Empowering education professionals with twenty-first century skills through master's dissertation/thesis work

Drawing upon a larger cross-national study, this paper explores the role of master's dissertation/thesis work in developing twenty-first century skills. Data was gathered via survey questionnaire from 600 education professionals enrolled in master's degree programmes in education offered in five countries: Poland, Portugal, England, Latvia, and Romania. The findings have revealed that participants recognise the usefulness of twenty-first century skills for their (future) professional practice, and perceive master's dissertation/thesis work as a valuable foundation for developing these skills. This study offers practical implications for master's course designers and contributes to our understanding that this assignment is not only a formal requirement for obtaining a degree, but that it also serves as a pathway towards deepening students' professional learning.

Keywords: twenty-first century skills; master's dissertation/thesis; master's level education; education professionals; twenty-first century education

Introduction and background

It is generally agreed in research and policy discourse that schools have a special responsibility to assist learners and students in acquiring and developing twenty-first century skills and, thus, preparing them to become pro-active workers and citizens (Burakgazi et al., 2019; Kim et al., 2019; Nieveen & Plomp, 2018; Schleicher, 2012). However, in order to do this effectively, education professionals should also possess and develop these skills within themselves (Chu et al., 2017; Gordon et al., 2009; Kim et al., 2019; Saavedra & Opfer, 2012; Sang et al., 2018). With this need in mind, many higher education institutions include twenty-first century skills in their mission statements, graduate profiles, or learning outcomes (Chan et al., 2017). However, even with these efforts, little is known about how exactly these skills should be best taught, supported, and guided in academic settings (van de Oudeweetering & Voogt, 2018; Virtanen & Tynjälä, 2019). As such, an important, but still unexplored, question remains regarding how students' engagement in research practices can foster their twenty-first century skills (Niemi & Nevgi, 2014). This study aims to address this knowledge gap by examining the potential role of the master's dissertation/thesis work[1] (MDTW) as a foundation for developing

[1] We used both terms 'dissertation' and 'thesis' together, as there are some differences in translation preferences and terminology in countries included in this study.

twenty-first century skills, as perceived by education professionals enrolled in master's degree programmes in education offered in five countries: Poland, Portugal, England, Latvia, and Romania. We define 'education professionals' as those professionals whose interest or work encompasses education-related activities (e.g. teachers, school counsellors, special needs educators).

Several frameworks and interpretations of what 'twenty-first century skills' means have been developed by government agencies and international organisations (e.g., Binkley et al., 2012; P21, 2015; Sala et. al., 2020), providing a broad list of skills and abilities 'transversal' across many fields, helping individuals to deal innovatively with challenging and unpredictable work situations (Voogt & Roblin, 2012). For example, according to the *Partnership for 21st Century Skills* framework (P21, 2015), the following categories are crucial for contemporary work settings: life and career skills (flexibility; adaptability; initiative; self-direction; social skills; cross-cultural skills; productivity; accountability; leadership; responsibility); learning and innovation skills (critical thinking; problem solving; communication; collaboration; creativity; innovation); and information, media and technology skills (media literacy; information literacy; ICT literacy). The EU *LifeComp* framework (Sala et al., 2020) also categorises competencies: personal (self-regulation, flexibility, wellbeing); social (empathy, communication, collaboration); and learning to learn (growth mindset, critical thinking, and managing learning). Even though such categorisations prioritise skillsets differently, there are common skills highlighted as vital across the board: communication skills, collaboration, information literacy skills, social and/or cultural awareness, creativity, critical and scientific thinking skills, as well as problem solving skills (Dede, 2010; Voogt & Roblin, 2012).

Although most of the above-mentioned frameworks have been developed for informing school curricula (Bourn, 2018), they are closely tied to ongoing debates regarding what kind of knowledge and skills educators themselves should possess. Indeed, as recent studies indicate, contemporary teachers and school leaders should be 'high-level knowledge workers who constantly advance their own professional knowledge as well as that of their profession' (Schleicher, 2012, p. 11) and constructors of new knowledge, rather than simply transmitters of information by rote (Cai & Gut, 2020; Häkkinen et al., 2017; Niemi & Nevgi, 2014). Furthermore, working in twenty-first century classrooms requires the use of innovative teaching and learning methods, ICT technology, incorporation of research results into the teaching process - as well as effective communication with students from a diverse range of backgrounds (Darling-Hammond & Lieberman, 2012; Häkkinen et al., 2017; Kereluik et al., 2013; Niemi &

Nevgi 2014). As such, this process depends on a capacity for critical thinking, independent and collaborative inquiry, and problem-solving skills (Häkkinen et al., 2017).

