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Potentials of the “Thinking Space” Blackboard

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This article examines the significance of the blackboard in today's classroom, especially in craft lessons, and why it should remain an indispensable didactic tool despite the increasing use of digital media.

When Johann Amos Comenius wrote his illustrated textbook Orbis sensualium pictus (“The visible world in pictures”) in 1658, this early educational work already included an illustration of a classroom with a blackboard.

Fig. 1: Johann Amos Comenius: Schultafel. Illustration on p. 296 of the 1882 book "Gamla Stockholm" (in Swedish), depicting a scene from a 17th century school classroom (from Orbis pictus). [File: Gamla_Stockholm_1882.djvu]

At least since that time, the blackboard has been seen as a symbol of school teaching. Generations of pupils were taught contexts in written or pictorial form using chalk and blackboard.

Today, in the digital age, the way in which content is taught in the classroom has changed dramatically. The introduction of digital projectors and whiteboards has opened up new possibilities. Nevertheless, the blackboard remains an indispensable tool, the uniqueness of which is particularly evident in handicraft lessons. The aim here is therefore not to make a comparison in the sense of an evaluation, but rather to take up the cudgels for the blackboard as a didactic tool in handicraft lessons and its future use in classrooms and workrooms.

The blackboard offers a unique opportunity to present complex content visually and promotes interaction between teachers and learners in a way that often cannot be achieved through the use of digital media.

In addition, the tactile experience of creating a board drawing promotes deeper understanding and manifestation of knowledge in students. This physical engagement contrasts with the often passive consumption of information on digital platforms, where learners may feel distanced from the material presented. Furthermore, as educators strive to integrate technology into their teaching methods, finding a balance that effectively utilizes both traditional tools and modern resources is likely to be crucial. In this way, teachers can create a more dynamic learning environment that not only encourages innovation, but also embraces the pedagogical strengths of established practices.

Especially in craft lessons, which are characterized by practical problem solving and creative thinking, the whiteboard shows its full potential. The structured visual representation of ideas enables concepts to be made tangible and complex relationships to be explained in an understandable way. This teaching tool also creates a connection for the principles of design thinking, which is about understanding users' needs, developing creative ideas and testing solutions (Pasko & Kravchenko, n.d.). By visually organizing information, the whiteboard encourages students to analyze, synthesize and evaluate data, which are essential components of critical thinking (Mamun, 2024).

Work in progress

This focus on the learning process is also closely linked to the promotion of divergent thinking. Craft as a school subject encourages students to think in many directions, which is particularly evident in sketches and spontaneous ideas. Craft as a school subject is a process-oriented subject, as it is based on recognizing and analyzing a question (what should be designed and how?) and, as a result, a constructive approach in the sense of practical problem solving.

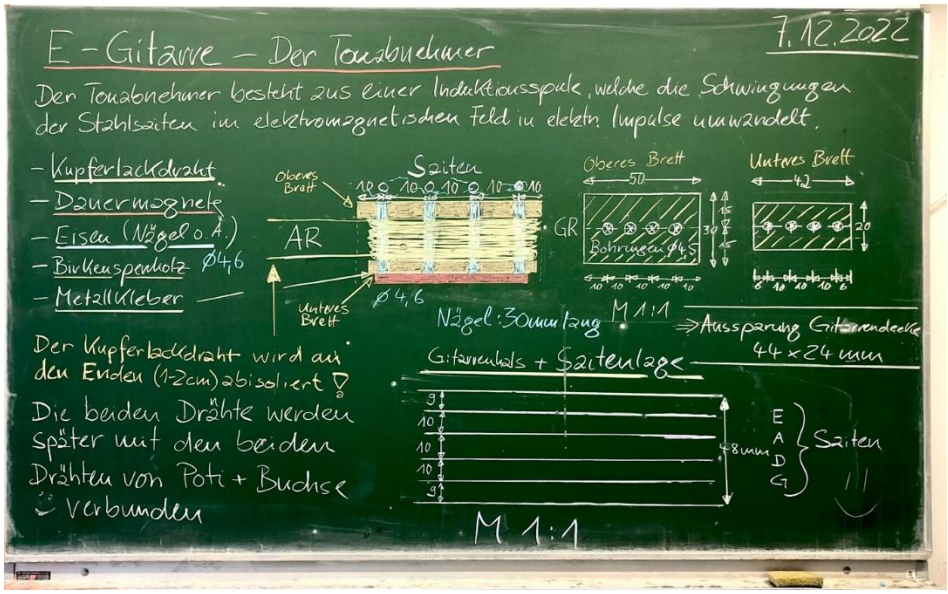

Fig. 2: Blackboard image: Electric guitar - pick up construction; ©Ralf Edelmann

This results in the need to allow thinking in as many directions as possible, which manifests itself in sketches. The promotion of divergent thinking is an essential aspect of education as it involves the ability to find creative, diverse and innovative solutions to problems (Guilford, 1967).

