are certainly little known at present:

- Environment and Resources Manager
- UX Designer
- Cyber Security Expert
- Data Scientist
- Supply Chain Manager
- Mobile Developer
- Content Creator
- SEO specialist
- Conversion Manager
- Cloud Engineer

In the vision of the author of these lines, however, there are many other professions that are related to the changing age structure in the coming years as well as to the increasingly less secure full employment in society. Thus, in addition to the professions in the social sector that already exist today (a detailed list of these can be found, for example, in [36]), professions will also emerge that will look more intensively after the higher number of unemployed or those in low employment, both in terms of their physical and mental health. "Family counsellors", "self-management trainers" or "leisure time designers" are just a few possibilities that come to mind.

In any case, this means general changes in the world of work in the coming years, in whatever field. Various 2020 statements by Dr Alessio J. G. Brown, co-director of the Centre for Population at the United Nations University UNU-MERIT in Maastricht, the Netherlands, describe these general changes:

"Work will become more flexible. We will be able to decide more ourselves when and where we work.

...

The work is becoming more heterogeneous. Instead of practising a clearly defined profession for many years, in the future we will participate in flexible projects with a bundle of competences. This will make biographies more diverse, careers more open.

...

Work is becoming more informal. Permanent employees and freelance experts form virtual teams in which hierarchies lose importance.

...

Work demands more adaptability and readiness for lifelong learning. All in all, however, work will not make us less satisfied in the future - if we embrace the new flexibility.

...

Work as a whole is becoming more confusing, the boundaries between job and private life are becoming blurred. Self-management and good leadership are needed to avoid stress. It is also important to prevent more and more entrepreneurial risks from being transferred to the individual. The growing number of crowdworkers needs stakeholders to provide social security." [37].

These changes in the world of work naturally go hand in hand with huge changes in society. Accepting this will be very difficult for people with the values that are valid today. Because values such as "high productivity", "maximising financial gain" or "steady growth" are still considered the basis of a functioning economic and social system. And the foundations for this are - of course - laid in schools, through appropriate training and educational goals, and through the influence of trainers, educators and teachers who have themselves grown up in this society with these value concepts and have lived with them up to now. This will certainly not change "on its own".

However, the vision of the author of these lines also sees possibilities of positive developments for society and its future here. Because, of course, this development in the world of work and the associated general change in society must be prepared through appropriate education in schools. After all, the children and young people of today are the ones who will later have to cope with this change in the future as adults. For this reason - according to the vision - those responsible in the ministries will make appropriate changes in the education system. On the one hand, with regard to the different focus already mentioned above, i.e. away from content-related teaching and towards the teaching of higher-level skills, as already mentioned by McKinsey 2017, namely towards

- *"Social Skills*
- *Creativity*
- *High-level cognitive abilities"* [35].

On the other hand, the changes will also take place with regard to the incorporation of new subjects or, in accordance with Vision 5, new projects. Especially in connection with the changes in society and the world of work, many projects lend themselves to the necessary changes in values, such as a project or subject with the theme "For each other - with each other".

The fact that this vision is already being pursued in rudiments is shown by the very helpful means of "Open Educational Resources" (OER) for this development. The Bertelsmann Foundation dealt with this in more detail in 2017 and writes:

"The central instrument of an education of the future that prepares for the work of the future is Open Educational Resources (OER). OER is the term used for all teaching and learning materials that are available under a free licence (e.g. many of the Creative Commons licences). Such licensed works can be used, modified, recombined and distributed by anyone at any time without running the risk of coming into conflict with copyright law. OER is a principle that can be applied to any form of educational material, whether it is a textbook, PowerPoint slide, technical drawing or training video.

...

The future of work is knowledge-intensive (keyword: automation). ... The keyword here is serendipity - the rather accidental discovery of something not explicitly sought, as part of a search process. Free access to educational materials reduces the barriers to exploration and increases the possibility of serendipity. If textbooks are freely licensed, students can explore bodies of knowledge that are not covered by their own school's learning materials quota. The current pioneer here is, for example, Cornelsen Verlag, which recently published the accompanying material for the school microcontroller "Calliope mini" under a free licence." [38].

Conclusion / Discussion. Of course, these visions listed here only concern a part of the possibilities and necessities for coping with the future in the world of

work, education and society in general. Of course, there are many more, but they are not listed here (not only for lack of space).

The visions are intended to provide inspiration and food for thought. However, they are always to be understood under the aspect of a possible realisation and not pure "pipe dreams". And above all, they are intended to motivate all those working in schools to look for and try to find appropriate ways of implementation. The intended reaction of the reader should therefore **not be**

"Yes, but at our school this is not possible because...",

but rather an

"Okay, let's see how we can implement this at our school...!"

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