SEIJA KARPPINEN, VEERA KALLUNKI, SEIJA KAIRAVUORI,
KAUKO KOMULAINEN & SARA SINTONEN

10. INTERDISCIPLINARY INTEGRATION
IN TEACHER EDUCATION

INTRODUCTION

The purpose of this chapter is twofold: on the one hand, to search for a meaningful form of interdisciplinary integration in order to enhance students' collaborative, associative, and creative learning; and on the other hand, to highlight the essential role of interaction in integrative teaching. Our focus is on a program to develop interdisciplinary integration in teacher education, by which we mean the activities that start with teaching the basics of separate subjects and continues to search for associations between the core of one subject in the content of another subject.

We tend to see interaction as a basis for learning. Interaction is implicitly involved in students' thinking when they connect new knowledge with old information, thereby following a socio-constructivist process (e.g., Edwards 2009), and when they find new associations in groups among scholarly topics. Through our method of integrative teaching, we are searching for new associations beyond different subjects and trying to find links between subject-specific drifts. Communication, sharing, and interaction enable individuals to be socially creative (Sawyer 2004; Mercer 1995; Edwards 2009). The focus is on understanding the process of learning within groups of individuals in specific social contexts. This theory of the "guided construction of knowledge" depends on two essential features, namely, talk as social action and the relationship between context and continuity (Edwards 2009). Mercer (1995) contends that knowledge exists as a social entity, not just as an individual possession and that the essence of human knowledge is that it is shared. This view recognizes how people construct knowledge together: "Individually and collectively we use language to transform experience into knowledge and understanding. It provides us with both an individual and a social mode of thinking." (Mercer 1995, 66–67; Edwards 2009.) We, the authors of this chapter, share the opinion that integrative teaching is one way of confirming interaction among students, between a teacher and students, and between teachers from different disciplines.

As a group of teacher educators and researchers who represent various interdisciplinary fields in teacher education at the University of Helsinki, we suggest that this kind of integration of subject topics in teaching-learning situations may enhance multifaceted collaboration among students and with the teacher. To meet and handle the challenges of integrative teaching and learning, we began several

years ago to question the present teaching practices in teacher training and develop our own teaching toward a more interactive approach. We share the view that teaching should promote more comprehensive thinking, as well as subject-specific knowledge construction on the part of students.

A university lecturer in teacher education in Finland has to deal with challenging concerns; he or she is required to have the readiness to teach in a subject-based way and to cross subject boundaries in an integrative way. As well, the Finnish National Core Curriculum for Basic Education (2004) and a draft for a new core curriculum for basic education (Finnish National Board of Education 2012) include requirements for integrative teaching. How does Finnish teacher training respond to these requirements and to the challenges of twenty-first century society? Those realities, and the current culture of sharing and participation, provided the guidelines for our search for potential forms of interdisciplinary integration that would be useful in teacher education at the University of Helsinki. The goals of our study are 1) to chart the present situation of integrative teaching practices carried out by teacher educators in Finnish universities, and 2) to envisage challenges and possibilities in integrative and interaction-oriented teaching practices being implemented by teacher educators in Finland.

Below, we discuss the kind of integrative education we have in mind and have been developing and how it could enhance interaction among students as well as between subject teachers. At the end of the chapter, we provide examples of Finnish teacher educators' experiences in integrative teaching and discuss the challenges that the sharing-centered twenty-first century culture presents for current and future teachers.

DESIGNING PRACTICES FOR INTEGRATIVE TEACHING

Our study is based on the methods of developmental work research (Engeström 2001; 2012) and design-based research (Baumgartner et al. 2003, Juuti & Lavonen 2006) in its collaborative development of teaching practices (Engeström 2001; 2012; Galison 1997; Gorman 2005). The interdisciplinary development work of teaching engages participants in active, participatory, and inquiry-based actions whereby individuals learn from one another and share their individual expertise (Engeström 2012). Collaborative development requires cross-border interaction and "trading zones," as Peter Galison (1997) points out. A "trading zone" involves a common space, shared objectives, joint language, and mutual exchange beneficial to all participants (Galison 1997; Gorman 2005; Engeström 2012). Our first step in the developmental work focused on the theoretical basis of integrative teaching, assessments of needs, and the outline of a framework for integrative teaching (Karppinen et al. 2012). This stage of the study continues to inform our integrative teaching and learning practices in teacher education programs in Finland.

