

Implementation of Innovative Teaching Topics in Vocational Agricultural Education

 [Karel Tomsik](#)¹ doc. Ing. Ph.D.;  [Katerina Tomsikova](#)² Ing. Ph.D.;  [Karel Nemejc](#)³ Ing. Ph.D.; [Karel Tomšík](#)⁴ jr. Ing.

Czech University of Life Sciences Prague, Faculty of Economics and Management^{1,4}, Institute of Education and Communication^{2,3}, Czech Republic

tomsik@pef.czu.cz¹; tomsikova@ivp.czu.cz²; nemejc@ivp.czu.cz³; tomsikk@pef.czu.cz⁴

Abstract: The main task of secondary agricultural schools, which have the character of vocational schools, is to give students theoretical information and information for current and future practice needs. The main educational document of the Czech Republic, the Strategy of the Education Policy of the Czech Republic 2030 + with its emphasis on environmental issues, innovation and education, confirms this task, especially for secondary schools focused on agricultural education. Circular economy, as a relatively new and innovative discipline, can be an example of whether secondary agricultural schools are willing and able to implement progressive disciplines in their teaching programs. The aim of this article is to assess whether secondary agricultural schools provide space in their educational programs for the inclusion of innovative topics in vocational education, with an emphasis on the circular economy. The investigation included qualitative research in the form of in-depth individual interviews with management representatives of selected secondary agricultural schools. The survey shows that schools are trying to use all available ways to increase their attractiveness and consider introducing innovations and new teaching topics as very important. On the other hand, they are bound by many obstacles that do not favour innovation or other attractive activities of schools.

Keywords: circular economy, agricultural education, innovation

Introduction

The primary mission of secondary vocational schools is to give students theoretical information and information for the needs of the practice, in particular for the needs of current practice, as well as the needs of practice in the future. In addition, secondary agricultural schools are connected with an important function of the state - the population's livelihood. In the Czech education system, secondary agricultural schools have the longest tradition, and their role is irreplaceable.

The current turbulent environment places considerable demands on all society groups because of the need to adapt to sudden and unexpected changes in the established climate. Economic crisis, escalating environmental problems, growing social tension in society and the rapidly deteriorating global political climate present humanity with challenges it has never faced before. The field of education is not left out either. On the contrary, the effectiveness of the education system will play a key role in whether society can deal with these challenges.

Therefore, the educational system at all levels must respond to emerging challenges, including implementing new disciplines and scientific approaches. This can be achieved in a knowledge society. As defined by UNESCO (2005): "knowledge societies are about capabilities to identify, produce, process, transform, disseminate and use the information to build and apply knowledge for human development". And in "emerging knowledge societies, there is a need for a deeper understanding of knowledge itself" (Hall et al., 2014). As evident from the above, the quality of the education system and its ability to respond to specific challenges is a cornerstone for sustainable development.

The idea of the need for a change in thinking and implementing new innovative practices is by no means new. As already mentioned in the groundbreaking publication *The Limits to Growth*, modern society's central and long-term problems can be understood as "arms race, environmental deterioration, the population explosion and economic stagnation" (Meadows, 1972). Fifty years later, it is obvious that the mentioned problems still persist, and in some cases, humanity has not been able to prevent their escalation. However, it cannot be said that nothing happened for half a century. In addition to the vast number of scientific projects and publications, global institutions such as the United Nations have also become involved in solving the problem, which has defined sustainability with reference to the need for intergenerational responsibility (UN, 1987). The topics also resonated at the national and European

levels. The question remains whether the progress in science and research has also been adequately reflected in the innovation of educational systems. K. Taber (2017), for instance, argues that "in many countries, school science tends to focus on areas of well-established science, where scientific knowledge appears firm and not currently under debate". Whether in individual countries or at different educational levels, the transfer of new knowledge and approaches to educational systems deserves key attention.

