Enhancing Teacher Training for Online Immigrant Integration Programs: A Design Science Approach

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Article Info	Abstract
	In the online implementation of immigrant integration training, there are areas that receive limited attention in the pedagogical studies of Finnish language and literature subject teachers. Using the Design Science Research method, an artifact of socially significant online integration training is studied. By participating in the evaluation and development of the design of this artifact, teacher students also contribute to the design of a meta-artifact. The results can be used to create a micro-credential for teacher training, enhancing teachers' abilities to work in online training programs that promote the integration of adult immigrants. The outcomes of collaborative development provide additional insights into the development needs of educational technology and the intersections of technological and pedagogical expertise. Co-design reveals issues that can be addressed either through pedagogical expertise in a technically simple environment or by developing future technologies, such as interaction-enabling design. Based on the findings, it is recommended to strengthen technological self-efficacy and practice culturally diverse pedagogy, online presentation, and facilitation skills in teacher training and orientate in interactive educational technology.

Introduction

The online implementation of integration training for adult immigrants was tested and evaluated at the University of Turku's Department of Teacher Education (OKL) during the pedagogical studies of Finnish language and literature (Fi) and Finnish as a second language (L2) teacher students in the didactics course in the autumn semester of 2019. Before this test group, only the teachers who had entered the workforce had acquainted themselves with the online implementation of integration training. The described online implementation has been organised and redesigned since 2015 when the Centers for Economic Development, Transport, and the Environment (ELY) started ordering integration training to be offered online in addition to traditional classroom instruction. This was done to ensure access to training in sparsely populated areas.

Design science research (DSR) and design case studies develops artifacts as solutions to the requirements defined by the environment. In this study, the environment is the context of immigrant integration training. The DSR method was originally used in the IT sector (Hevner, 2004), but it can be applied to connect technological projects

with knowledge from other fields and examine designs and design processes (Apiola & Sutinen, 2021). The reliability of the research is defined by the researcher's long-term commitment to the phenomenon and working with it, as well as participation in the design process to develop a deeper understanding from observations. This is transparently described in the paper (Smith, 2010). By using design science method, technological design in a societal context can be comprehensively described, thus increasing the understanding of how artifacts function. This research is an opening contribution to the research of online training for immigrants, a field not previously explored in the context of integration.

This study is one iteration of DSR, focusing on the year 2019. Arffman was the sole provider of online integration training for the first few years (Hartikainen et al., 2020). In the period 2015-2021, the training reached 630 learners (Haikala, 2019; Haikala & Kuja-Lipasti, 2021). The backgrounds of the learners varied from highly educated to semi-literate. Based on the introductory sessions conducted at that time, a demonstration was designed for the pedagogical studies of Finnish language and literature (Fi) and Finnish as a second language (L2) teacher students, including user testing, where teaching adult immigrants online was practiced and familiarity with the immigrant integration training was provided. The demonstration was unique since, prior to this, online teaching or teaching adult immigrants had not been practiced in the Fi and L2 teacher training programs at the University of Turku's Faculty of Education.

Testing an online training model with different users is essential to gather information on whether the artifact is suitable for its intended use, how it functions in the real world, and how it should be developed (Baskerville et al., 2018, 361). For this study, teacher students are an excellent test group since, during their teaching practice, they become sensitive to critically assess teaching methods. The instructions and practices generated during the testing phase form a meta-artifact for this research, a micro-credential for teacher training.

The goal of this DSR study is to develop online integration training for adult immigrants as a learning environment and to investigate how this educational service is perceived by teacher students, making it credible, functional, and user-friendly. Through collaborative development, it is possible to create short-term training for teacher training that supports effective learning in online integration training (meta-artifact) and provides guidelines for future online implementations (artifact).

Research Background

Information and Communication Technology in Teacher Education

When seeking the reasons for Finland's strong performance in the PISA assessments, teacher education has been considered one of the most crucial criteria (Doil & Pietzner, 2023; Ustun & Eryilmaz, 2018). Success factors include extensive practice periods in teacher training schools, a focus on subject content, the prestige of the profession, leading to the enrollment of high-potential learners, the recognition of continuous education, and the learning of skills essential for PISA in teacher education. The emphasis in Finnish teacher education is not on teaching practices or acquiring a ready-made teaching method but on identifying and developing students' abilities through research-based approaches (Mikkilä-Erdmann, Warinowski & Iiskala, 2019).

The PISA 2022 ICT Framework (OECD, 2021) introduces a digital teaching and learning assessment tool into the PISA evaluation. Previous PISA studies have had several shortcomings regarding questions about the use of information and communication technology (ICT), and previous ICT survey forms were created without a comprehensive evaluation framework (OECD, 2021, 28-29). Despite the widespread use of ICT, there are many unexplored aspects related to its availability, impact, quality, and use. The framework assesses the extent and purposes for which different types of teachers use ICT, as well as the role of ICT in pedagogically different teaching situations. Teachers must identify, assess, and select the necessary ICT resources that align with their learning objectives, context, and pedagogical approach. Furthermore, resources need to be managed, shared, and updated (OECD, 2021, 28). There are indications that new teachers may lack sufficient training in the pedagogical use of ICT, while more experienced teachers may lack technical knowledge for using ICT in teaching. Competence and experience influence the desire to use ICT (OECD, 2021, 34).

There is no predefined educational path to becoming an integration training instructor or an online teacher, but the job descriptions vary with the rapid changes in society. Fi and L2 teachers require skills for L2 instruction and for working effectively in a culturally diverse online environment. The use of digital technology in teaching is not a matter of choice (OECD, 2021; Vuorikari, 2022; Redecker, 2017), but it is of paramount importance that teachers can navigate digital environments and utilise digital technology in their teaching, whether it is everyday encounters online or the delivery of content using digital tools.

The role of teachers has evolved with the widespread adoption of online learning and digital learning environments. Distance teaching redefines the role of teachers and elicits strong opinions and emotional reactions within the profession, sometimes even despair when extensive subject matter knowledge is no longer sufficient for effective education. Diverse and location-independent teaching requires a more precise understanding of each learner's individual profile.

Teachers' Digital, Pedagogical, and Cultural Competence

Teachers graduate to educate active citizens in a digital society (Vuorikari, 2022). The framework for teachers' digital competence includes the areas needed for digital competence, with the focus being on the use of digital technology for enhancing and innovating education rather than technical skills (Redecker, 2017). It is the teacher's responsibility to support learners in achieving digital citizenship, which is a combination of knowledge, skills, and attitudes related to the responsible use of digital technology (Vuorikari et al., 2022, 3).

Graduates of Finnish language and L2 teacher training programs are qualified to teach not only in primary and secondary education but also as teachers of Finnish for adults, for example, in integration training (Suomenopettajat, Sept. 21th 2023). The teacher training programs for subject teachers in language and literature emphasise teaching Finnish language and literature, with teaching practice generally taking place in basic education and general upper secondary education. Adult learners are not necessarily encountered during teaching practice, and the perspective on L2 instruction remains quite superficial.

