Research Article

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What is Developing Integrated or Interdisciplinary or Multidisciplinary or Transdisciplinary Education in School?

DOI 10.1515/sigtem-2017-0010

Abstract: Interdisciplinarity is a vital topicality in contemporary education and science. In general education of Latvia, the concept 'integrated learning' is traditionally used. The question is, if interdisciplinary teaching/learning differs from conventional approaches, or it means something completely new in terms of study content organisation and a pupil's self-regulated learning. In order to find it out, the article analyses the concept of interdisciplinary teaching/learning in comparison with the integrated learning and identifies their common and distinctive features.

Keywords: integrated teaching/learning, interdisciplinary learning, integrated curriculum

Introduction

New discoveries and perspectives in different fields are provided by interdisciplinary research in modern science. Over the past decade, taking over terminology from the development of science, the concept of interdisciplinary learning is increasingly being mentioned when it comes to school education. The question arises as to whether it is synonymous with integrated learning, which is traditionally used in Latvia to characterise violations of the boundaries of a field of science or subject whilst studying several subjects at the same time, or interdisciplinary training, is fundamentally different, which would significantly change the learning process important components of planning and implementation: objectives, teaching content and teaching methods.

Aim of the Article

The aim of the article is to analyse, compare and interpret mutual relationship between the concepts 'integrated learning' and 'interdisciplinary learning' and different understanding of these concepts within the context of teaching learning process as well as pedagogical process.

Materials and Methods

The article comprises a theoretical analysis looking for similarities and differences in the etymology of the terms to be studied, various approaches to educational concepts, explanation of pedagogical principles, definitions of the aims, the desired result, teaching/learning content and methodological descriptions

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in order to develop a common understanding about the terminology used in educational reforms and to collect effective approaches to educational development. The article uses studies, conclusions, scientific articles and publications that feature each approach separately and also compare various approaches in order to understand with what meaning and in which contexts the concepts 'integrated teaching/learning' and 'interdisciplinary teaching/learning' are used.

Essence of the Term 'Integrated Teaching/Learning'

The meaning of word 'integrate' relates to merge, adapt, synthesise, include, unite and coordinate. To integrate (verb): to combine two or more things in order to become more effective. Integrated (adjective): combined to form a single thing, combining or coordinating separate elements so as to provide a harmonious, interrelated whole, organised or structured so that constituent units function cooperatively. Related words: complete, entire, holistic, inherent, inseparable, united (n.d.) (Roget's 21st Century Thesaurus*)*. The word 'integration' is the act of combining into an integral whole. Synonyms of the word 'integration' are consolidation, combination, combining and compounding (the act of combining things to form a new whole) (vocabulary.com).

Integrity is a quality featuring a whole that is formed by the unity of constituent parts (components, elements), internal balance. In pedagogy, with the word 'integrity', we usually understand personality integrity, understanding oneself as a value, a significant part of humanity, concurrently understanding and also being aware of the analogical role of other personalities (Skujiņa, 2000). From the integration aspect, it is important to especially point out inner balance so that in teaching/learning process, all aims and tasks of initially separate elements as the contents of independent school subjects are achieved and accomplished in educational process. Also, the aspect of personality integrity is important, how a pupil obtains knowledge and skills in the process of mastering the learning content and how they will be used and developed, attitudes in order to engage in educational process meaningfully.

In Latvia, the integrated approach to learning was developed by Petersons (1931) and Dekens (1919); today, integrated teaching/learning is explored and developed by Petere (2014) and Anspoka (1999, 2003). The efficiency of integrated teaching/learning is justified with the connection of learning to life (because life is a whole), gaining the unity of a child's spiritual development and understanding of coherence within knowledge. Anspoka considers vital the connection of the term 'integration' with integrity and unity of perception differently from other concepts that highlight more the external connections of phenomena (Anspoka, 1999).