By "design-based research," we mean methods that "focus on designing and exploring the whole range of designed innovations: artifacts as well as less

concrete aspects, such as activity structures, institutions, scaffolds, and curricula" (Baumgartner et al. 2003, 5–6). Using a design-based research method is often a cyclic process in which successive phases can be separated. There is no standard procedure for doing design-based research, but the method's phases depend on the goals and topic areas in the process. According to Juuti and Lavonen (2006, 60–61), the following aspects are essential in using design-based research: (1) assessing needs and defining objectives, (2) an iterative design for the artifact, (3) evaluating the artifact by piloting and testing.

INTEGRATIVE TEACHING: EDUCATION FOR SHARING AND INTERACTION

In this chapter, we are approaching integration from a teacher-centered perspective. This means that subject matter or themes are primarily taught as subject-based and then used to cross over the subject's borders (e.g., discipline-based integration; see Juuti, Kairavuori, & Tani 2010). In this kind of horizontal integration, the teacher establishes general objectives and creates a coherent whole by having a broad range of vision (horizon), for instance, the scientific principle of evolution, as a background framework for the teaching. (Komulainen 2007; Sawyer 2004; 2006; Beane 1997; Malinen 1992, 73–74.) A teacher can also be seen less as a transmitter of knowledge and more as the initiator of the learning processes and a facilitator of knowledge creation (Aaltonen 2004, 54).

In different teacher education programs in Finland, there are ongoing efforts to develop more interactive teaching methods (e.g., at the universities of Jyväskylä, Tampere, and Helsinki). These initiatives are in line with current trends in developing teacher education programs in Finland, as well as with the recommendations by the Finnish National Core Curriculum for Basic Education (2004). According to the National Core Curriculum, teaching can be either subject-based or integrated. The aim of integrated teaching is to explore a subject from the viewpoints of different disciplines in order to create an overall picture of the topics learned (Finnish National Core Curriculum 2004.)

In learning, there is also a need to take into account today's learning environments, which open new paths for interaction, for example, through the integration of teaching. In recent studies, learning in general has been defined as a continuous and ubiquitous process (e.g., Kumpulainen et al. 2009, 43, 48; Barron 2006, 202). In the changing world of the twenty-first century, new learning environments are emerging (Krokfors et al. 2010; Banks et al. 2007). At the same time, the earlier physicality of learning environments is being challenged. In an extreme interpretation, the physical learning environment cannot be separated from the mental, because learning is understood as taking place in our minds (LUKE 2010, 32).

The present young generation of primary school children (ages 7 to 12) is accustomed to interacting in social, participatory settings. It is obvious that the digital culture and social media offer new kinds of tools and environments for learning and knowledge processing. According to Greenfield (2009), the problem is in the way

we are accustomed to communicating with learners at school: we often rely on older media, such as print and lectures. However, young students do not have the skills for processing such media with maximum efficiency.

Digital technology and especially the Internet are no longer tools simply for disseminating and retrieving information, but are necessary for dialogue and sharing, for interpersonal communication, self-expression and creativity, and also for entertainment. Teachers, educators, and educational researchers are now struggling to take into account the changing relations between schools and these new digital spaces in today's digitally mediated landscape in which young people spend increasing amounts of time. This landscape provides the context in which young people represent and share their life stories, feelings, and experiences, construct their identities, and learn the norms of peer group behavior (Buckingham & Martinez-Rodrigues 2013, 10–11; Sintonen 2012, 6–16). As Buckingham and Martinez-Rodrigues (2013, 13) argue, "while some commentators still appear to be inflating the bubble of technological hyperbole, or tolling the bell of digital doom, there are many researchers and educators who are moving ahead with the job of working out how we can make the best of the opportunities that are arising here."