However, fundamental challenges have brought significant progress in the development of new disciplines and approaches in recent years, especially those that accent sustainability. Among such disciplines can be counted, for instance, bioeconomy or circular economy. In particular, the circular economy is becoming a discipline that has the potential to combine both the economic aspects of local economic development and contribute to the fulfilment of environmental goals. R. Gwang-Nam et al. (2022) see the circular economy that is currently attracting great attention from many countries and regions as an alternative for sustainable development. The fact that this topic should not appear in educational systems only in higher education is evidenced by many authors. Education for sustainability at the level of "adult learning and education, vocational education and training and organisational training for sustainability" is emphasised by Ch. Scalabrino et al. (2022); achieving sustainability is also put into context with innovations in the educational process of vocational education by E. Bezvikonnaya et al. (2020). A research study elaborated by M. Cyrankowska et al. (2019) also comes to the conclusion that teachers who know the foundation of sustainable development focus students' attention on sustainability issues and look for solutions.

The mission of secondary education, especially secondary agricultural schools, is in the Czech Republic immediately emphasised in the Education Policy Strategy of the Czech Republic 2030+. The fundamental question is whether secondary agricultural schools (hereafter SAS) in their School Education Programmes (hereafter SEP) take into account the fact that it is necessary to familiarise students with new topics. Teaching process, which was originally performed according to mandatory teaching documents, was replaced by much more flexible teaching in accordance with the SEP in 2004, which each school designed on the basis of the Framework Educational Programme (FEP). The FEP sets individual educational areas for schools and defines the target requirements for graduates' competencies once they have been mastered. For schools, only compliance with the minimum time allowance for educational areas is binding. Schools are thus given a lot of space to exercise autonomy in deciding on taught subjects and their contents and, above all, the possibility of considering how to use the disposable hours.

Contemporary practice in the Czech Republic rather indicates that teaching, which is determined by the available number of hours, does not favour such innovations. This is due to the fact that, in connection with the introduction of the state matriculation exam, there is a tendency to increase the number of hours of matriculation subjects at the expense of vocational ones. Specific and unique information that can be shared within vocational subjects would strengthen the abilities of agricultural experts to reflect on current development trends. Therefore, vocational subjects should have their place in the educational process. Ultimately, they have the capacity to affect such strategic goals as food security, self-sufficiency or sustainable development.

Considering the above-mentioned facts, the circular economy can be an example of a discipline that should be implemented among vocational subjects at SAS in the Czech Republic. According to Oxford Language Dictionary (2022), the circular economy is "an economic system based on the reuse and regeneration of materials or products, especially as a means of continuing production in a sustainable or environmentally friendly way". However, the advantage of the circular economy consists not only in saving resources; the concept has the potential to encourage local economies due to eliminating long transportation and reusing materials within specific areas. It also contributes to a more closed circulation of financial flows if the local actors are capable of implementing circular economy ideas into their local activities. Therefore, the authors decided to investigate if secondary agricultural schools in rural areas in the Czech Republic are open to including such innovative disciplines, like the circular economy, in their educational programmes.

The aim of this article is to assess whether secondary agricultural schools provide space in their educational programs for the inclusion of innovative topics in vocational education, with an emphasis on the circular economy.

Methodology

The main method of the primary research was represented by in-depth semi-structured interviews with representatives of selected secondary vocational schools teaching in study field 41 (agriculture). The list of these schools was generated from the Registry of Schools and Educational Facilities. From the complete set of secondary schools on the territory of the Czech Republic, which represents 1,285 secondary schools and vocational schools, 179 schools offer a group of study programmes 41 Agriculture and Forestry, of which 37 are secondary schools and vocational schools where the agricultural study programmes prevail (11 offer only study programme of the group 41, 26 at the same time study programme 41 and 1-2 related study programmes). 142 secondary schools offer agricultural study programmes together with others (40 offer study programmes of group 41 and another 3-5 study programmes, 102 with more than 6 other groups of study programmes).

The first selection step was a choice of schools with predominance or equivalence of agricultural study programmes (88 in total). The second selection criterion was the location of a particular educational facility in a municipality of up to 5,000 inhabitants (27 in total). Therefore, 27 semi-structured interviews with 67 respondents (directors, deputy directors, and teaching staff members) were realised. The questions mainly aimed at their opinion on introducing innovations in teaching. Data collection and processing took place in 2021-2022.