A significant portion of graduating Finnish language teachers find employment as L2 teachers. Integration training is offered entirely online or through blended learning, so teachers need to have the skills to plan, implement, and develop online education. A comprehensive study on the state of L2 instruction in Finland at different educational levels highlighted resource constraints and the challenge of recruiting qualified L2 teachers, whose need for additional and continuous training has been identified at every educational level (Owal Group, 2022). The study did not take into account labour market-oriented training or training programs ordered by employers.

Online Immigrant Integration Training

Over the past 20 years, immigration to Finland has been steadily increasing. Nevertheless, the number of immigrants in Finland is among the lowest in the European Union. In 2022, 5.8% of the population in Finland did not hold Finnish citizenship (OSF). Finland is a leading digital society with the most extensive telecommunications infrastructure on the planet. Public services in society are digital, making digital literacy essential for Finland's development and economy (Ali-Yrkkö et al., 2023).

In recent years, immigration has been driven by work and study-based applications, which is also reflected in residence permit applications for family members (The Finnish Immigration Service, 2023). Integration training reaches 14,000 newcomers annually (Seppälä et al., 2022a; Kekki et al., 2023). International recruitment has rapidly developed and become established, with proactive companies expanding their expertise in the field (The Finnish Immigration Service, 2023). Recruiting training programs have increased the number of online courses, but from an official perspective, the customer journey is incomplete, leading to a lack of standardised data on these courses (TEM, 2023).

Integration training for adult immigrants is work-oriented training, which includes language and communication studies as well as skills related to work and societal functioning (OPH, 2012; 2022). The Employment and Economic Development Office (TE) directs unemployed immigrants to integration training programs organised by various service providers, which are procured through competitive bidding. Unemployed immigrants have the right to an integration plan, and after its preparation, they can participate in services that promote integration, such as integration training (Integration Act, 2010). When the comprehensive reform of the Integration Act comes into effect in 2025, municipalities will be responsible for organising integration training programs and other measures to promote integration in the future (Integration Act 681/2023).

Integration training programs can progress at a slow, basic, or fast pace, and learners may be placed in a literacy group based on their abilities (OPH, 2012; 2022). Learners can join an ongoing group, and they can quickly transition to the labour market (Seppälä, 2022a), which requires the teacher to guide a changing group and master methods for continuous training design. Although learners are assigned to an appropriate group based on their starting level, less than 35% of participants reach the B1.1 target language proficiency level (CEFR), which is defined as functional basic language skills (VTV, 2018). The number of learners reaching the target level in online courses is approximately the same (Hartikainen et al., 2020), but without a thorough examination of the background factors of integration training participants, it is unrealistic to assess the success of training

implementations from the perspective of achieving the target level (Seppälä, 2022b). The target level does not indicate, for example, the learner's professional competence. The quality control and impact monitoring of integration education are not yet sufficiently standardised (TEM, 2023).

At the beginning of integration training, the attitudes of adult students toward online learning were generally negative, especially before the era of the COVID-19 pandemic. Building trust in online teaching requires teachers to overcome new barriers first. By enhancing their technological self-efficacy, teachers can use educational technology more effectively, which, in turn, increases learners' motivation and commitment to online learning (Lee & Ogawa, 2023). Forced online teaching during the pandemic has been seen as providing opportunities for innovating teaching and practicing the use of technologies in education, especially communication opportunities with learners (Santagata et al., 2023). Interaction occurs between learners, between the learner and the teacher, and between the learner and learning materials (Valkonen, 2020). Teachers need to connect with learners, see them, talk to them, and build practices and motivation for individual and group discussions. Teachers must be capable of managing and selecting digital resources suitable for shaping teaching interactions in a group.

Research Design and Methods

Research Questions

In Design Science Research (DSR), innovative artifacts are designed in a user-centric and practical manner with the aim of benefiting organisations or individuals (Hevner, 2004). The artifact is developed in iterative cycles, where suitable user groups test and evaluate it in practice. Based on experiences and feedback, the artifact is refined (Hevner, 2007). In this study, the artifact is an educational service product, online integration training for adult immigrants (Hartikainen et al., 2020; Ahola & Hartikainen, 2022). DSR is used to investigate how to shape the artifact in a way that is necessary, useful, and meets the requirements of the intended environment. The design of online training involves a process where a problem is defined, and a service or product is developed as a solution, which is continuously evaluated and tested (Peffers et al., 2008).

A detailed DSR method, which allows research, co-development, re-design, and evaluation, is suitable for the design of online integration training because it enables the updating of weak and outdated aspects of the artifact, making it relevant to different user groups (Peffers et al., 2008). Using an iterative method allows for the customisation and integration of continually evolving knowledge in online learning and integration training into the technologically designed education model (see Figure 1). DSR engages its users to actively participate in the development of the artifact (Peffers et al., 2008). When theory is applied broadly, there is no need for multi-method research.

Teacher students and their mentors participated in the design of online integration training in the third iteration cycle (Ahola et al., 2024), in collaboration with the company providing educational services, teachers, and student groups. DSR research supports the practical development research paradigm, building innovative ways to address real-life challenges based on user needs and developing innovative artifacts that actively respond to society (Hevner et al., 2004, 75; Peffers 2007, 89-90), in this case, facilitating an effective and efficient training process.

In DSR research, the iteration process of the artifact can be defined through iteration phases (Peffers et al., 2007). Table 1 describes the characteristics of the online integration training artifact and the impact of the meta-artifact.
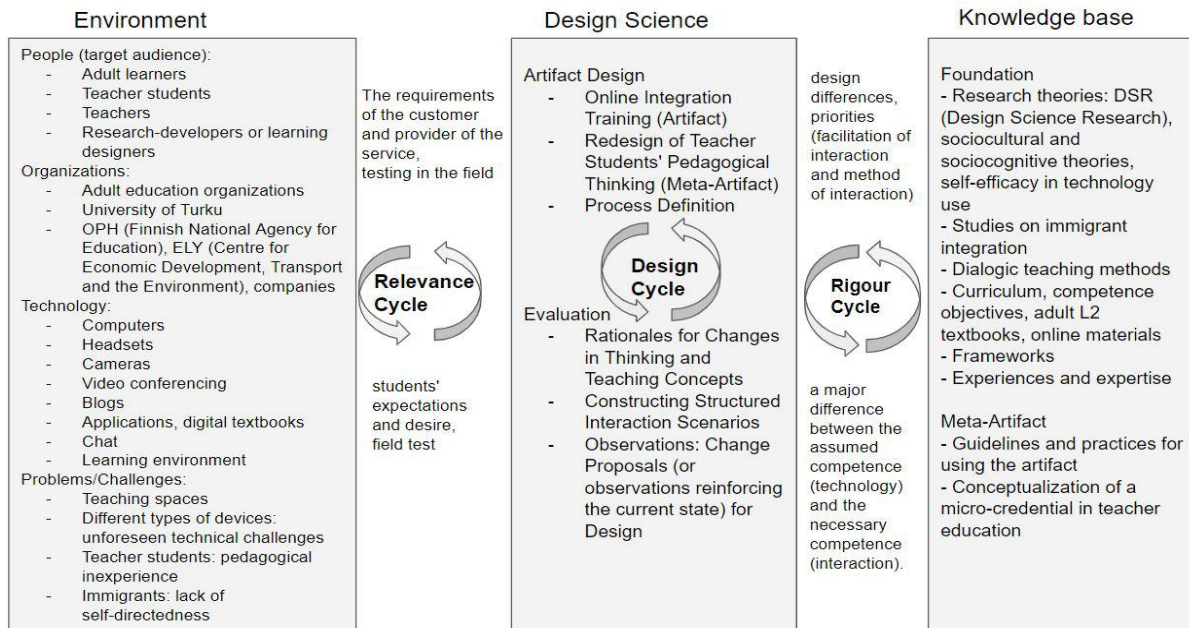
Figure 1. The Environment, Knowledge Base, and their Interrelationships of Online Integration Training Artifact based on Hevner (2007)