In the field of constructivist educational methods, a variety of techniques have emerged in recent decades that are designed to facilitate creative thinking and action. The primary goal of these techniques is to expand the learner's perceptual framework in order to generate creativity. The aim is to provide students with the necessary skills and competencies to navigate the professional landscape of the future autonomously and responsibly. The 21st Century Skills (see P21, 2019), which are closely linked to constructivist pedagogical practice, can also be located here. These skills include critical thinking, problem-solving skills, creativity, communication and collaboration. Learners are encouraged to think independently, develop innovative solutions and act in diverse social and digital contexts. In this way, the constructivist approach not only promotes specialist knowledge, but also the key skills that are essential for successful participation in modern, technology-driven society and the world of work.

"Thinking can be compared entirely to drawing pictures", Ludwig Wittgenstein (1921, §3.12) formulated in the mid-thirties of the last century. Wittgenstein often compares his way of working to that of a painter, analogizing thinking (and speaking) to drawing pictures (Fischer, 2017). If you turn this sentence around in the sense of the sketch as graphic thinking, you can grasp the importance of this representation, which is by no means intended to be perfect. Of course, sketches can also be created using electronic media and displayed for all to see in the classroom. However, the sensual quality of chalk on a blackboard, including the scratching noise (which is not pleasant for everyone), the brittleness and the imperfection caused by the material, represent an authenticity in the visible actions of the teacher which, in contrast to digitally generated drawings, comes across as downright human in its inadequacy. This "humanity" and the fact that blackboard images are created "live" in front of the pupils' eyes, so to speak, naturally involves a susceptibility to error that does not occur to the same extent when using digital media. Anyone who has ever had to work on a blackboard with a blackboard compass (if available in the classroom) knows what we are talking about.

Error culture

Error culture can be defined as the ability to accept errors as an integral part of learning and to draw conclusions from them (Dewey, 1933). This definition will be used in the following as a basis for analyzing the role of the blackboard. A constructive error culture not only plays an important role in the school context, but also gains particular significance in handicraft lessons. Here, the focus is on the process of recognizing and learning from mistakes, and the blackboard becomes the central medium for making these learning moments visible. Solutions, but also unsuccessful solutions, are the result of dealing with problems. Failure is instructive. Those who really think learn as much from their mistakes as from their successes (Dewey, 1933). Solving problems together encourages teamwork and mutual learning by strengthening collaboration and knowledge sharing between team members. Through cooperative forms of learning, students can improve their learning experience and develop a deeper understanding of the topics covered (Bleck & Lipowsky, 2021).

Consequently, the establishment of a positive error culture in the classroom is very important and, as a consequence, the realization that I as a teacher also make mistakes and learn from them. In this context, I remember situations where students pointed out mistakes to me while I was creating a blackboard, which in turn can be seen as an indication that the students are following my actions in a thoughtful way. With digital files already prepared at home and then projected in the classroom, I can avoid these mistakes as a teacher, but I usually present finished slides without making the constructive process - for example of a drawing - visible and thus comprehensible. Similar to printed sheets (copies), these are therefore perfect "end products" (final drawings) that are robbed of their processual nature.

In this respect, it takes a certain amount of courage to take the risk of developing an idea on the blackboard in front of the class, either in drawing or in writing, which of course always encourages errors in thinking and presentation. For me as a teacher, however, this risk offers a valuable opportunity to cultivate a culture of error and how to deal with it in a school context. Particularly in craft lessons (technology and design), I would like to allow and even encourage "mistakes" in the sense of experimental constructive thinking. Not least in this sense, the blackboard and chalk enable direct analog implementation and representation. Even though the

imitation of haptics on digital whiteboards and other digital drawing tablets has progressed in recent years, students miss out on essential tactile design features when imitating traditional tools such as brushes using digital media. In any design process, a broader sensory experience should be included that goes beyond mere sight (Maze, 2002).

Nowadays, it is almost impossible to predict future developments with certainty. Surprises are the order of the day, and teachers often have to learn from unusual situations. Mistakes are inevitable. However, it is precisely these mistakes and setbacks that can offer valuable opportunities for individual learning and personal growth in competence, provided we classify them correctly.