Within the secondary research, the main method was the analysis of documents. The primary document was the Strategy for the Education Policy of the Czech Republic up to 2030+ (referred to as "Strategy 2030+"). The essence of this document is represented by two strategic objectives and four strategic lines. The first strategic objective is defined as the educational focus on increasing the level of key competencies and literacy of pupils, students, and citizens. The second strategic objective is formulated as reducing inequality in access to quality education and enabling the maximum development of the potential of pupils and students. One of the main implementing documents of Strategy 2030+ is the Long-Term Intention of Education and Development of the Education System of the Czech Republic for the Period 2019-2023 (referred to as "Long-Term Intention 2023"). It contains three key objectives: 1. more money for the quality work of teachers, 2. completion of the curriculum review and support for the implementation of the innovative FEP into schools, 3. improving the management of schools and school facilities by streamlining the cooperation between the centre and the middle link of the management (regional authorities). The Long-Term Intention 2023 also includes a chapter Education for Sustainable Development (referred to as "ESD"). Among its goals belong the creation of a functional environment for further education which will enable the acquisition of knowledge and competencies in the field of sustainable development and which will systematically offer updated educational programmes for educators, public administration, business sphere, and non-governmental non-profit organisations aimed at the practical application of sustainable development and will ensure availability of ESD to the public equally in the Czech Republic. The issues of ESD are also discussed abroad. The University of Seville conducted the research "Inclusion of Sustainable Development Security Elements into Teaching" within the course "Education for Sustainability", which was intended for secondary school teachers (Solis-Espallargas et al., 2015). There are also critical views that environmental sustainability is still on the fringes of the curriculum in most countries (Gough, 2016).

Among other documents analysed (because it is related to the topic) belongs Strategy of the Regional Development of the Czech Republic 21+ (referred to as "SRD Czech Republic 21+"). Its purpose is to realise adequate interventions in various regions of the Czech Republic to fulfil the fundamental goal of the regional policy, which is lowering disparities among those regions and supporting sustainable development, which stands on three pillars – social, economic, and environmental.

Results and Discussion

Opinion on the possible need to change traditional practices in agricultural activities and preparation for them

- Innovative topics are important, and schools implement them (25), although they are not included in SEP (5).
- Environmental issues are topical (7).
- Education in families is important to understand environmental issues (2).

- Innovative topics should be implemented only marginally (1).
- Not topical for technical fields (1).

As part of the interviews, the opinion on the need to change traditional practices in agricultural activities was ascertained. The majority of school management representatives (25) agreed on the importance of introducing new topics, especially environmental ones. Five of them emphasised that they do this already, even though it is not included in the SEP. The schools focus mainly on environmental issues, especially the issue of drought and lack of water (in 7 cases), which, according to their findings, can also be observed (and therefore practically illustrated) on the school grounds (e.g. on the racetrack, vineyards, school grounds). The circular economy is perceived as a discipline that is strongly linked to environmental topics, as recycling, less burden on resources and support of the local economy are ultimately one of the ways of environmental sustainability. Schools also note an active approach of students. Some students ask about the environmental issues themselves (mentioned five times), and schools encourage them in their interests. Two school representatives also emphasise the importance of education in the family, which is needed to make students aware of the responsibility for environmental problems. Only one respondent mentioned that topics focused on environmental issues, including the circular economy, should be included in the teaching only marginally as part of the diversification and enrichment of study programmes. One respondent stated that this issue is not so topical in technical fields.

Obstacles in the implementation of innovative topics

- Lack of disposable hours in SEP (7).
- Lack of teachers (3).
- Low students' interest (9).
- No obstacles (10).

Although the answers to the previous question show that the majority of schools consider the inclusion of innovative topics to be important, school management sees that their practical implementation runs into barriers of an organisational nature. These barriers consist of the lack of available hours in SEP (confirmed in 7 cases), the fact that there is a general lack of teachers (in 3 cases), and generally low interest of students, although some students (as mentioned above) are actively interested in these current topics (in 9 cases). On the contrary, 10 of the interviewed schools do not see any problem in introducing this important information into teaching. That is almost a third of those interviewed.