Table 1. Iteration Process of Online Integration Training Artifact and Teacher Training Meta-artifact

Attribute	Artifact	Meta-artifact
Societal Significance	Resource-efficient integration training online	Micro-credential in teacher training: Teacher students as resilient online instructors
Objectives	To provide immigrants with sufficient skills for the Finnish job market	Strengthen teachers' digital competence and agency
Collaborative Development Parties	Training commissioner (ELY), education service provider, teachers, support staff, learners, learning designers, researchers	Teacher educators, researchers, teacher students, online educators, and learners
Demonstration (User Experience)	Lightweight, technically, pedagogically, and linguistically accessible online training for facilitating teaching	Guidance, practices, and pedagogy for the online training model and process
Design evaluation	Learning outcomes, student feedback, teacher observations, commissioner feedback/requirements	Initial and final surveys, teacher and researcher observations

Interaction with the Environment	Peer-reviewed research articles in 2020 & 2022, nominated for the Integration Act of the Year 2018, mention in the OECD Language Policy Report 2021, conference presentations in 2020a, 2020b, 2021, introduction of the artifact to the German (BAMF) integration education coordinator, teacher education programs	This article produced recommendations for teacher training and useful ideas for learning designers in culturally diverse context.

The participation of teacher students in the design process supports the development of the artifact. Constructing meta-artifacts that support and observe the artifact (online training service) is a complementary approach to artifact development (Iivari, 2003). Developing teacher education as a meta-artifact addresses the societal need to reform teaching and develop teachers who are flexible, globally mobile, and understand the needs of the labour market and companies.

The design process provides additional information about the prior knowledge of teacher students, practical information relevant to the online integration training provider, and reveals the discrepancies between assumed and actual required competencies. This information is evaluated for the technological and pedagogical development of the training model. The research question is: What experiences did student teachers have about participating in the design process?

The research question includes perspectives on how does the participation of teacher students in the design of online training create a micro-credential for teacher training (meta-artifact), and also, how did the evaluation develop or impact the online training model (artifact).

Context of Using DSR Method

The environmental context that sets requirements for the design process is the societal context of online integration training. Immigrant education addresses the correction of labour shortages, and as such, it has significant societal importance. Participants in these training are adults from various professions who complement their expertise with language and cultural knowledge and build networks in their new home country with support. The implementation of the educational service involved the client ELY Center, the educational service provider, regional companies, as well as the dynamic and learning community of teachers and students.

The learning environment for online training is dynamic and resilient, as it must adapt to different levels and types of groups and teachers. The skills of the parties involved vary greatly. In this study, the design version 3 of the artifact was already refined from versions 1 and 2 to make it simpler (see Ahola et al., 2024) because the more demanding and complex functions used in earlier designs required extensive experience in online teaching and more teacher resources. The learning environment consisted of accessible technological applications, such as video calls, chats, blogs, and electronic learning materials. The technical challenges of flexible design have often been unpredictable and individual.

The rigour cycle operates the knowledge base and artifact design (see Figure 1). The redesign of the artifact takes place in the design cycle. In this study, the focus is on the relevance cycle (see Figure 2), which describes the interaction between the environment and the design of the educational service. Based on the assessment and feedback from teacher students, a micro-credential is conceptualised, which is a competency-based small unit of knowledge (Hunt et al. 2020). The requirements for the artifact and the meta-artifact change as a result of this process. The next step after this process would be the design cycle, where the changes are integrated into the next versions of the artifact and the meta-artifact.

5. Feedback and Results
End-of-course survey (16 respondents) and feedback from teachers of integration training:
- More time for orientation
- More realistic conditions
From teacher students:
- Changes in attitudes
- Expansion of pedagogical understanding, see analysis

4. Teaching sessions
- Preparation with the small group and the teacher
- Technical operation during the teaching session
- Getting to know the group to be taught
- Conducting teaching sessions
- Opportunity for debriefing with the group's teacher

3. Workshop
- Diving into the curriculum
- Formulating learning objectives
- Searching for and creating materials
- Planning the teaching session, interaction, and guidance

Relevance Cycle

1. Desire to Learn
- Background survey (21 informants)
- 12 had former online studies related to degree studies
- Perception of online learning: learning environments used at your own university, material banks and asynchronous written discussions
- a few applications commonly used in schools are known
- plenty of negative experiences from familiar learning environments, also some good ones.

2. Increasing knowledge
- Presentation of research: online learning and learning concepts
- Presentation of online integration training
- Job duties of an online teacher
- Online classes and communication
- Daily routines
- Competence goals
- Creating material online
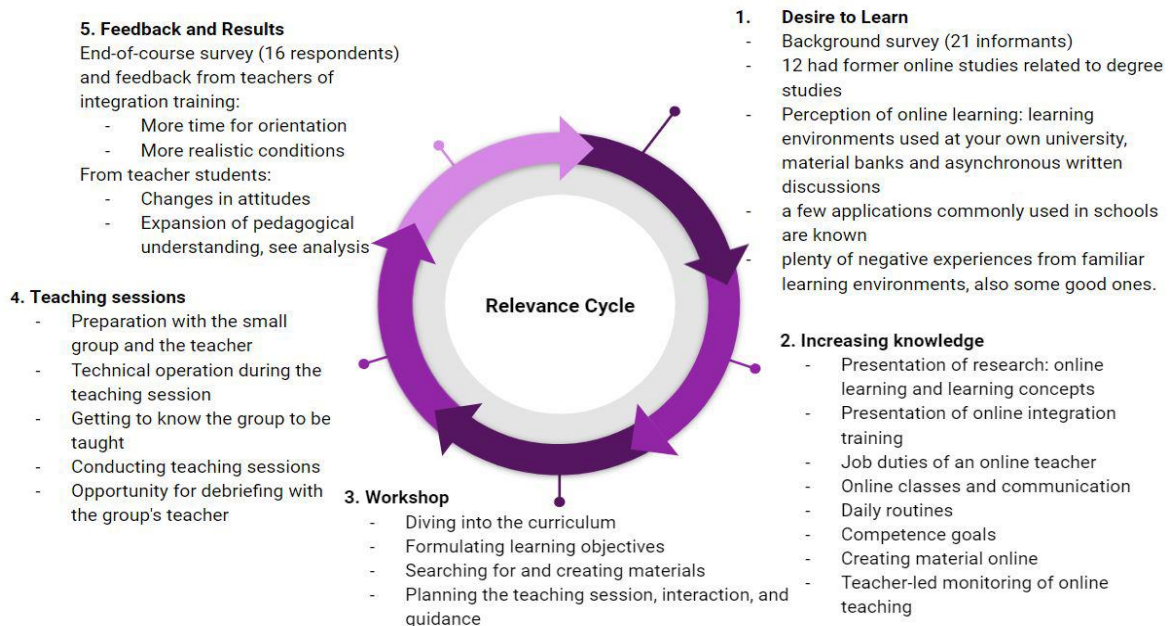- Teacher-led monitoring of online teaching