Integrated teaching/learning or a teaching/learning process have to be related with the whole 'which envisages not only the acquisition of learning content as a whole by a specific age group, but also ensures that "a holistic approach to personality development promotes a pupil's intellectual, emotional and social development within correlations' (Anspoka, 2003, 5). Integrated teaching/learning, being related to the whole, ensures pre-emptive implementation of teaching/learning ideas (Anspoka, 2003) because during the acquisition of one school subject, whilst learning about one content issue, a pupil inadvertently will get an idea about the content of another school subject to be mastered.

The most essential in integrated teaching/learning is the wholeness (Kauliņa, 2013; Petere, 2003). The integrated learning process that creates a whole, which a pupil can see according to his/her abilities, generates the motivation for learning. Thus, a teacher's action is important, as a result of which, the conditions are created where a pupil him/herself sees the wholeness of learning content, not the teacher indicates the connections to be seen. Awareness of the motive in integrated learning is the inner driving force, a subjective component, individual and different to everyone (Petere, 2014, 116). Integrated learning can be a training provision condition envisaging structured work with a clear conception, methods and principles, combining several educational paradigms in such a way that provides a possibility for each pupil to learn in his/her own style and landmarks in the officially recognised learning environment (Csorba, 2013).

Three approaches exist to integration: multidisciplinary, interdisciplinary and transdisciplinary (Drake, Burns, 2004).

Multidisciplinary Teaching/Learning as Integrated Teaching/ Learning Approach

Prefix 'multi-' is described as combining form meaning 'many, much, multiple, many times, more than one, more than two' and used in the formation of compound words (dictionary.com). In school practice, it can be related to each case when more than one subject is learned at the same time.

Multidisciplinary approaches focus primarily on the disciplines. Teachers who use this approach organise standards from the disciplines around a theme. Picture 1 shows the relationship of different subjects to each other and to a common theme in multidisciplinary teaching/ learning). There are many different ways to create multidisciplinary curriculum, and they tend to differ in the level of intensity of the integration effort. The following descriptions outline different approaches to the multidisciplinary perspective (Drake, Burns, 2004).

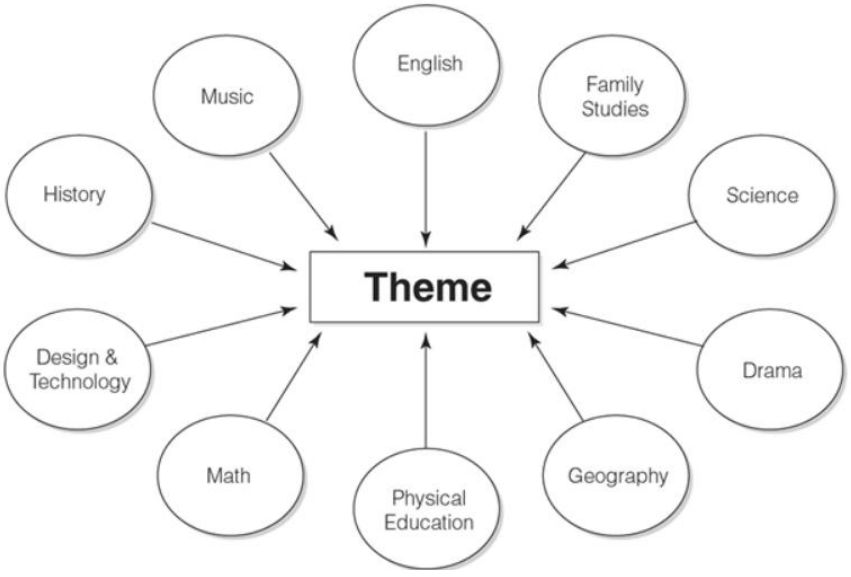

Figure 1. Multidisciplinary Approach (Drake, Burns, 2004).

