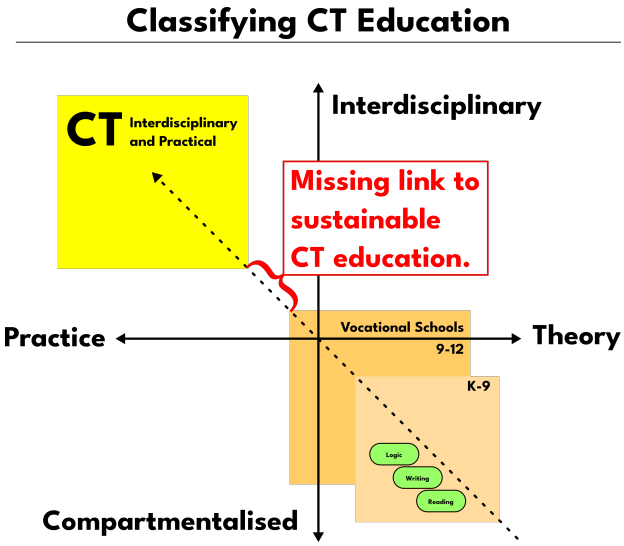
Executive Summary

Practitioner Assisted Teaching of Vital Computational Thinking Skills for a 21st Century Society.

The leap from formal education and K-12 schools to a productive, creative and modern work environment is often surprisingly difficult. Having young people struggle in these transitional periods while entrepreneurs and businesses strive to merge new team members seemed like a worthy cause to investigate. Education often lacks the efficacy to integrate modern methods and technologies as the process of teacher education can not adequately cope with the intensity of technological and methodological progress. Especially in the field of Computational Thinking practitioners can incorporate hands-on knowledge and act as a vital interface between schools and businesses.

This research project conducted in higher secondary education in Lower Austria utilised the iterative Action Research approach. The experimental study integrated practitioners in the classroom and conducted workshops to evaluate the perceived impacts. A major missing link in current formal educational systems was discovered. Based on expert-driven, participatory workshops in Austria, the effects and benefits of practitioner integration are evaluated to alleviate the problem.

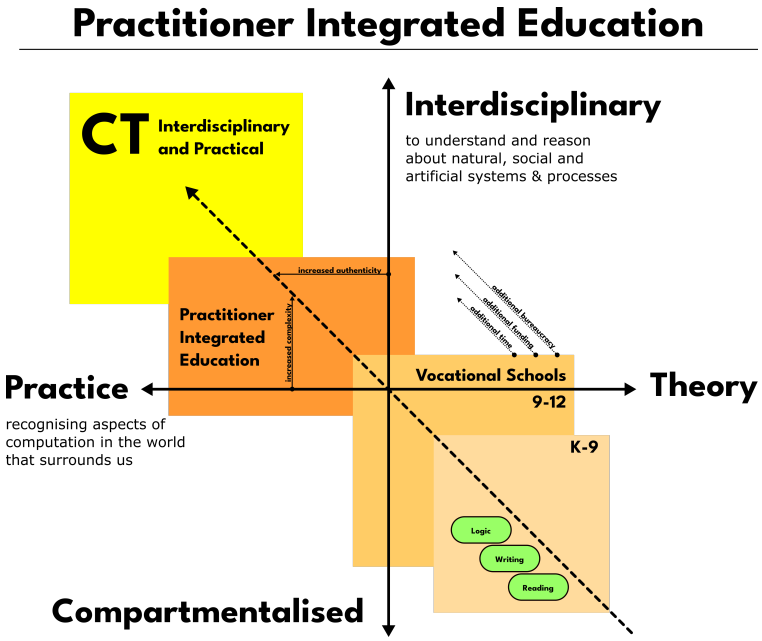


In multiple stages, the problem-solving approach of Computational Thinking (CT) was introduced to learners aged 16 to 18 (K-12). This research project reveals the immense potential of expert integration in secondary schools. The primary research question worked on and answered in this thesis was: **What consequences has practitioner integration on Computational Thinking education?**

A lot of effort has been made to link CT directly to the concepts of coding and computer science. Removing CT from its namesake of computing has rarely been tested despite the multitude of pleas that the two topics are not necessarily linked. As a problem-solving approach, CT utilises the tools developed by computer science for solutions far outside the narrow field. It can and should be used to create smart, sustainable solutions to the complex and interdisciplinary problems our society faces today. To reflect the struggles posed due to the COVID-19 pandemic, the thesis project also looked into lessons for a post-social-distancing world. Today's students are used to virtual and remote learning environments. The space in which teaching is conducted appears not as important as the human connections shared in these learning environments. Several other factors were more relevant to all

participating stakeholders and the allotted time, presented topics and socio-cultural elements played a much bigger role. This can lead to more utilisation of these technologies now broadly tested and understood in formal K-12 education globally.

The Austrian education system often lacks interdisciplinary and practical teaching. The complexity of real-world projects can not be approximated by narrowly compartmentalised school subjects and curricula focused on the theoretical baseline of knowledge. CT needs a solid foundation in K-9 and K-12 educational settings to foster the required understanding of the world. But - and this is especially important for formal education - the practical problem-solving approach of CT as envisioned by Wing and other scholars is inherently practice-based and interdisciplinary, as it looks to identify all elements and stakeholders of a given problem. The figure above highlights the problematic missing link identified during this research project. Vocational schools try to equip learners with practical knowledge and for a long time now schools strive towards interdisciplinarity. Despite these efforts the crucial links are missing in most formal schools today, the lack of interdisciplinarity and authentic, practical projects prevents sustainable CT exploration.



This new model derived from the experiments shows the fundamental potential of Practitioner Integrated Education in a CT context. The case studies highlighted that additional effort is necessary to introduce outside experts and practitioners into a classroom, especially without clearly defined guidelines. The model framework proposes that the additional time spent causes a significant increase in knowledge and understanding due to authentic, interdisciplinary and contextualised projects. CT can only be grasped to its full potential when utilised by learners to solve real-world challenges. It has positive learning effects as more diverse learning strategies are enabled and modelled during these workshops. Learners showed very positive resonance and the created projects were successful. The efficacy of participants as well as teachers in the use and utilisation of Computational Thinking strategies was improved. Long-term effects need to be proven by future research.

Practitioner Integrated Education offers a unique link to let learners grasp the power of CT and give young people the opportunity and powerful tools to face the unprecedented challenges of our future.

Striving for a future worth living.