For the purpose of this study, a list of twelve twenty-first century skills was derived from these previous reviews: data gathering and organisation; analysing data and drawing conclusions independently; good organisation of own work; autonomously proposing solutions to problems; learning new skills quickly; providing informed arguments to defend own views; interpersonal communication; teamwork; people management; complying with ethical principles; continuously deepening knowledge and skills; and self-reflection before modifying actions accordingly. Our selection of these skills was based primarily on the following criteria: (a) they are essential for education professionals in the process of designing of twenty-first century learning environments (Kim et al., 2019; Schleicher, 2012); (b) they are reflected in the educational aims and learning outcomes of master's programmes at the universities involved in this study; and (c) they refer to a wide range of concepts currently considered as central to shaping the future of education (Sala et al., 2020).

The master's dissertation/thesis is a key element in completing this level of study, with outcomes focused on an understanding of, and an ability to conduct, research (Macfadyen et al., 2019). However, research has shown that MDTW has the further potential to develop skills and abilities that are useful for and transferable to professional practice (Eklund et al., 2019; Kowalczuk-Walędziak et al., 2019; Maaranen, 2010; Råde, 2014), including: problem-solving skills; independent learning; critical thinking; a sense of responsibility and diligence; communication skills; teamwork skills; the ability to write and plan in-depth work; self-discipline; and data analysis skills. However, although these studies report outcomes that may be recognised as attributable to 'twenty-first century skills,' few explicitly connect or label such findings in these terms. For example, Niemi & Nevgi (2014) note that 'research studies in TE can prepare teachers for the role they are expected to fulfill when promoting twenty-first century skills and simultaneously bring additional value to teachers' professional duties in schools and classrooms' (p. 140). Given that the dissertation/thesis is an empirically-based piece of work presented in a rigorous, highly structured academic format, we believe that focusing on this component of master's degree programmes may shed more light on the relationship between research studies and twenty-first century skills.

Method

Research context and participants

This investigation is part of a larger survey-based study into master's level students in education across five European countries: Poland, Portugal, England, Latvia, and Romania (see Kowalczuk-Walędziak et al., 2019). From the original sample of 645 participants, a sub-group of 600 participants involved in master's programmes in education with a dissertation/thesis as the final element in obtaining the degree was chosen for this study.[2] The participants represented over fifteen master's courses across a wide range of fields (e.g., elementary education, English language teaching, special needs education and inclusion, leadership and management, school counselling) offered in the authors' own universities (or other higher education institutions in the case of Portugal). In all cases, this dissertation/thesis required students to design and complete a piece of research on a clearly defined topic under the supervision of a faculty member.

Of the respondents, 30.7% were from Poland, 12.7% from Portugal, 16.5% from England, 16.3% from Latvia, and 23.8% from Romania. The vast majority of participants were female (91.7%) while 8.3% were male, and their ages ranged from 21 to 58 years (M = 29.18 years; SD = 8.34). 9.8% of participants did not indicate their ages. At the time of study, 58.0% of participants had already been working in the education sector (e.g. as teachers, school counsellors, and speech therapists). The years of professional experience among the participants ranged from one year to 38 years (M = 4.93 years; SD = 7.64).

Data collection and analysis

The data was collected through a survey questionnaire, offered in the official language of the participants' countries of residence, distributed in both paper and online formats either by the researchers themselves or their university colleagues. Participation in this survey was voluntary and anonymous. The questionnaire was composed of four main sections: (1) the participants' demographic information; (2) the participants' experience of their master's degree programmes in general; (3) the participants' experience of completing their master's degree final projects; and (4) the participants' suggestions for improving the quality of their master's programmes to better prepare them for their professional work.