Spatial representation

The three-dimensional representation of workpieces is of particular importance for handicraft lessons. Children should learn how to create simple layout and floor plan drawings from the first grade onwards. The blackboard makes it possible to actively demonstrate all the necessary steps up to the finished spatial representation, which means that the blackboard image finds its way directly into the pupils' workbooks.

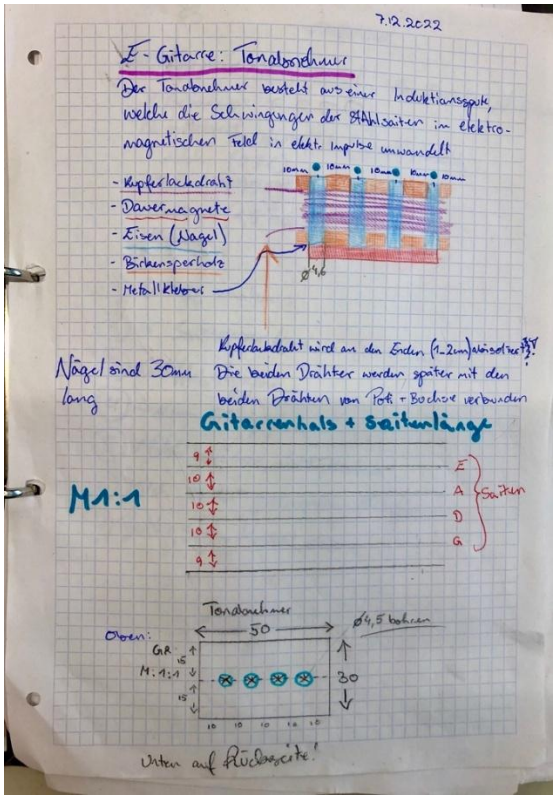

Fig. 3: Pupils' workbook sketch; ©Ralf Edelmann

A kind of algorithmic learning by breaking down complex problems into simple steps, or step-by-step solutions or understandings of the structure of complex phenomena. In addition, individual questions from the students and their possible solutions can be displayed on the board ad hoc and visible to all. This often results in imperfect sketches, the use of which has always been a major concern of mine.

If you look at the blackboard historically from an art didactic and work didactic perspective, concepts by Friedrich Froebel (1854) come to light. In her article "Friedrich Froebel's Spielgaben - eine Grundlage der Kunstpaedagogik" published in 2023, Sidonie Engels examines the relevance of Froebel's Spielgaben for art education (Engels, 2023). She argues that the systematic introduction of shapes such as points, lines, surfaces and solids through the Spielgaben stimulates not only mathematical but also aesthetic and artistic learning processes. The development of shapes supports the possibilities of spatial three-dimensional representation. By drawing cubes, circles or other geometric elements on the board, the connection between two-dimensional and three-dimensional objects was made clear. Children were encouraged to imitate the given shapes and develop them further independently. By combining the toys with the pictures on the board, they were able to explore creative patterns, symmetries and compositions, which trained their artistic and aesthetic sensibilities.

Engels emphasizes that working with the Spielgaben enables children to grasp basic design principles and develop their creativity. By drawing and observing shapes on the board, children were able to better understand the relationships between different geometric figures and train their spatial imagination. Engels emphasizes that this practice not only fostered an understanding of geometric shapes, but also laid the foundation for artistic creation. She also argues that blackboard pictures and playdough together represent an early form of aesthetic education that not only focuses on mathematical but also artistic learning processes. This not only promoted cognitive engagement with the content, but also social skills. Blackboard pictures provided the framework for joint learning and discussion. Children were able to present their results on the board and compare them with each other, which promoted social interaction and an understanding of aesthetic principles.

Froebel often combined the blackboard pictures with practical exercises in which the children recreated the shapes of the toys with their hands. This interplay between visual and tactile experiences reinforced learning and made abstract concepts tangible.

This shows how fundamental visualization can be in successful educational practice. The importance of the blackboard in art education lies in its ability to foster creativity and critical thinking among students, which is in line with the broader goals of aesthetic education. The panel painting method can be seen as a practical application of the aesthetic transfer method. The aesthetic transfer method is considered effective in bridging the gap between art and education, which makes it a valuable tool in the field of artistic subjects (Duh & Zupančič, 2011).

Spontaneity

As an outspoken advocate of teaching that is not only cross-curricular, but basically completely open to situations, questions often found their way into ongoing lessons, sometimes and at first glance far removed from the classic curriculum of art and craft lessons.