Figure 2. The Relevance Cycle Addresses the Environment in which the Artifact Evaluation Takes Place

DSR Research aims for updates and additions to the knowledge base (Baskerville et al., 2018). The knowledge base of this study consists of research data in DSR, online learning, sociocultural and socio-constructivist language pedagogy, surveys related to integration training, curricula, online materials, dialogic methods, and frameworks defining the digital skills of teachers.

Implementation Details and Data

In the testing situation, a web-based lesson implemented through video conferencing was part of the artifact to be developed. The orientation of teacher students to online teaching was based on practicing interactive online teaching in actual ongoing integration training groups and planning in small groups. The technical learning component was kept minimal, as it was anticipated that technology could be seen as challenging. The risk was that pedagogical methods, subject content, and guidance might become secondary.

Twenty-one teacher students participated in the demonstration, answering a background survey before and a reflective feedback survey after the exercise. The survey was anonymous, but respondents added an identifier code for comparing the initial and final survey responses. A summary has been compiled from the surveys

(Hartikainen, 2023), from which, by applying the method of thematic analysis (Aronson 1995; Nowell et al. 2017), essential categories for online teaching and fresh ideas for artifact design development were distilled. Background information about respondents' online teaching experiences, attitudes, and perspectives before and after teaching practice was extracted from the summary to facilitate reflecting on the development of participants' knowledge and technological self-efficacy.

The schedule with teacher students was as follows:

Phase 1 September 2019	Background survey, research introduction, presentation of online integration training, duties of an online teacher, virtual classroom, communication, daily routines, learning objectives, creating material online, monitoring online teaching.
Phase 2 October 2019	Workshop: familiarisation with the curriculum, defining learning objectives, finding and creating online materials, design interaction and guidance during teaching sessions.
Phase 3 November 2019	Preparation in small groups, using technology in the teaching situation, getting to know the student group, conducting teaching sessions, debriefing with the student group's teacher, final survey.
Materials	Curriculum, learning objectives, adult L2 textbooks, online materials.

The background survey was designed based on previous induction experiences and research-based (e.g., OECD 2021). Based on the practical answers to the questions, the instructor could assess the teacher's digital competence (Redecker 2017), which would help determine the phase at which introducing a new teacher to online teaching should start.

Of the respondents to the initial survey, 13 believed they could teach online in their work. Six respondents were unsure, and two responded that they did not want to teach online. The segment was conducted just before the COVID-19 lockdown, so attitudes reflect the digital learning environment of 2019. The most significant change is that teachers and teacher trainees at that time thought they could choose to teach online or not if they did not consider themselves "digital persons."

After the teaching session, feedback on the teaching experience was collected through a final survey, which was open for two weeks. The questions were formulated to encourage reflection on the teaching session and interaction situations compared to traditional classroom teaching. It was also designed to consider whether attitudes toward online teaching changed when practiced in a guided and safe environment. As DSR researchers are interested in the weaknesses and alternatives for redesigning educational services, the feedback aimed to provide information on what aspects did not work well. Responses were classified into emerging categories and reflected the Digital Competence for Educators framework (Redecker 2017).

Concerning the paper's authors, Hartikainen and Ahola are familiar with the artifact design and have been its developers and users. For ethical reasons, this can affect the evaluation of survey results, critical examination, and

interpretation. For this reason, Professor Sutinen is also involved as an author in the research, responsible for the objectivity of interpretations.

Description of the Design Process and Analysis

The analysis is divided according to the phases of the relevance cycle (Figure 2). The analysis describes and assesses the usage situation and co-development of the meta-artifact with teacher students. The meta-artifact contains guidelines and teaching practices from which the requirements for the next iteration of the artifact emerge.

Desire to Learn

In the background survey, expectations for the teaching demonstration and the qualities of a good online teacher were inquired. Responses resembled future workplace skills (see, for example, World Economic Forum 2023) (see Figure 3). Interactive (synchronous) online learning was unfamiliar to the respondents. They only had experience with self-paced online courses. Online learning was seen as suitable for independent, self-directed, flexible, self-motivated learners, and those who couldn't attend in-person classes. When asked about expectations for the online teaching demonstration, responses emphasized an interest in learning the basics of online teaching and using technology (see Figure 3).
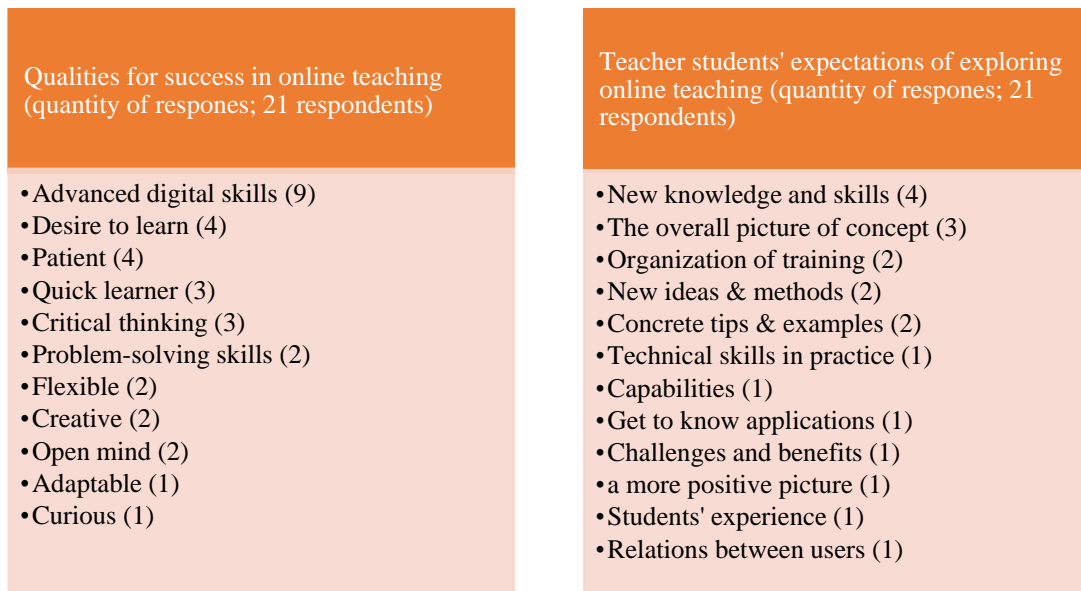
Qualities for success in online teaching (quantity of respones; 21 respondents)	Teacher students' expectations of exploring online teaching (quantity of respones; 21 respondents)
• Advanced digital skills (9) • Desire to learn (4) • Patient (4) • Quick learner (3) • Critical thinking (3) • Problem-solving skills (2) • Flexible (2) • Creative (2) • Open mind (2) • Adaptable (1) • Curious (1)	• New knowledge and skills (4) • The overall picture of concept (3) • Organization of training (2) • New ideas & methods (2) • Concrete tips & examples (2) • Technical skills in practice (1) • Capabilities (1) • Get to know applications (1) • Challenges and benefits (1) • a more positive picture (1) • Students' experience (1) • Relations between users (1)