The data yielded by the two skill-based questions in the third section of the questionnaire was used to address the research questions of the present study. In the first question, the participants were asked to evaluate the usefulness of each of the twelve twenty-first century

[2] The other 45 participants, all experienced teachers from Portugal, were excluded on the basis that they had already graduated from their programmes at the time of the study.

skills for their (future) educational practice: 'To what extent can the skills listed below be useful for your (future) professional practice?' Respondents rated these skills on a five-point Likert scale from 1 (extremely useless) to 5 (extremely useful). In the second question, a similar scale was used to evaluate the potential contribution of MDTW to the development of each of these skills: 'To what extent has your master's degree diploma work been a good foundation for developing the skills listed below?' Again, respondents rated each skill on a five-point Likert scale from 1 (not at all) to 5 (to a very large extent).

The survey data was analysed with descriptive statistics and non-parametric tests. Mean, standard deviation, and frequency counts were calculated. The Mann-Whitney U test was used to determine if there were significant differences associated with gender (male/female) and employment status (working/not working). The Kruskal-Wallis H test was used to determine the level of significance (if any) of differences based on participants' age (under 24/25-35/36-45/ 46-54/55 and over) and country of residence (Poland/Portugal/England/Latvia/Romania).

Results and discussion

Perceived usefulness of twenty-first century skills for professional practice

We first asked the respondents to rate the usefulness of each of the twelve twenty-first century skills for their (future) professional practice. The participants perceived all of them to be highly useful, with the mean ratings for nearly all skills (ten out of twelve) higher than 4.50 (Table 1). This indicates that participants do indeed appreciate the skills that are considered essential for successful teaching and learning in twenty-first century learning environments (Kim et al., 2019; Schleicher, 2012).

Table 1. Mean differences between the ratings for perceived skill usefulness and the contribution of MDTW to twenty-first century skills development

Skills	The perceived contribution of MDTW to twenty-first century skill development*	Skill gap	The perceived usefulness of twenty-first century skills for (future) professional practice**
continuously deepening knowledge and skills	4.47	-0.21	4.68
good organisation of own work	4.37	-0.31	4.68
interpersonal communication	4.22	-0.44	4.66

self-reflection before modifying actions accordingly	4.39	-0.23	4.62
providing informed arguments to defend own views	4.26	-0.34	4.60
complying with ethical principles	4.21	-0.37	4.58
learning new skills quickly	4.15	-0.40	4.55
teamwork	3.82	-0.72	4.54
analysing data and drawing conclusions independently	4.42	-0.11	4.53
autonomously proposing solutions to problems	4.20	-0.32	4.52
data gathering and organisation	4.36	-0.09	4.45
people management	3.68	-0.62	4.30

* Standard deviations for ratings of MDTW contribution to development of each twenty-first century skill ranged from 0.728 to 1.194.

** Standard deviations for usefulness ratings ranged from 0.570 to 0.860.

There were statistically significant variations in the perceived usefulness of skills depending on the participants' demographic profile (Table 2)[3]. However, as the sample size from each country is relatively small and diverse, it is not justified to make any strong conclusions about the nature of these differences. Instead, we believe that this may be a starting point for further discussions and research.

Table 2. Perceived usefulness of twenty-first century skills for professional practice by participants' demographics

Skills	Gender	Age	Employment status	Country

[3] In Table 2 and Table 3 we report only the *p*-values for the results of the Mann-Whitney U and Kruskal-Wallis H tests.

continuously deepening knowledge and skills	0.192	0.019*	0.000**	0.000**
good organisation of own work	0.123	0.977	0.377	0.002**
interpersonal communication	0.038*	0.391	0.241	0.000**
self-reflection before modifying actions accordingly	0.262	0.025*	0.000**	0.000**
providing informed arguments to defend own views	0.745	0.508	0.003**	0.000**
complying with ethical principles	0.007**	0.031*	0.001**	0.000**
learning new skills quickly	0.253	0.071	0.002**	0.017*
teamwork	0.005**	0.327	0.498	0.023*
analysing data and drawing conclusions independently	0.589	0.922	0.182	0.000**
autonomously proposing solutions to problems	0.101	0.720	0.000	0.006**
data gathering and organisation	0.665	0.160	0.156	0.012*
people management	0.852	0.022*	0.000**	0.000**

**p < .05; **p < .01*

Country. Overall, the participants from Portugal, Romania, and Latvia assigned a higher rating to nearly all of the twenty-first century skills in comparison to participants from Poland and England. Interestingly, participants from England rated the usefulness of each skill as consistently lower than participants from other countries.