The advocacy of open-ended teaching involves the integration of educational strategies that focus on creativity, critical thinking and problem-solving approaches in various disciplines. For example, being able to solve open-ended problems encourages students to creatively apply their knowledge in, for example, mathematics, thus promoting critical thinking that is essential for real-world challenges (Varveris & Tsiantos, 2023). This approach is not limited to mathematics; it also extends to other areas where open-ended learning can enhance self-efficacy and performance. The range of topics covered in this way and visualized on the board extends from cooking recipes, soccer tables, assembly instructions for Ikea furniture and other kits, the function and maintenance of a siphon, the correct way to put away a dishwasher, etc.

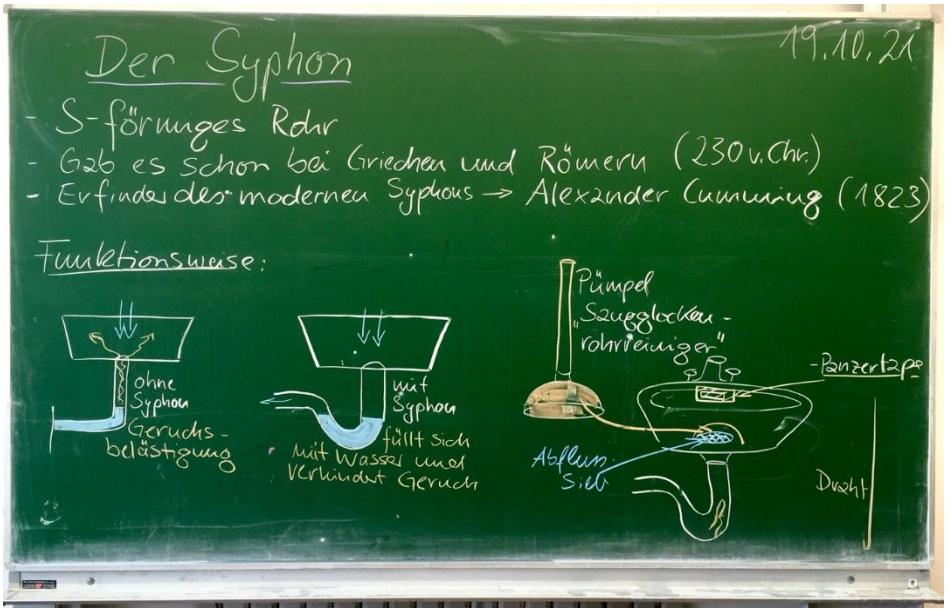

Fig. 4: Blackboard image: Siphon - function, history and maintenance; ©Ralf Edelmann

There are (almost) no limits here, as long as you are prepared to respond to the students' current questions or events.

For example, I have fond memories of maintenance work carried out by our school caretakers during lessons. When the school caretaker asked at the beginning of the heating period if he could bleed the radiators during my work lessons, I always agreed, as I see it as an ideal opportunity to teach my class practical manual and technical work that they can use themselves later in their adult lives. Such unplanned "incidents" can then be discussed using blackboard pictures and recorded in the work folder. Even when I am building new shelves for the workshop as a custodian, which I like to include in the lessons, I use the blackboard in front of everyone for drawings, material lists and other design sketches.

Your own ideas can also flow into the lesson in this way - even if it's not about the work itself. Here is an example of an "earworm" with which I started a five-hour work unit. Immediately after welcoming the class and inquiring about their well-being, I told them about this earworm that was so stuck in my head that I felt unable to start the upcoming project straight away. One pupil then advised me to focus on the song and the artist. Using a digital projector and the internet platform YouTube, we played the song (Takeo Ischi: "Mein Vater ist ein Appenzeller") and then yodeled together and talked about the artist himself, the Japanese yodeling king Takeo Ischi. It should be noted here that I got rid of the catchy tune myself, or rather passed it on, because some of my students hummed Takeo Ischi's classics for the rest of the unit. Another example is the South Seas state of Tonga, which my students didn't know existed until the day we were studying it for similar reasons, which also spontaneously resulted in a pretty solid board picture.