Figure 3. Qualities for Success in Online Teaching and Teacher Students' Expectations of Exploring Online Teaching

Increasing Knowledge

The introduction of the assessable and developable artifact started with the knowledge base (Figure 1): research on online learning, the DSR method (Hevner, 2007), learning theories, and the zone of proximal development

(Lantolf, 2018). Next, the design used in online integration training was introduced, and attention was given to the working environment: the routines and duties of an online teacher, the virtual classroom, communication and sharing options, and the schedule. The design was created so that even those with limited language skills could manage their study routines: how to navigate the daily schedule, the chat, the group webinars, and smaller groups. The online teacher's guiding role was emphasized. For example, if the day started with a group chat, the teacher ensured that each learner sent their responses to the chat. With interactive methods, presence can be controlled throughout the day as needed, but learning is not tied to a specific location.

Next, teacher trainees familiarised themselves with the curriculum for immigrant integration training (OPH 2012; 2017). Using examples, teacher students considered how the curriculum could be shaped into specific learning objectives, "functions": During one online meeting, one skill was learned, such as typical vocabulary and dialogues in a specific interaction scenario in Finnish society, for example "how do I book a doctor's appointment?" or "how do I order in a restaurant?". Following this, guidance was provided on facilitating online meetings and shaping materials with the idea that in the online environment, less is more, and transferring classroom teaching to the online space only works in exceptional cases. Finally, we followed a Finnish language lesson online and discussed observations. The integration training instructor and the participants were each in their own homes. The group consisted of 12 learners who had video and audio connections to the teacher, as well as a chat function.

Workshop

In the workshop, the curriculum was examined more closely, and thought was given to how learning objectives could be formulated so that the subject taught was not too broad. Teacher students selected learning objectives and familiarised themselves with teaching materials for adult L2 learners. The materials were modified from existing resources to be suitable for online use or created from scratch in small groups. Finally, teaching sessions online were planned, with an emphasis on speaking exercises. Specific attention was requested for guidance and navigation online. Interaction situations were scripted carefully to make it easy for learners to participate: how the screen looked, where the focus should be, how the teacher appeared, presented, and engaged with the learners, individual attention to each, supporting language learning through speech, and guiding the situation forward so that everyone had a chance to practice speaking. Sometimes learners might have a higher threshold for participating in online discussions, but typically, in the group, they quickly get used to the idea that everyone takes turns speaking, or there's another low-threshold way to participate.

Teaching Sessions

The day before the teaching sessions, the opportunity to test audio, video, sharing, and other basic functions in the virtual classroom with the group's teacher was provided. On the day of the lesson, the situation was managed at OKL in such a way that a chat connection had been established with the integration training instructors, who were waiting for teacher trainees in their virtual classrooms. Teacher trainees went 15 minutes before the lesson to test the connections. Small groups were involved in a 60-minute webinar, and each was given 10 minutes to

practice the teaching. The groups were located in different rooms in the OKL building. Getting acquainted and starting teaching is easiest in a calm place, but because the demonstration was part of a didactic course, the didactic instructor hoped to gather at the teacher training institute. Not everyone had their own workspace, and the noise of others could disrupt online teaching. It's possible that the space made the experience uncomfortable for someone. On the other hand, based on feedback and observation, students supported each other when they were in the same place.

Feedback and Results

Based on teacher students' feedback, the central aspects in developing the online training artifact and, on the other hand, how the teaching situation was encountered as a teacher (meta-artifact) were evaluated. In the final survey, weaknesses of online teaching situations were asked, which are compared to the functionality and further development of the online training design (artifact) and the teacher education micro-credential (meta-artifact).

Challenges of online teaching according to teaching trainees (quantity of responses; 16 respondents)

- Technical issues, trust in technology (13)
- Lack of face-to-face interaction (9)
- Limited support (6)
- Individual learning challenges (5)
- Maintaining motivation (3)
- Material loss (2)
- Accessibility (2)
- Platform/application usability issues (2)
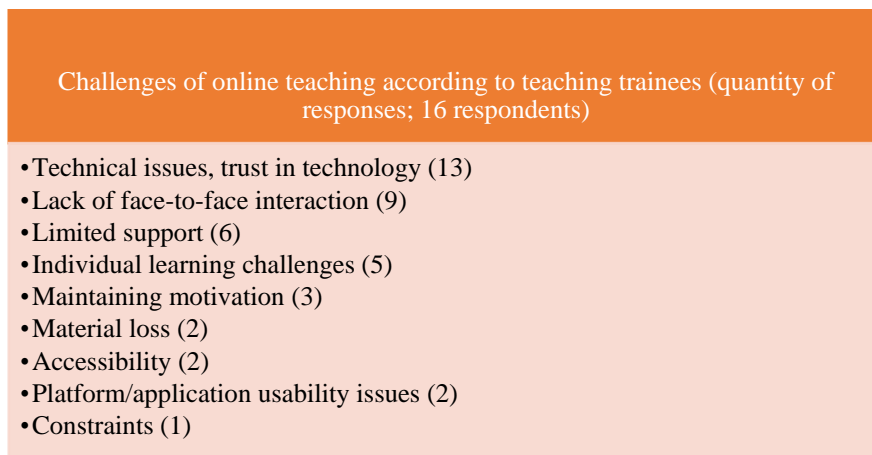- Constraints (1)

Figure 4. Challenges of Online Teaching according to Teaching Trainees

The final survey also investigated the flow of the teaching sessions, a comparison of online and classroom teaching, and the suitability of the teacher to the online environment. For this study, the responses formed three key categories related to the use of design, which are linked to the requirements of the environment produced by the relevance cycle in the meta-artifact and the next design iteration of the artifact.

1. Using Technology in Teaching: In the meta-artifact, sharing, presenting, and using materials, problem-solving; in the artifact, ease of use and functionality of technical features.

2. Pedagogical Design: In the meta-artifact, material and learning method design, learning objectives, management of available learning environments, learners' skill levels; in the artifact, front-end design, visual aesthetics, layout of technological elements.

3. Interaction: In the meta-artifact, confident presentation, group and individual communication, group work, pedagogical guidance; in the artifact, interaction design, technological choices.