Disposable teaching time for innovation implementation

- Lack of disposable hours due to strengthening classes of subjects related to the common part of the matriculation at the expense of vocational subjects (11).
- Satisfaction with disposable hours (5).
- Not topical, the school implements the curriculum without the matriculation exam (8).

The answers to these questions were primarily oriented towards the current issue of introducing and implementing the state matriculation examination. School management representatives agreed in 11 cases that already in the past, in relation to the introduction of the state matriculation exam, they had to strengthen the classes of subjects related to the common part of the matriculation. Strengthening compulsory subjects, therefore, removes the space for introducing new topics into teaching. In five cases, there is satisfaction with the number of available hours. Eight schools do not solve the problem of available hours because they only implement the curriculum without the matriculation exam. It can be concluded that the curriculum of agricultural schools is more or less oriented towards general education subjects and does not offer sufficient space for teaching subjects focused on current trends significant for agricultural practice. The circular economy can be an example of a discipline for which there is not enough space left in the available hours. This poses a danger that graduates of vocational schools will not have sufficient professional competencies, which may make it difficult for them to enter tertiary education. The same opinion is held by Birzina et al. (2021). Insufficient or outdated professional competence and fixation on traditional topics also reduce their ability to competently and effectively engage in the practice.

Conclusions

The investigation focuses the research on agricultural schools located in rural areas, which are characterised by many specifics. Rural space plays an important role in sustainability issues, not only from an environmental point of view (the role of natural space, agriculture and other specific activities in rural areas) but also from an economic (viable local economy) and social perspective. The above-mentioned characteristic represents the so-called internal potential, which can facilitate a good embedding of secondary agricultural schools in such an environment. Agricultural schools are often the only secondary schools in rural localities and small towns, but this fact in itself does not affect their attractiveness). The opportunity to increase their attractiveness is mainly given by the decentralisation of regional education. However, there are also other factors that can increase the attractiveness of rural SAS, like the flexibility of the SEP, socio-political proclamations on the creation of multifunctional integrated educational facilities, Education for Sustainability (part of the Long-term Plan of the Education System) or innovation of educational programmes and methods. Teaching topical issues can ultimately affect the fulfilment of such strategic goals as, for example, sustainable development.

Among the main tasks that (not only) secondary agricultural schools will have to solve is the innovation of SEP and FEP depending on the demands of the labour market but also on the need to introduce innovations into teaching and respond to new challenges. As the research concluded, agricultural schools are interested in doing this. The authors ask the same question as Birzina et al. (2021): "will schools offer a sufficient number of lessons with topics that will support the development of students' science literacy?" The answer may be that they can, if they make maximum use of the mentioned "freedom" provided by the FEP, abandon the inertia in teaching some subjects and give more space to interdisciplinary relationships.

Topics related to circular economy issues can become part of existing educational areas (given by the FEP) within those subjects already taught at secondary agricultural schools. By completing teaching subjects covering these topics, students will acquire new target competencies that will appropriately complement the competencies given by the FEP. There is also possible to create a specific subject, "Circular economy", using available hours. It is also possible to use other forms of teaching, e.g. excursions to a company practising a circular economy approach. Another way is to apply activation methods in teaching, e. g. discussion with experts, heuristic interviews or creating a project method for students on the topic "circular economy".

An effective way how to implement attractive and innovative topics could also lie in offering such subjects to hobby groups or as a leisure activity, and to strengthen their effectiveness, offering participation to parents or other family members and citizens. This proposal could be particularly suitable in the conditions of a small town, where "teachers have a closer relationship with pupils and are more involved in their lives, including extracurricular activities", which is also confirmed by surveys from Russia and Latvia (Jermolajeva et al., 2019). Teaching new, innovative and interesting topics such as the circular economy also brings a challenge in the form of greater application of activation methods, such as projects that will be connected with the practice. In this regard, the authors agree with Cakula (2021) that "all forms of education are equally important and complement each other, thus enriching the culture of education and general experience of the learning individuals".

The circular economy is currently the topic of many scientific studies and conferences. However, for this concept to contribute to sustainability in the real world, the idea must not be limited to an academic environment. Secondary agricultural schools in rural areas are ideal places for transferring innovative thinking to those who will influence the sustainability of further development in practice.