Online sharing and participation are everyday activities for "Millennials," the current university student generation. Millennials have also been called the "Net Generation" and "Generation Y." Neil Howe and William Strauss, authors of the book *Millennials Rising: The Next Great Generation* (2000), identify the beginning of the generation as those born in 1982 and suggest that this demographic has a number of characteristics that sets them apart from previous generations. One shift is from the expectation that reference sources are products of a single mind to the expectation that reference sources should be produced by many, who collectively contribute to the group process. Here, we argue that the integrative and communicative settings we are developing in university teaching-learning are benefiting from these two aspects: the idea of sharing and integrative processing. Greenfield (2009) says that, although this generation may have adopted new skills, for example, impressive visual intelligence, the cost seems to be deep processing: mindful knowledge acquisition, inductive analysis, critical thinking, imagination, and reflection. We argue that these skills are essential in teacher education and that students would benefit from integrative teaching.

THE PRESENT SITUATION IN INTEGRATIVE TEACHING PRACTICES

The main purpose in questioning the present situation is not to argue with the numerous opinions or construct generalizations on the basis of this kind of knowledge, but rather to understand the pedagogical horizon of integration in current Finnish teacher education. To support our developmental work in interdisciplinary integrative teaching, teacher educators in multidisciplinary subjects in all Finnish teacher training departments (the universities of Helsinki, Oulu, Jyväskylä, Eastern

Finland, Turku, Lapland, Tampere, Kajaani, and Rauma) were asked about their practices and challenges in integrative and interactive teaching by means of an online questionnaire. The questionnaire focused on the teachers' experiences with integrative instruction, the potential and challenges in integrative teaching, as well as the teachers' visions for the future.

In 2012, we approached some two hundred teacher educators, and twenty-nine answered. The majority (65%, 19/29) were female teachers. Why such a low response rate? Possible reasons may be too little time or lack of motivation or too few experiences in integrative teaching. However, the respondents represented all possible school subjects and teacher education programs (class teacher, kindergarten teacher, and/or subject teacher education). The teacher educators who responded were quite experienced in their work; one third (31%, 9/29) had been teaching more than twenty years; almost one fourth (24%, 7/29) had taught from sixteen to twenty years; and one fifth (21%, 6/29) had taught from eleven to fifteen years. Only 10% were beginners, who had worked at most five years. The teachers' experiences tell us that, the more teaching experience a person has, the more critical is their attitude toward integrated teaching. The less-experienced teachers (five years or less) were eager to implement integration in their teaching, but were short on courage or the skills to plan and carry out integrative teaching experiments. The expertise of more experienced teachers was needed to support the novice teachers. However, these needs were not met.

Teacher Educators' Experiences in Integrative Teaching in Teacher Education

Teacher educators understand integration as a diverse and dynamic phenomenon with various pedagogical solutions, an understanding that is also in line with our conceptions of the heterogeneity of the present state of integrative teaching. The teacher educators identified integrative processes and practices as various joint events, theme days, or larger projects in cooperation with colleagues or partners outside the school. The teachers' conception of integration was that it enriches optional pedagogical solutions in teaching and leads to re-organization of the content to be learned. Some of them believed that, at its best, integration creates new ideas and ways of thinking and supports varied ways of sharing and working together. For example:

> New traditions were born during the school year. Different kinds of students worked together, solved problems, which are not usually faced in normal teaching. The teachers' collaboration was meaningful. The parents and other guests were involved successfully. (Teacher Educator 16)

> . . . [the integration] created experiences of success, new ways of looking at familiar things, and in that way it created motivation, to have the courage to think differently. (Teacher Educator 12)

Some of the teachers' observations were more critical; they pointed out the problems faced in short-term interventions and the change in their own practice.