Learning approach: We use integrated curriculum to refer to an instructional method and materials for multidisciplinary teams of teachers to organise their instruction so that students are encouraged to make meaningful connections across subject areas. English, mathematics, science, social studies and career technical teachers all collaborate to plan and present lessons that centre around a central, career-themed issue or problem (Steinberg, 1997). Characteristics of An Effective Multidisciplinary Integrated Curriculum: Academic and Technical Rigor Curriculum units are designed to address the key learning standards identified by the district; Authenticity Units use a real world context (e.g. community and workplace problems) and address issues that matter to the students; Applied Learning Units engage students in solving problems that call for competencies expected in high-performance work organisations (e.g. teamwork, problem-solving and communication); Active Exploration Units extend beyond the classroom by connecting to internships, field-based investigations and community explorations; Adult Connections Units connect students with adult mentors and coaches from the community's industry and postsecondary partners; Assessment Practices Units involve students in regular performance-based exhibitions and assessments of their work; evaluation criteria reflect personal, school and real-world standards of performance (Steinberg, 1997). This characterisation far exceeds the boundaries of multidisciplinary learning defined by Burns and Drake (2004) and fits with the transdisciplinary approach.

Interdisciplinary Teaching/Learning as Integrated Approach

The word 'Inter' is used to form adjectives meaning 'between or among the people, things, or places mentioned'(Cambridge dictionary). The word 'interdisciplinary' is combining or involving two or more academic disciplines or fields of study or combining or involving two or more professions, technologies, departments or the like, as in business or industry (dictionary.com). Interdisciplinary is something that's interdisciplinary covers more than one field of study; inter-, which means 'between' in Latin, and disciplinary, which is from the Latin discipline and means teaching or knowledge (vocabulary.com).

In interdisciplinary approach to integration, teachers organise the curriculum around common learning across disciplines (see Picture 2). They chunk together the common learning embedded in the disciplines to emphasise interdisciplinary skills and concepts. The disciplines are identifiable, but they assume less importance than in the multidisciplinary approach. Beyond the academic content, these students learned generic skills related to working together, research, writing and design and construction (Furger, 2001; Drake, Burns, 2004).

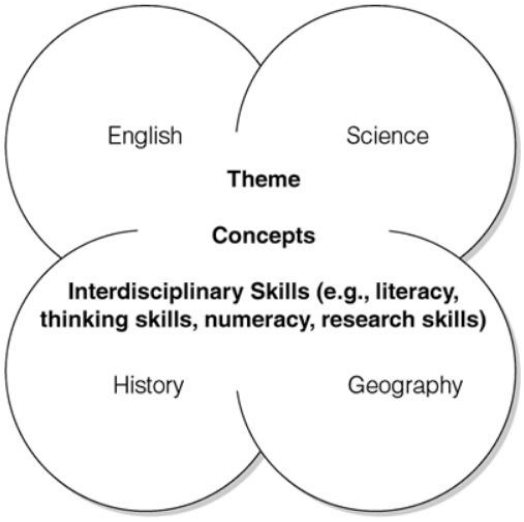

Figure 2. Interdisciplinary Approach (Drake, Burns, 2004).

Interdisciplinary teaching/learning must be characterised as the process in which pupils integrate information, methods, tools, perspectives, possibilities, ideas, concepts and theories from two or more fields in order to create 'products', explain the phenomenon or solve problems. Pupils are not able to do it using means of one field such as information, methods, tools, ideas and concepts (Boix-Mansilla, 2010). In interdisciplinary pedagogical process, problem questions are discerned, the most appropriate ways of problem solution are applied, the approbation of the obtained results is implemented as well as at the end of the process of problem question solution, it is formulated and analysed what new knowledge and skills have been acquired, what skills and knowledge have been improved, what is the contribution to the development of other pupils. Interdisciplinary teaching/learning envisages pupils' self-directed and self-designed way of mastering learning content. The development of understanding of interdisciplinary teaching/learning of learning content is determined by such a learning process through which a pupil integrates his/her views and ways of thinking from various fields, facilitating thematic understanding of a particular field (Kidron, Kali, 2015). Integration of the knowledge of interdisciplinary teaching/learning focuses on personal ideas which a pupil develops, as a result of which, his/her learning experience develops. When processing and building links between their ideas, pupils develop harmonised and normative understanding that allows them to interpret new situations (Linn, Eylon, 2011).