Responses highlighted the overlap of pedagogical questions with interaction and technology use. Respondents were in a learning environment as teachers for the first time, and real-time interactivity was new to them. They

found that presenting in an online environment differed from a classroom setting and required more attention. Many felt they needed assistance with the mechanical use of technology. On the other hand, many respondents define "management of technology" as how to facilitate a learning situation, manage content, and interact in the online environment.

Table 2 compares the competencies of digital competence for teachers (Redecker 2017) with improvement suggestions extracted from the final survey, changes in teacher students during the process, and design ideas for the next iteration interpreted by the authors of the article.

Table 2. Teacher's Digital Competence, Improvement Suggestions for the Artifact, Changes in the Meta-artifact, and Design Ideas for the Next Iteration

DigCompEdu	Design Development Proposal (Artifact)	Teacher Student's Transformation (Meta-Artifact)	Ideas for Design 4
Professional engagement: reflectiveness, digital continuous professional development, and collaboration.	Proposed changes mainly due to pedagogical inexperience. How can design guide the teacher?	Mainstreaming; online teaching becomes "common," new teachers better prepared Increased technology orientation	Artificial intelligence, automation, adaptiveness Fixing device and connectivity issues requires significant financial resources
Selecting, creating, and sharing digital tools	Moving from platform-dependent teaching design to the use of diverse methods	Expanding critical thinking: from platform-based to pedagogically dynamic online teaching	Using artificial intelligence and analytics to assist in assessment and development to reduce chaos, automation
Teaching and learning: instruction, guidance, collaboration, self-regulation	Can design ease tension? Considering emotions and moods	Multisensory approaches The impact of facial expressions and gestures on interaction	*Affective computing*: recognising emotions, e.g., with artificial intelligence
Assessment with digital tools	Individual skill levels	Digital differentiation	Competency-based and adaptive learning and assessment
Empowering learners: accessibility, inclusion, differentiation, personalisation, engagement	More room for improvisation? How to address technical issues: audio quality, connections?	The concept of building structured digital interaction situations Facilitation skills in design	Lightweight, mobile, accessible technologies that enhance audio and image quality
Promoting learners' digital skills	A single learning environment with	Acceptance of continuous development	Is it possible to build one dynamically functioning

everything needed (as opposed to the current design built from different applications)	processes A broader understanding of the teacher profession The ability to tolerate that there's no finished, unchanging concept	learning application that responds to societal changes and works synchronously with employer organisations?

Discussion

This research aimed to investigate how the participation of teacher students in the design of the online integration training artifact led to the development of a meta-artifact that could form the basis for a micro-credential in teacher education to support teachers' professional development in a meaningful way (Hunt et al., 2020). Additionally, the study provided insights into the interplay of teachers' technological and pedagogical competencies and highlighted issues that can be addressed either through pedagogical expertise in technically straightforward environments or through the development of technologies. Research question asked: What experiences did student teachers have about participating in the design process?

The results show the following. First, teachers' beliefs about the nature of teaching and learning determine their pedagogical choices (OECD, 2014). Professional development enhances teachers' technological self-efficacy, leading to the use of technology in teaching (Afari et al., 2023). Their attitudes and experiences provided further information about the technological self-efficacy at the initial stage, and how the content related to online teaching should be designed in teacher training. The survey responses contribute to designing new technologies that address pedagogical challenges and consider the accessibility aspects of online learning environments.

Language is learned through interaction, and learning occurs within the zone of proximal development, even online (see Lantolf, 2018). To provide learners with positive experiences and an interaction-encouraging context (Zhang, 2022), it is necessary to consider that there are technically achievable opportunities for spontaneous questions and multi-directional interaction, which teachers can exploit and guide pedagogically so that learners become adept interactors and participants in the online environment.

Second, the meta-artifact includes guidelines and practices for operating within the online training artifact. Validating the meta-artifact can be challenging because it can be an abstract approach or method to system development (Iivari, 2003). Key elements in the design of the meta-artifact emerge from the relevance cycle of the artifact (see Figure 1 and 2), whose stages allowed for the design and evaluation of the meta-artifact as the design process of the artifact, with additions and deletions, was underway simultaneously. Based on this research, a comprehensive learning module for teacher training or professional development in online teaching could be created.

Third, regarding how the evaluation situation improved the online training artifact, information was obtained about pedagogical needs and ideas for design improvement. The DSR process worked well as a method because

the iterative process incrementally provides information about how learning design should be developed and what kind of knowledge teachers need. Observations during the design process were assessed, providing justifications for changes in mindset and teaching concepts, and their consolidation and prerequisites were critically reviewed. The findings support other research on teachers' technological self-efficacy, where key competency areas include subject matter knowledge, communication, and the use of technology in teaching (Gözum, 2023). The design ideas are recognised but require more financial resources than what can be obtained from the public sector for education services. For example, developing solutions for automation and adaptivity and promoting language learning and interaction through AI solutions are slow and expensive.

When studying a design case, it is desirable to analyse the negative and unsuccessful aspects of the design (Smith 2020). This is important because research whose result is the entire described design process provides readers with valuable information about any phase or detail of the process. It is part of knowledge construction and enhances the quality of the design process when the choices made in the development of design are explained (Howard 2012; Smith 2010). Considering this, it can be asserted that the version of the design evaluated by the teacher students is technically lighter than its predecessors but still heavy to use. It should be more accessible and lightweight, with particular attention to audio quality. Technical issues like internet disruptions negatively affect the teaching experience and teachers' self-efficacy (Celik, 2021). Improving accessibility and usability of the design is facilitated when technical practices and the basic functions of applications used in teaching, such as video, audio, chat, and small groups, are familiar (Santagata et al., 2023).

The data were collected anonymously because the goal was not to collect personal viewpoints but to categorise general attitudes, thoughts, and experiences regarding online teaching. Respondents were not experienced teachers, and they did not have prior experience as online instructors. For this reason, it was meaningful for the researchers, who are experienced online instructors and learning designers, to form categories from the responses that represent advanced online teaching based on research, rather than providing direct quotations. The risk is that design experience, the commercial goals of the companies providing training, and the societal context in a current topic related to solving labour market issues may influence observations. The research process must be open, but at the same time, it is essential to be aware of the risks posed by external influences on data interpretation in the research conversation.

Future Research and Development

Adult education organised through tenders is evolving rapidly and has changed significantly since online integration training began in 2015. It requires sustained, practical research and an understanding of the factors that affect the organisation, implementation, and quality of education, such as societal changes, the business world, knowledge base, skills, expectations of the target group, and the resources of education service providers.

As online teaching becomes more widespread, the role of teachers has expanded. Teachers of integration training prepare learners for the job market and work closely with the business and corporate world. How can teacher education keep up with these changes? How is the success of education measured? Teacher competencies require

risk-taking ability, an entrepreneurial attitude (Peltonen et al., 2021), new forms of collaboration (co-teaching, corporate partnerships), and the ability to tolerate constant changes in teaching concepts. Additionally, ethical issues related to online teaching should be examined, such as technology use contexts, equal opportunities for use, and cybersecurity, as there are specific risks related to cybersecurity for immigrant students.