> Bad experiences. [Integration] messes up understanding of subject-based concepts and wholes, which is already at a low level among student class teachers. (Teacher Educator 23)

> Integration is laborious, and it requires a lot of readiness to think in a new way. Rewarding. Anyhow, a single time is not enough, but interventions should be realized several times and [should be] developed further. (Teacher Educator 11)

These answers reveal that sometimes there is a lack of patience to go deep enough into the integrative practice. Even though the first time may not be a great success, the continuity may offer deeper understanding.

The Potential and the Challenges of Integration

The teachers' experiences revealed their understanding of what is essential in being a teacher. The teacher is required to master a range of skills; for example:

> [By integrating] we could create a strong core for a teacher, surrounded by special features of different subject areas. What is central is that there could be things to learn that are common to every teacher, such as skills in interaction, emotional skills, and pedagogical content, such as ethics, morals, psychology, motivation and so on …. (Teacher Educator 8)

> [The] effects [of integration] on basic education: erasing the border lines between school subjects, changing the idea of the teacher from a knowledge transmitter to a guide in constructing understanding and applying knowledge. (Teacher Educator 7)

Even though integration was seen as very rewarding, the teacher educators identified many challenges. They described difficulties in organizing and coordinating the practice. The limited resources of time and space together with the increased number of meaningful negotiations and the amount of collaborative planning seem to be complicated. Another set of challenges the teacher educators described was the risk of superficial learning outcomes. Some of them stated that integration, if implemented too early in a teacher training program, might cause difficulties in adopting basic subject-specific skills and knowledge. The basics should be thoroughly studied before implementing integrative practices. Moreover, the strong tradition of subject-based pedagogy and teachers' positions as subject teachers in teacher education were also seen as very difficult and structurally too fixed to adopt integrative practices.

The Teacher Educator in the Twenty-First Century

At the heart of integrative projects, the teacher educators identified skills in collaboration and interaction, including dealing with emotions and growth in critical

thinking. Many of them also highlighted skills in multimodal media technology. These groups of skills constructed visions of future schools in which generalist teachers would work together with specialist teachers, actively using modern multimedia and learning technologies in cooperation with the surrounding society.

> [The skills and knowledge needed today are] multidisciplinary and versatile knowledge plus collaboration skills. These days hardly anyone works alone in an office, but rather works in diverse projects together with other people, which demands collaboration skills both at the national and the international level. In addition, collaboration within the school in different instances is current, and integration between the school subjects is a possibility. (Teacher Educator 3)

> Knowledge should be more connected, for example, by using ICT and cultural themes in education. We need more partners in cooperation with society at school. (Teacher Educator 26)

> [The skills and knowledge needed today are] knowing the Finnish cultural heritage. Knowing diverse processes in different disciplines and the arts. ICT is everyone's working base/space and tool. Integration requires practice, concerning personalities and techniques. Integration means that the school is an active part of society as well. (Teacher Educator 16)

Despite all the positive integrative experiences, some of the teachers were against integrative activities; they pointed out the value of the old subject-based standards, as in the following comment:

> I think the future is not based on emphasizing, for example, the concepts of crafts, visual arts, music education, and so on in all teaching and messing up the teaching of biology and geography. The same goes for the whole range of natural science subjects in school. It is unnatural and superficial to teach them together as in the American system. (Teacher Educator 23)

DISCUSSION

In this chapter, the teacher education program at the University of Helsinki is discussed from two standpoints: one is the search for meaningful interdisciplinary integrative teaching methods that would enhance students' collaborative, associative, and creative learning; the second is the challenges and possibilities of integrative and interaction-oriented teaching methods.

According to some teacher educators in Finland, integration in education turns out to be mainly positive, and teachers have used multidimensional pedagogical solutions to carry out integration in their classrooms. The teachers pointed out reasons for unsuccessful trials at integration. There is a need to discuss further the challenges and difficulties in implementing integrative teaching before rejecting new trials. It is also important to consider longer-term integrative activities that have continuity and depth.

The teacher educators framed the possibilities in integrative teaching in light of a future-oriented concept of a teacher, based on shared expertise and skills in interaction, emotions, and collaboration. However, it appears that the practices of integrative teaching in teacher education are still more or less subject- and teacher-oriented.