Interdisciplinary teaching/learning should promote learning culture in which pupils are motivated to develop their personal opinions and thoughts, feel comfortable to express their ideas, respect other pupils' ways of thinking, freely discuss ideas with others at all competence levels and evaluate the potential of learning by cooperation, improving understanding (Collins, 2016). A significant aspect of interdisciplinary teaching/learning is a pupil-centred approach to learning that comprises learning through discussion, cooperative learning and the learning based on group work. In the initial stage of pupil-centred teaching/ learning, it is not envisaged *what* a pupil is learning but *how* he/she is doing it (Kramer, 2007).

Transdisciplinary Teaching/ Learning as Integrated Approach

The prefix 'trans-' is used with a meaning 'across, beyond, crossing, on the other side, changing thoroughly, transcending' (dictionary.com). That explanation suggests various possibilities of interconnections between disciplines.

In transdisciplinary approach, the concepts, research processes and topics converge with a significant impact on the perceptions of all the sectors involved, leading to top innovative, unforeseen solutions. In the transdisciplinary approach to integration, teachers organise curriculum around student questions and concerns (see Picture 3). Students develop life skills as they apply interdisciplinary and disciplinary skills in a real-life context. Two routes lead to transdisciplinary integration: project-based learning and negotiating the curriculum.

The Soundings program is based on the work of James Beane (1990, 1993, 1997), who advocates theme studies revolving around personal growth and social issues (Drake, Burns, 2004).

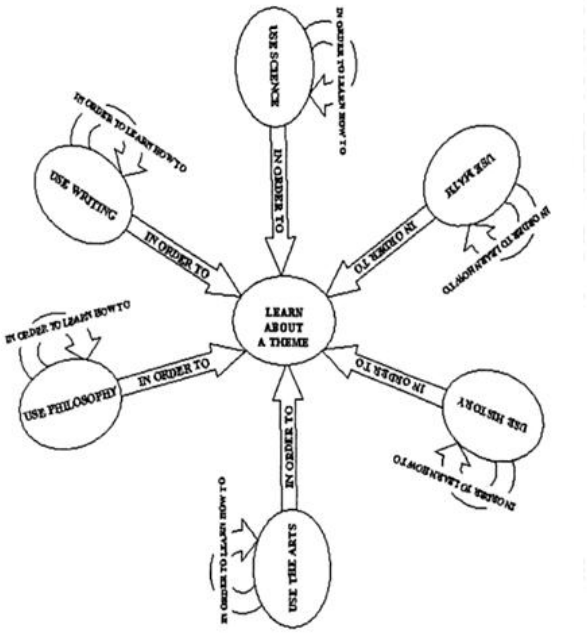

Figure 3. Transdisciplinary Model (Kaufman, Moss, 2003).

Transdisciplinary learning is the exploration of a relevant issue or problem that integrates the perspectives of multiple disciplines in order to connect new knowledge and deeper understanding to real life experiences. It is important in transdisciplinary teaching/learning to involve students in asking authentic questions – have them participate and connect to their lives as well as to give the opportunity for students to discover answers. Therefore, the tasks should be inquiry based and allow time for discovery – 'uncovering' (Kaufman, Moss Osborn, 2003).

Results

Common and Distinctive Features in Approaches to Integrated Teaching/Learning

As a result of the analysis of concepts 'integrated learning and interdisciplinary learning', we can conclude that these concepts have common features and vital distinctions that are decisive in learning process.