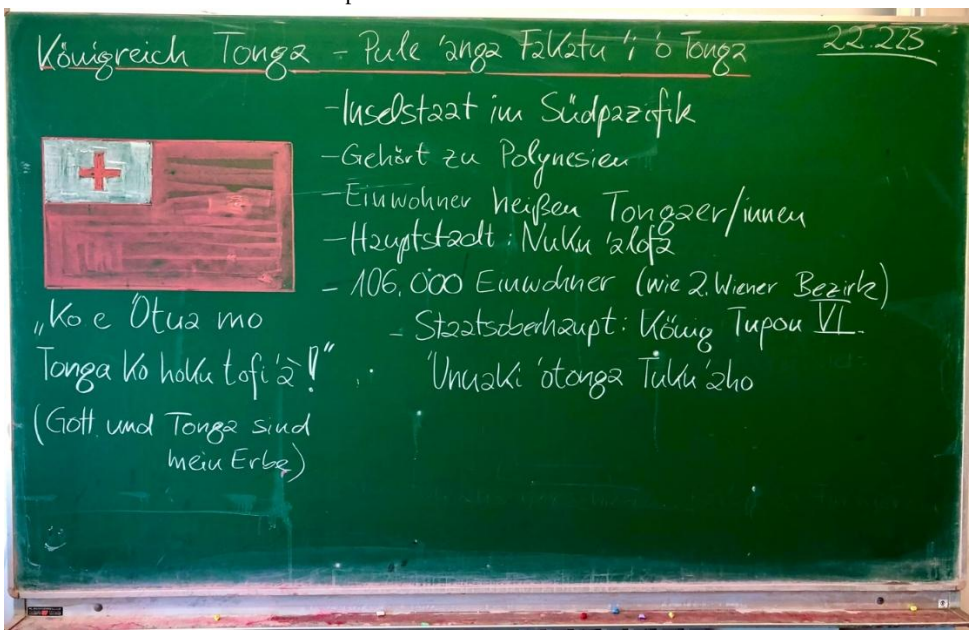

Fig. 5: Blackboard image: State of Tonga

Numerous other examples could be cited here, which were recorded by means of sometimes curious blackboard pictures, often creating a cheerful and relaxed atmosphere and establishing a sketching culture among my students in order to record, communicate and play with thoughts or questions.

Inspired by my blackboard pictures, many pupils began to keep sketchbooks, which we then examined regularly. These serve as tools for discussion, for tracking ideas and for promoting artistic development. The use of sketchbooks in teaching and learning processes offers numerous benefits that improve student

engagement and understanding. They are a valuable tool for fostering creativity, especially in artistically talented students, as they allow them to document their projects and ideas, which can lead to deeper engagement with concepts (Szekely, 1982). In addition, sketching and writing in sketchbooks facilitates memorization skills in an age characterized by overwhelming streams of information. These methods improve comprehension and critical thinking skills while keeping students actively engaged in their learning (Myagkova, 2020). In addition, drawing as a learning strategy has been shown to improve memory and reduce anxiety, especially when learners are supported during the drawing process, leading to better problem-solving outcomes (Ainsworth, 2010; Ainsworth et al., 2021).

Conclusion

Global societal change and digitalization are accelerating challenges we face today. In the context of 21st Century Skills (P 21, 2019) and the so-called 4C skills (critical thinking, creativity, collaboration and communication), these challenges are contextualized under the term VUCA World (Unger, 2019). The term VUCA was coined to describe the characteristics of this dynamic world, and the panel shown reflects these characteristics. Volatility is reflected in the dynamics of rapid technological and social change, while Uncertainty illustrates the low predictability of the long-term development of digitalization and education. Complexity is visible in the increasing demands on teaching methods and the integration of digital media, and ambiguity is reflected in the complexity and variety of interpretations of the content shown. The blackboard offers every opportunity to meet the challenges of the VUCA world and prepares students to think flexibly, deal with uncertainty, master complex tasks and use ambiguity productively. The 21st Century Skills prepare learners not only to survive in the VUCA world, but also to act actively and competently. The combination of VUCA and the 4Cs shows that education in the 21st century must go beyond the mere transfer of knowledge in order to meet the demands of a dynamic and unpredictable future.

In conclusion, it can be said that the blackboard is much more than a traditional teaching tool. It combines didactic structure with creative freedom and prepares students specifically for the challenges of the modern world. The whiteboard allows teachers to actively involve students in the learning process while encouraging deeper engagement with the content through interactive and collaborative activities. All of this results in students being equipped with the necessary skills and knowledge to tackle the various challenges that characterize the complexity of the modern world. Blackboarding not only prepares students for these obstacles, but also significantly improves their ability to think independently and develop innovative solutions to effectively solve current problems. In addition, this particular learning style helps to increase students' motivation by actively participating in the educational process, giving them the opportunity to express and integrate their own interests and personal strengths into their learning experience.

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