Teacher educators are generally aware of the skills and readiness of their student teachers, such as how the Millennials and the younger generations use social media and how they have attitudes of sharing. This led us to consider whether there might be a gap between the objectives and the practices. The question also comes up of how the challenges of today could be answered and what kinds of methods and tools should be used to create meaningful activities for the students.

Teaching and teacher education are in a continuous state of progress, and both should respond to the challenges of the present. The views and aims of our development work for integrative and interaction-oriented teaching discussed here in the spirit of today's sharing-centered culture correspond to the objectives of the new Finnish national core curriculum for basic education, which is still being drafted (Finnish National Board of Education 2012). According to the draft for the new core curriculum, the future objective for the integration of teaching is to help students structure their own experiences of daily life and school life into meaningful wholes. The aim is also to help pupils combine skills and knowledge from various disciplines. Furthermore, the new curriculum recommends that teachers organize learning projects in which students can explore the same topics from different viewpoints and acquire experiences in participatory and creative activities.

There is a need to continue this kind of development and to implement practical teaching experiments. We are already conducting several teaching experiments in teacher education and in cooperation with primary schools.

REFERENCES

Aaltonen, K. (2003). *Pedagogisen ajattelun ja toiminnan suhde*. *Opetustaan integroivan opettajan tietoperusta lähihoitajakoulutuksessa* [The relationship between thinking and action: A teacher's knowledge base in integrative teaching in nursery school education]. Joensuu: University of Joensuu.

Banks, J., Au, K., Ball, A., Bell, P., Gordon, E., Gutierrez, K., Brice Heath, S., Carol D. Lee, C., Lee, Y., Mahiri, J., Nasir, G., Valdes, G., & Zhou, M. (2007). *Learning in and out of School in Diverse Environments*. The LIFE Center (The Learning in Informal and Formal Environments Center) and the Center for Multicultural Education, University of Washington, Seattle. Retrieved January 30, 2013, from http://depts.washington.edu.centerme/LEARNING LIFE REPORT.pdf

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development*, *49*, 193–224.

Baumgartner, E., Bell, P., Brophy, S., Hoadley, C., His, S., Joseph, D., Orrill, C., Puntambekar, S., Sandoval, W., & Tabak, I. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher*, 32, 5–8.

Beane, J. A. (1997). *Curriculum integration. Designing the core of democratic education.* New York: Teachers College, Columbia University.

Buckingham. D., & Martinez-Rodrigues, J. B. (2013). Interactive youth: New citizenship between social networks and school settings. *Comunicar*, *40*(20), 10–13.

Edwards, J.-A. (2009). Socio-constructivist and socio-cultural lenses on collaborative peer talk in a secondary mathematics classroom. In M. Joubert (Ed.), *Proceedings of the British Society for Research into Learning Mathematics*, *29*(1)*.* Retrieved April 9, 2013, from http://www.bsrlm.org.uk/IPs/ip29–1/BSRLM-IP-29–1-09.pdf

Engeström, Y. (2001). Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of Education and Work*, *14*(1), 133–156.

Engeström, Y. (2012, February) *Yhteiskehittely ja vaihdon vyöhykkeet tutkijoiden ja elinkeinoelämän välillä* [Collaborative development and the zones of exchange between researchers and economic life]. Lecture conducted from the University of Helsinki.

Finnish National Board of Education (2012). *Luonnos perusopetuksen opetussuunnitelman perusteiksi 2014* [A draft for the Finnish national core curriculum for basic education 2014]. Helsinki: Finnish National Board of Education. Retrieved March 11, 2013, from www.oph.fi

Finnish national core curriculum for the basic education. (2004). Helsinki: Finnish National Board of Education. Retrieved March 11, 2013, from www.oph.fi

Galison, P. (1997). Image & logic: A material culture of microphysics. Chicago: The University of Chicago Press.