The concept of integrated learning comes from pedagogical field; its importance is clarified in terms of the development of a pupil's personality development. The meaning of integrated learning is to take care how to organise teaching/learning so that a pupil's development is harmonious – 'in the unity of reason, feelings and will' so that learning is included in life events and a pupil creates a holistic picture of the world. Separate subject areas and their interconnections are significant as long as they approach the mentioned aim. However, interdisciplinary, multidisciplinary and transdisciplinary concepts are based on the relationship between school subjects and science fields (it is written in terminology) and a pupil's learning is derived from them. It follows that integrated learning and the other concepts belong to different categories (See Picture 4).

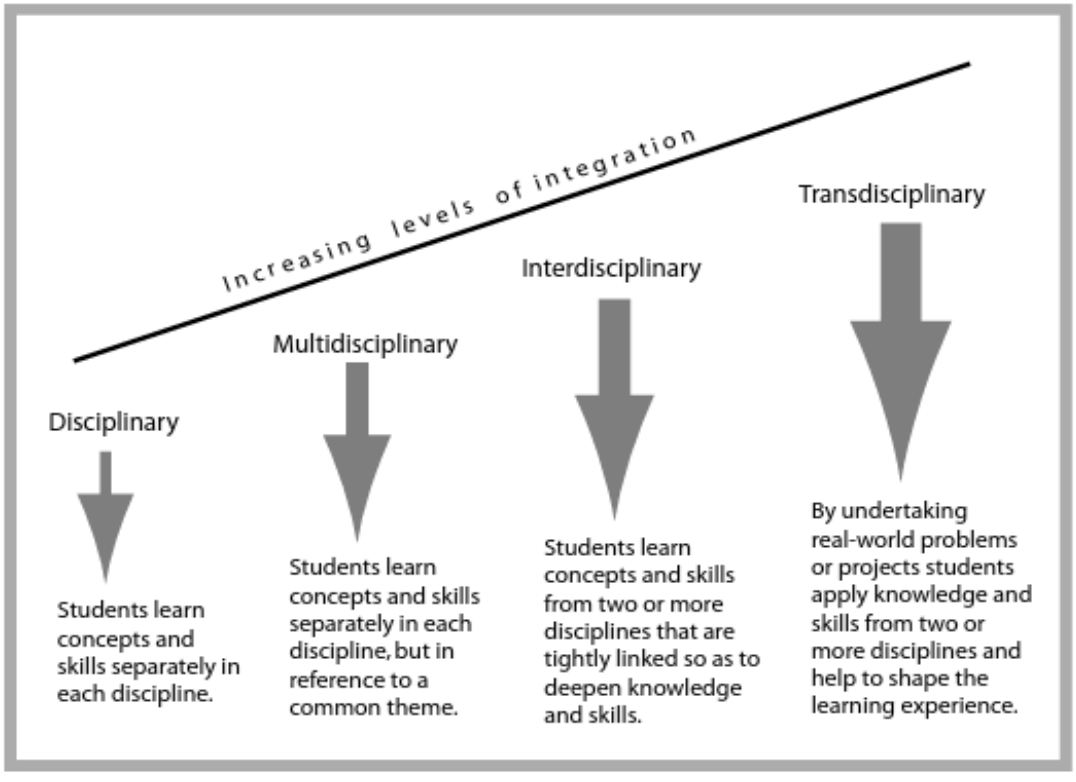

Figure 4. Levels of Integration (Kaufman, Moss Osborn, 2003).

Integrated learning content can be designed in multidisciplinary, interdisciplinary and transdisciplinary ways. It means that integration concept is broader than disciplinarity, and integration not always means such a deep integrity. However, featuring multidisciplinary, interdisciplinary and transdisciplinary learning as distinctive types of integrated learning that implement the connection of science fields (subject areas) at various levels, with different aims and methods (Drake, Burns, 2004).

The main conclusions that resulted from the analysis of the concepts, integrated learning and interdisciplinary learning, have been summarised and displayed in Table 1.