Bibliography

1. Birzina, R., & Pigozne, T., & Lapina, S. (2021). Trends in STEM Teaching and Learning within the Context of National Education Reform. The Proceedings of the International Scientific Conference *Rural Environment. Education. Personality (REEP)*, 14, 41-49. Latvia University of Life Sciences and Technologies. <https://doi.org/10.22616/REEP.2021.14.004>
2. Bezvikonnaya, E., & Bogdashin, A., & Portnyagina, E. (2020). Further vocational education in the context of the implementation of the sustainable development strategy. *E3S Web of Conferences*. 208, 5 p. <https://doi.org/10.1051/e3sconf/202020809031>

3. Cyrankowska, M., & Kostecka, J., & Mazur-Paczka, A. (2019). The Role of Relationships in Teaching Content Important for Sustainable Development. The Proceedings of the International Scientific Conference *Rural Environment. Education. Personality (REEP)*, 12, 34-39. Latvia University of Life Sciences and Technologies. <https://doi.org/10.22616/REEP.2019.004>
4. Hall, B.L., & Escrigas, C., & Tandon, R., & Granados-Sánchez, J. (2014). Transformative knowledge to drive social change: visions for the future. *Higher Education in the World 5. Knowledge, Engagement and Higher Education: Contributing to Social Change*. Series: GUNi series on the social commitment of universities (5). Palgrave Macmillan: Basingstoke, pp. 301-310.
5. Cakula, S. (2021). Active Learning Methods for Sustainable Education Development. The Proceedings of the International Scientific Conference *Rural Environment. Education. Personality (REEP)*, 14, 59-65. Latvia University of Life Sciences and Technologies. <https://doi.org/10.22616/REEP.2021.14.006>
6. Gough A. (2016). Environmental Sustainability in Schools. *Global Education in the 21st Century Series*. Rotterdam: Sense Publishers. https://doi.org/10.1007/978-94-6300-761-0_6
7. Gwang-Nam, R., & Chol-Ju, A., & Hyon-Sik, J., & Chun-Sim, J. (2022). A Study on the Types of the Circular Economy. *Research Square*. <https://doi.org/10.21203/rs.3.rs-2000438/v1>
8. Jermolajeva, J., & Bogdanova, T., & Silchenkova, S. (2019). Professionalism as Viewed by Urban and Rural Teachers in Latvia and Russia: Analysis of Structural Components of Teacher Professional Identity. The Proceedings of the International Scientific Conference *Rural Environment. Education. Personality (REEP)*, 12, 57-62. Latvia University of Life Sciences and Technologies. <https://doi.org/10.22616/REEP.2019.007>
9. Meadows, D.H., & Meadows, D.L., & Randers, J., & Behrens, W. (1972). *The Limits to Growth: A report for the Club of Rome's project on the predicament of mankind*. New York: Universe Books
10. Oxford Language Dictionary. (2022). <https://languages.oup.com/google-dictionary-en/>
11. Scalabrino, Ch., & Salvador, A.N., & Martínez, J.M.O. (2022). A theoretical framework to address education for sustainability for an earlier transition to a just, low carbon and circular economy, *Environmental Education Research*, 28:5, 735-766. <https://doi.org/10.1080/13504622.2022.2031899>
12. Solís-Espallargas, C., & Valderrama-Hernández, R. (2015). La educación para la sostenibilidad en la formación de profesorado. Qué estamos haciendo? [Education for sustainability in teacher training. What are we doing?]. *Foro de Educación*, 13(19), 165-192. <https://dx.doi.org/10.14516/fde.2015.013.019.00> (in Spanish)
13. Taber, K.S. (2017). Reflecting the Nature of Science in Science Education. *Science Education An International Course Companion*. Rotterdam: Sense Publishers. https://dx.doi.org/10.1007/978-94-6300-749-8_2
14. UN. (1987). *Our Common Future: Report of the World Commission on Environment and Development*. New York: UN. <https://digitallibrary.un.org/record/139811#record-files-collapse-header>
15. UNESCO. (2005). *Toward knowledge societies. UNESCO World Report*. Paris: UNESCO. <https://www.unesco.org/publications>