In the online implementation of integration training, it is essential to ensure that everyone acquires sufficient language skills for their life and employment in Finnish society. Adaptive learning environments need to be developed because adaptive online learning offers individualised progress possibilities and pathways, and adaptive assessment is necessary to obtain information about guidance needs and the required changes in education design, as well as to understand learners as individuals. The development of systems requires funding models targeted at long-term research and development work.

Online teaching involves detailed guidance, which can be digitally shaped in various manners. Teacher communities need educators specialised in learning design whose responsibilities include supporting design work, institutionalising common practices, and ensuring the uniformity of teaching. Online learning design should be practiced under guidance to provide teachers with support in building interaction situations and developing technical, pedagogical, and linguistic accessibility.

Online teaching presents uncertainties in self-efficacy, and it is viewed as a matter of choice that one can refuse. Working via the Internet should be an equal way to teach. Further research is required to understand how teachers' online teaching skills have been practiced. The initial phase of the COVID-19 pandemic was exceptional when educational institutions provided training for teachers. Now that the worst phase of remote teaching is over, is there a risk that new teachers lack practice in online teaching?

Recommendations

To ensure that teachers have the readiness and prerequisites to design qualified online learning, we recommend the following for teacher training:
1. Orientation to enhance online teacher self-efficacy.
2. Practice in online interaction and presentation skills.
3. Training in basic technological practices.
4. Training in culturally diverse encounters, including online interactions in accessibility, inclusivity and security point of view.

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References

Afari, E., Eksail, F., Khine, M. & Alaam, S. (2023). Computer self-efficacy and ICT integration in education: Structural relationship and mediating effects. *Education and Information Technologies, 28*, 12021-12037. https://doi.org/10.1007/s10639-023-11679-8

Ahola, M. & Hartikainen, A. 2022. Lesson Learned of Tablet Course for Semi-literate Immigrants. In book Ahram, T., & Taiar, R. (Eds.). (2022). Human Interaction & Emerging Technologies (IHIET-AI 2022): Artificial Intelligence & Future Applications (Vol. 23). AHFE International. Doi: http://doi.org/10.54941/ahfe100844

Ahola, M. & Hartikainen, A, Sutinen E. (2024). Inclusion by Integration: Designing Online Training for New Immigrants as Future Workforce Contributors to Finnish Society. [Manuscript submitted for publication]

Aronson, J. (1995). A Pragmatic View of Thematic Analysis. *The Qualitative Report, 2*(1), 1-3. https://doi.org/10.46743/2160-3715/1995.2069

Arrosagaray, M., González-Peiteado, M., Pino-Juste, M. & Rodríguez-López, B. (2019). A comparative study of Spanish adult students' attitudes to ICT in classroom, blended and distance language learning modes. *Computers & Education, 134*, 37-38. https://doi.org/10.1016/j.compedu.2019.01.016

Baskerville, R., Baiyere, A., Gregor, S., Hevner, A. & Rossi, M. (2018). Design Science Research Contributions: Finding a Balance between Artifact and Theory. *Journal of the Association for Information Systems, 19*(5), 358-376. https://doi.org/10.17705/1jais.00495

Council of Europe (2020). *Common European Framework of Reference for Languages: Learning, teaching, assessment – Companion volume*. Council of Europe Publishing, Strasbourg. www.coe.int/lang-cefr

Celik, B. (2021). Prospective Foreign Language Teacher Candidates' Views on the Use of Communication Technologies in Foreign Language Education and Their Self-Efficacy Beliefs: Case of Erbil, Iraq. *International Journal of Social Sciences & Educational Studies, 8*(1). pp. 59-72. https://doi.org/10.23918/ijsses.v8i1p59

Ali-Yrkkö, J., Kässi, O., Pajarinen, M., & Rouvinen, P. (2023). *Digibarometer 2023: Data, AI, and Economic Growth*. Taloustieto Oy, Helsinki. https://www.etla.fi/en/publications/other-publications/digibarometri-2023-data-tekoaly-ja-talouskasvu/

Doil, M., & Pietzner, V. (2023). Structure of Science Teacher Education in PISA Leading Countries: A Systematic Review. *Education Sciences, 13*(8), 826. https://doi.org/10.3390/educsci13080826

The European Framework (2003). *The Common European Framework for Learning, Teaching, and Assessment of Languages*. EVK. WSOY.

Gözüm, A., Metin, Ş. & Uzun, H. (2023). Developing the Teacher Self-Efficacy Scale in the Use of ICT at Home for Pre-school Distance Education During Covid-19. *Technology, Knowledge and Learning, 28*, 1351-1381. https://doi.org/10.1007/s10758-022-09616-8

Haikala, R. (2019). *Immigrant integration trainings online at Arffman* 4/2015-6/2019. https://www.gimaraworld.com/research/onlinedata/

Haikala, R., & Kuja-Lipasti, J. (2021). *Immigrant integration trainings online at Arffman* 4/2015-1/2021. https://www.gimaraworld.com/research/onlinedata/

Hartikainen, A., Ahola, M., Apiola, M., & Sutinen E. (2020). The immigrant integration online training program in Finland, 2020 43rd International Convention on Information, Communication and Electronic Technology (MIPRO), 2020, pp. 872-877, doi: 10.23919/MIPRO48935.2020.9245168.

Hartikainen, A. (2023) Summary of digital pedagogy research surveys for mother tongue and literature and Finnish as a second language for student teachers. https://www.gimaraworld.com/research/onlinedata/

Hevner, A., March, S., Park, J. & Ram, S. (2004). Design science in information systems research. *MIS quarterly,* 75-105. https://doi.org/10.2307/25148625

Hevner, R. (2007). A three cycle view of design science research. *Scandinavian Journal of Information Systems, 19*(2), 4. https://aisel.aisnet.org/sjis/vol19/iss2/4

Howard, C. D., Boling, E., Rowland, G., & Smith, K. M. (2012). Instructional Design Cases and Why We Need Them. Educational Technology, 52(3), 34–38. http://www.jstor.org/stable/44430039

Hunt, T., Carter, R., Zhang, L. & Yang, S. (2020). Micro-credentials: the potential of personalized professional development. *Development and Learning in Organizations, 34*(2), 33-35. https://doi.org/10.1108/DLO-09-2019-0215

Hyypiä M., & Khan R. (2018). Overcoming barriers to frugal innovation: Emerging opportunities for finnish SMEs in Brazilian markets. *Technology Innovation Management Review, 8*(4), 38-48. http://doi.org/10.22215/timreview/1150

Iivari, J. (2003). The IS core-VII: Towards information systems as a science of meta-artifacts. *Communications of the Association for Information Systems, 12*(1), 37. Doi:10.17705/1CAIS.01237

Kekki, M., Ronkainen, R., Seppälä, T. & Weide, M. (2023). Kotoutumiskoulutuksen opetussuunnitelman perusteet kuvaa tavoitettaan osallisuutta epämääräisesti ja kapeasti. *Aikuiskasvatus, 43*(1-2), 90-97. https://doi.org/10.33336/aik.126145

Eligibility requirements. Finnish Teachers Association (referred to 20th Sep. 2023) https://www.suomenopettajat.fi/opiskelu-suomen-opettajaksi/kelpoisuusvaatimukset/

The Act on the Promotion of Immigrant Integration (2010). 1386/2010. https://finlex.fi/en/laki/kaannokset/2010/en20101386

The Act on the Promotion of Immigrant Integration (2023). 681/2023. https://tem.fi/en/project?tunnus=TEM100:00/2019

Lantolf, J. P. (2011). Integrating sociocultural theory and cognitive linguistics in the second language classroom. In Hinkel, E. (eds.), *Handbook of research in second language teaching and learning*, Volume II (303-318). New York: Routledge.