Employment status. Participants who were employed in education at the time of the study assigned a higher mean rating to the usefulness of nearly all the twenty-first century skills than those who were not working in the sector; however statistically significant differences were

found for the following skills: ‘continuously deepening knowledge and skills’; ‘self-reflection before modifying actions accordingly’; ‘providing informed arguments to defend own views’; ‘complying with ethical principles’; ‘learning new skills quickly’; and ‘people management.’ These results indicate that those with existing professional experience value these skills more highly than those without, suggesting that such skills are valuable for successful work, thus should be put into focus in master’s programmes.

Age. Although the participants aged 46-54 rated the usefulness of all the twenty-first century skills for (future) professional practice more highly than participants under the age of 24, statistically significant differences were found for ‘continuously deepening knowledge and skills’; ‘self-reflection before modifying actions accordingly’; ‘complying with ethical principles’; and ‘people management.’

Gender. Female participants, overall, rated the usefulness of all twenty-first century skills more highly than their male counterparts, however statistically significant gender-based differences emerged only for ‘interpersonal communication’; ‘teamwork’; and ‘complying with ethical principles.’

Perceived contribution of MDTW to twenty-first century skills development

Respondents were then asked to indicate the extent to which their MDTW had been a good foundation for developing twenty-first century skills. Table 1 shows that the majority of participants perceived MDTW as a good foundation for developing twenty-first century skills, as the mean ratings for ten of the twelve specified skills were higher than 4.00. The top-ranked skills were: ‘continuously deepening knowledge and skills’ (M=4.47), ‘analysing data and drawing conclusions independently’ (M=4.42), ‘self-reflection before modifying actions accordingly’ (M=4.39), and ‘data gathering and organisation’ (M=4.36). These skills can collectively be described as research-orientated, cognitive, personal, and fundamental for life-long learning. On the contrary, ‘teamwork’ (M=3.82) and ‘people management’ (M=3.68) skills were rated comparatively lower, possibly because the majority of a student’s work on their master’s dissertation/thesis is done individually, with the guidance of a supervisor in a more or less one-on-one relationship (de Kleijn et al., 2012).

There were some statistically significant differences in the perceived contribution of MDTW to twenty-first century skills development depending on the participants’ demographics (Table 3).

Table 3. Perceived contribution of MDTW to twenty-first century skills development by participants' demographics

Skills	Gender	Age	Employment status	Country
continuously deepening knowledge and skills	0.144	0.001**	0.000**	0.000**
good organisation of own work	0.130	0.117	0.006**	0.000**
interpersonal communication	0.000**	0.004**	0.002**	0.000**
self-reflection before modifying actions accordingly	0.191	0.060	0.001**	0.000**
providing informed arguments to defend own views	0.383	0.000**	0.000**	0.000**
complying with ethical principles	0.047*	0.000**	0.000**	0.000**
learning new skills quickly	0.570	0.000**	0.000**	0.000**
teamwork	0.004**	0.001**	0.019**	0.000**
analysing data and drawing conclusions independently	0.033*	0.152	0.000**	0.000**
autonomously proposing solutions to problems	0.089	0.081	0.000**	0.000**
data gathering and organisation	0.122	0.050*	0.002**	0.000**
people management	0.245	0.000**	0.000**	0.000**

$* p < .05$; $** p < .01$

Country. The contribution of MDTW to the development of all twenty-first century skills was rated most highly by participants from Romania, with mean ratings for the majority of skills over 4.60. In contrast, participants from Poland gave the lowest rating to the following skills: 'people management,' 'complying with ethical principles,' and 'learning new skills quickly.' Conversely, participants from Portugal allocated relatively high ratings to the significance of MDTW for developing 'interpersonal communication' and 'teamwork.' Data from other countries did not show statistically significant differences.

Employment status. Participants who were employed in the education sector were more convinced than those who were not that MDTW provides education professionals with twenty-first century skills, assigning comparatively higher mean ratings for all skills.