Table1. Common and Distinctive Features in Approaches to Integrated Teaching/Learning

	Integrated teaching/learning		
	Multidisciplinary	**Interdisciplinary**	**Transdisciplinary**
Commonalities	Includes more than one subject Pretends to be more effective than learning each subject separately Builds a holistic system Students are active learners		
Basis for integration	Topic	Skills and concepts common for two disciplines	Actual social/ economical/ cultural/ ecological problem from actual life
Connections	Topic has interconnections with each discipline.	Processes and concepts of one discipline help to develop understanding about the other one	All disciplines have particular sense in life context
Focus	On specific subject knowledge and skills Subject-oriented	On student's skills development Student-oriented	On complex problem-solving meeting values and actual needs of society Problem-oriented
Aim	To obtain new knowledge easier	To indicate, use and develop particular general skills	To solve a problem, using content knowledge and skills
Results	Understanding the topic from perspective of different disciplines. Disciplined do not influence each other Routine expertise	Concepts and skills of one discipline change the methods of other discipline. Adaptive interdisciplinary expertise	Innovative solutions of a problem by developing the content and tools of different disciplines
Learning outcomes	Different discipline knowledge and skills	Deeper levels of conceptual coherence, varied set of reasoning and meta cognitive strategies	Life skills and understanding the sense of learning
Starting point	Relation of concepts and processes of one-subject to the topic	Reflecting students' skills and competences – possessing and lacking ones	Questioning in order to indicate the problem – reflecting students' life experience and world actualities
Decisions	What content must be learned? Common topic for particular period	What concepts and skills are necessary for me – my needs, interests, competences?	Which skills and content can help to solve the problem?
Feedback	To what extent did I learn the content?	Which my skills are developed?	How my learning helped to resolve the problem?
Cooperation	Student–teacher Student–student	Student–teacher Student–student Teacher–teacher	Student–teacher Student–student Mutual cooperation of all teachers School–community
Critics	Structured, closed set of knowledge	Individualism, lack of interest in actual knowledge	Complex content and activities

We can see different perspectives there: meaning of 'integration' is related to wholeness, harmony, unity; but 'interdisciplinary' to combination, involving, that is, some kind of process. Interdisciplinary courses have the potential to support metacognitive learning objectives, including the ability to know when and how to use different concepts and reasoning strategies. These kinds of learning objectives are what distinguish *routine* from *adaptive* expertise (Hatano, Inagaki, 1986).

A routine expert can effectively and consistently solve problems of a particular type. An adaptive expert can do this as well and also has an understanding of the meaning and purpose of the problem-solving strategy. We began our analysis by choosing a small number of interdisciplinary tasks and operationalising

Paxson's concept of 'impact' by asking a series of questions about the degree to which each discipline was represented in the task as written:
1. What is the phenomenological context of this task?
2. What question or aim is being addressed in this problem?
3. What set of conceptual ideas are students expected to engage with in this task?
4. What reasoning strategies are students expected to engage with in this task?

If educators deal with questions 4, the interdisciplinary approach is realised. If they have answers on questions 1 and 2, the transdisciplinary integration can be realised. For multidisciplinary approach, it is enough to plan the content for learning (question 3). It can be realised comfortably without questioning about in traditional forms of curriculum.

Conclusions

- The aim of integrated learning is holistic development of student's personality by unity of school learning with real life.
- All approaches to integrated curriculum pretend to be more effective for student's learning than traditional one-discipline-based approach.
- The main differences between curriculum integration approaches lay in understanding the reasoning strategies, mutuality of connections and complexity of contexts.
- If educators are aware of the type of integration – answer a proper question and implement the specific ways of planning and cooperation – they can realise the educational goals more effective.
- In context of the new demands to education – development of students' competences and life skills – the transdisciplinary approach can be seen as the most productive kind of integration.

Project Erasmus+ Developing Interdisciplinary Economics, Ethics and Citizenship Education in Secondary Schools 2016-1-LT01-KA201-23232

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