Lee, N. & Ogawa, C. (2021). Online Teaching Self-Efficacy – How English Teachers Feel During the Covid-19 Pandemic. *Indonesian TESOL Journal, 3*(1), 1-17. https://doi.org/10.24256/itj.v3i1.1744

The Finnish Immigration Service. (2023). *Immigration to Finland*. 23/1. https://migri.fi/documents/5202425/166014458/Maahanmuutto+Suomeen+1_23.pdf

Mikkilä-Erdmann, M., Warinowski, A. & Iiskala, T. (2019). Teacher Education in Finland and Future Directions. *Oxford Research Encyclopedia of Education.*

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods, 16*(1). https://doi.org/10.1177/1609406917733847

OECD (2021). *PISA ICT Framework. OECD 2018*. https://www.oecd.org/pisa/sitedocument/PISA-2021-ICT-Framework.pdf

OECD (2014). TALIS 2013 Results: An International Perspective on Teaching and Learning. *TALIS, OECD*

Publishing, Paris, http://dx.doi.org/10.1787/9789264196261-en

OPH = The Finnish National Agency for Education. (2012). *Curriculum Guidelines for Adult Immigrant Integration Training. Regulations and Instructions 2012:1.* Helsinki: The Finnish National Agency for Education. Retrieved from https://www.oph.fi/sites/default/files/documents/139342_aikuisten_maahanmuuttajien_kotoutumiskoul utuksen_opetussuunnitelman_perusteet_2012.pdf

OPH = The Finnish National Agency for Education. (2017). *Curriculum Guidelines for Adult Basic Education 2017. Regulations and Instructions 2017:9a.* Helsinki: The Finnish National Agency for Education. https://www.oph.fi/sites/default/files/documents/aikuisten_perusopetuksen_opetussuunnitelman_perust eet_2017.pdf

OPH = The Finnish National Agency for Education. (2022). *Curriculum Guidelines for Integration Training. Regulations and Instructions 2022:1a*. Helsinki: The Finnish National Agency for Education. https://www.oph.fi/fi/tilastot-ja-julkaisut/julkaisut/kotoutumiskoulutuksen-opetussuunnitelman-perusteet-2022

Pan, X. (2022). Exploring the multidimensional relationships between educational situation perception, teacher support, online learning engagement, and academic self-efficacy in technology based language learning. *Frontiers in Psychology, 13*, 1000069. doi:10.3389/fpsyg.2022.1000069

Peffers, K., Tuunanen, T., Rothenberger, M. & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems, 24*(3), 45-77, doi:10.2753/MIS0742-1222240302

Peltonen, K., Niiranen, S., Ikäheimonen, T. & Oikkonen, E. (2021). An overview of the current state and future directions of Finnish entrepreneurship education research. *Ammattikasvatuksen aikakauskirja, 23*(1), 4-26. https://journal.fi/akakk/article/view/107441

Redecker, C., (2017). DigCompEdu. In Punie, Y., (eds.). *European Framework for the Digital Competence of Educators*. Publications Office of the European Union, Luxembourg. doi:10.2760/159770

Santagata, R., Villavicencio, A., Wegemer, C., Cawelti, L. & Gatlin-Nash B. (2023). "I have been pushed outside of my comfort zone and have grown as a result": Teacher professional learning and innovation during the pandemic. *Journal of Educational Change*. https://doi.org/10.1007/s10833-023-09491-9

Seppälä, T. (2022a). Finnish as a second language learners' agency in the context of the individualised practices of Integration Training. In Seppälä, T., Lesonen, S., Iikkanen, P. & D'hondt S. (eds*.) Language, Change and Society*. AFinLA's annual review.

Seppälä, T. (2022b). Koulutustaustan ja lähtötaitotason merkitys suomen kielen oppimiselle kotoutumiskoulutuksessa. *Puhe ja Kieli, 42*(1), 17-44. https://doi.org/10.23997/pk.119692

Smith, K.M. (2010). Producing the Rigorous Design Case. International Journal of Designs for Learning, 1(1), 9-20. https://scholarworks.iu.edu/journals/index.php/ijdl/article/view/917

Official Statistics of Finland (OSF): Citizenships granted [online publication]. (2022*). Helsinki: Statistics Finland* [Referenced: 6.11.2023]. https://stat.fi/en/publication/cl88hxccgjhd90cvvuhl0a4gp

Suomi/ruotsi toisena kielenä -opetuksen nykytilan arviointi. (2022). *Owal Group*. https://owalgroup.com/wp-content/uploads/2022/03/S2-opetuksen_arviointi_170322.pdf

TEM = Ministry of Economic Affairs and Employment of Finland (2023). *Osaajatarpeisiin vastaaminen*

työvoiman maahanmuutolla ja Suomessa jo olevien maahanmuuttajien osaamisen tehokkaammalla hyödyntämisellä. Retrieved from https://tem.fi/documents/1410877/163665975/Osaajatarpeisin+vastaaminen_maahamuutto+ja+kotoutuminen.pdf/79ff3141-debd-d639-3a3f-c9dbd5c77465/Osaajatarpeisin+vastaaminen_maahamuutto+ja+kotoutuminen.pdf?t=1685624037435

Ustun, U., & Eryilmaz, A. (2018). Analysis of Finnish Education System to Question the Reasons behind Finnish Success in PISA. *Studies in Educational Research and Development, 2*(2), 93-114.

Valkonen, L., Tyrväinen, H. & Uotinen, S. (2020). Luottamuksen rakentuminen verkkokoulutuksessa. Kasvatus, 51(1), 21-37. http://urn.fi/URN:NBN:fi:jyu-202004152761

Vuorikari, R., Kluzer, S. & Punie, Y., (2022). *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes.* Publications Office of the European Union, Luxembourg. doi:10.2760/115376

VTV = National Audit Office in Finland (2018). *Conclusions and recommendations of the National Audit Office 15/2018.* Helsinki: National Audit Office in Finland. http://urn.fi/urn:isbn:978-952-499-431-6

World Economic Forum (2023). *The Future of Jobs Report 2023.* https://www.weforum.org/reports/the-future-of-jobs-report-2023/

Zhang, Y., (2022). The Effect of on Educational Technology on EFL Learners' Self-Efficacy. *Frontiers in psychology, 13.* 881301-881301. https://doi.org/10.3389/fpsyg.2022.881301

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