Age. There were also some statistically significant variations according to age demographic, with older respondents (40-54) assigning higher ratings than those under 24 for eight of the skills: 'continuously deepening knowledge and skills,' 'data gathering and organisation,' 'providing informed arguments to defend own views,' 'interpersonal communication,' 'complying with ethical principles,' 'learning new skills quickly,' 'team work,' and 'people management.'

Gender. Female participants assigned greater significance to MDTW than male participants for developing four skills: 'analysing data and drawing conclusions independently,' 'interpersonal communication,' 'complying with ethical principles,' and 'teamwork.'

Skill gap

In order to more deeply explore the contribution of MDTW to twenty-first century skills development, the 'skill gap' was examined. Following the approach suggested by Sinche et al. (2017), a skill gap was calculated as the mean difference between how well a given skill was developed through MDTW and the corresponding rating of the importance of that skill for (future) professional practice. This means that if participants viewed a particular skill as being developed to a greater extent during MDTW than its perceived usefulness for (future) professional practice it received a positive score. Conversely, if the usefulness of a skill for (future) educational practice was rated more highly than its development during MDTW it received a negative score (Sinche et al., 2017). Gaps with a magnitude greater than or equal to -0.40 were identified as indicating potential areas for improvement in master's dissertation courses. As shown in Table 1, relatively small 'skill gaps' (i.e. less than -0.40 points) with a negative score were found for the majority of skills, indicating that MDTW was generally perceived as a robust foundation for developing these skills. Participants perceived MDTW as enhancing the following skills: 'data gathering and organisation'; 'analysing data and drawing conclusions independently'; 'continuously deepening knowledge and skills'; and 'self-reflection before modifying actions accordingly' (mean differences ranged from -0.09 to -0.23); on the other hand, they were slightly less convinced about the dissertation/thesis' usefulness for

developing skills such as ‘teamwork’; ‘people management’; ‘interpersonal communication;’ and ‘learning new skills quickly’ (mean differences -0.72; -0.62; -0.44; -0.40, respectively).

Conclusion, practical implications, and further research

While this study has some limitations due to the convenience and diverse sample employed, it does demonstrate that working on a master’s dissertation/thesis can provide a valuable context for education professionals to strengthen their twenty-first century skills. However, we think that in order to enhance this fertile learning environment, the unique format of MDTW can be rethought and revised. Therefore, firstly, it is fundamental for academic staff (particularly for dissertation/thesis supervisors) to be aware that *all* stages of MDTW may be used as a tool for building and advancing their students’ twenty-first century skills. Secondly, having in mind the lower ratings for ‘teamwork’, ‘people management’, ‘interpersonal communication’, and ‘learning new skills quickly’, supervisors should facilitate more constructivist teaching practices during master’s dissertation courses, specifically by creating opportunities for students to talk with their peers; to present and defend their views; to employ critical thinking during their literature review process; to work collectively; and to lead smaller sub-groups of students in solving problems (e.g., Chu et al., 2017; Kember et al., 2007; Smith & Bath, 2006; Virtanen & Tynjälä, 2019). Thirdly, it is also vital to systematically assess students’ expectations and experiences in terms of twenty-first century skills during their academic studies, if it is to be ensured that these studies adequately prepare them for evolving educational practice needs. Finally, when planning to relaunch or refresh the tasks and activities on master’s dissertation/thesis courses, there is a need to give greater focus to informal learning in workplaces, in order to merge together academic and practical knowledge to support the development of all twenty-first century skills (Kaulēns, 2019; Råde, 2019).

Further research should explore not only education professionals’ perceptions of the significance of MDTW for developing twenty-first century skills, but also the tangible levels of skill acquisition which comes from their work on such an assignment. Intervention research would also be valuable in learning more about the effects of other master’s level research practices on developing twenty-first century skills among students and graduates. Finally, as this study is focused solely on education professionals involved in master’s programmes belonging, in most cases, to the same training institution in each country, it would be worth exploring the possible differences in students’ perceptions of the usefulness of MDTW across academic disciplines, across demographics, and across other higher education institutions in those countries.

Disclosure statement

No potential conflict of interest was reported by the authors.

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