Gorman, M. E. (2005). *Trading zones*, *interactional expertise and interdisciplinary collaboration.* Retrieved April 9, 2013, from http://bart.tcc.virginia.edu/tradzoneworkshop/Tradingzonesdesc.pdf

Greenfield, P. (2009). Technology and informal education: What is taught, what is learned. *Science Magazine*, *323(5910)*, 69–71.

Howe, N., & Strauss, W. (2000). *Millennials rising: The next generation.* New York: Vintage.

Juuti, K., & Lavonen, J. (2006). Design-based research in science education: One step towards methodology. *Nordina*, 4, 54–68.

Juuti, K., Kairavuori, S., & Tani, S. (2010). Tiedonalalähtöinen eheyttävä opetus monikulttuurisessa koulussa [Subject-based unification of teaching in a multicultural school]. In A. Kallioniemi, A. Toom, M. Ubani, & H. Linnansaari, H. (Eds.), *Akateeminen luokan opettajakoulutus* [Academic class teacher education] (pp. 295–312). Suomen kasvatustieteellinen seura.

Karppinen, S., Komulainen, K., Kallunki, V., Sintonen, S., & Kaasinen, A. (2012). Reflecting concept of design learning in collaborative development work – Towards integrative teaching practices in Finnish teacher education. *LLinE Lifelong Learning in Europe*, *Issue 4/2012.*

Komulainen, K. (2007). Draaman keinot äidinkieleen ja kirjallisuuteen pohjaavassa kokonaisopetuksessa. [Drama methods in overall education based on language and literature]. In K. Merenluoto, A. Virta & P. Carpelan (Eds.), *Opettajankoulutuksen muuttuvat rakenteet* [The changing structures of teacher education] (pp. 543–540). Turku: University of Turku.

Krokfors, L., Kangas, M. Vitikka, E., & Mylläri, J. (2010). Formaalin koulutyön ja informaalin oppimisen rajapinnoilla. [At the interface between formal school work and informal learning]. In R. Smeds, L. Krokfors, H. Ruokamo, & A. Staffans (Eds.), *InnoSchool – välittävä koulu. Oppimisen verkostot*, *ympäristöt ja pedagogiikka* [InnoSchool – Intermediary School: Learning networks, environments, and pedagogy] (pp. 63–70). Espoo: Technical College of Aalto University.

Kumpulainen, K., Krokfors, L., Lipponen, L., Tissari, V. Hilppö, J., & Rajala, A. (2009). Learning bridges – Toward participatory learning environments. Helsinki: Helsinki University Print. Retrieved January 11, 2013, from http://hdl.handle.net/10138/15631

LUKE (2010). *Lukiokoulutuksen kehittämisen toimenpide-ehdotuksia valmistelevan työryhmän muistio* [Memorandum of the preparatory commission for the development of high school education]. Helsinki: Ministry of Education and Culture.

Mercer, N. (1995). *The guided construction of knowledge: Talk amongst teachers and learners.* Clevedon: Multilingual matters.

Sawyer, K. (2004). Creative teaching: Collaborative discussions disciplined improvisation. *Educational Researcher*, *33*(2), 12–20.

Sawyer, K. (2006). Educating for innovation. *Thinking Skills and Creativity*, *1*, 41–48.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *Journal of the Learning Sciences*, *3*(3), 265–283.

Schrage, M. (2001). *The relationship revolution.* Retrieved April 12, 2006, from http://www.ml.com/woml/forum/relation.htm

Sintonen, S. (2012). *Susitunti. Kohti digitaalisia lukutaitoja.* [The wolf lesson. Towards to digital literacy]. Helsinki: Finn Lectura.

AFFILIATIONS

Seija Karppinen
Department of Teacher Education,
University of Helsinki

Veera Kallunki
Institute of Behavioural Sciences,
University of Helsinki

Seija Kairavuori
Department of Teacher Education,
University of Helsinki

Kauko Komulainen
Department of Teacher Education,
University of Helsinki

Sara Sintonen
Department of Teacher Education,
University of Helsinki