

# Adolescents' digital career aspirations: Evidence for gendered pathways in a digital future

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## Abstract

**Introduction:** Computers and technology are still perceived as a male domain. As a result of this “digital gender gap” boys aspire careers in the information and communication technology (ICT) branches much more than girls. Guided by the situated expectancy-value theory of motivated behavioral choices, the present study aims to shed light on the predictors of digital career aspirations.

**Methods:** Self-report questionnaires were completed by 1018 Austrian adolescents (52.3% girls; 72% non-immigrants;  $M_{\text{age}} = 13.55$ ,  $SD_{\text{age}} = 0.88$ ) attending 61 Grade 7 and 8 classes located in 17 vocational secondary schools between April and June 2019. Individual and class-level predictors of digital career aspirations were investigated with multilevel modeling.

**Results:** Hierarchical linear models revealed that boys, younger adolescents, and second-generation immigrant adolescents had higher levels of digital career aspirations compared to girls, older adolescents, and non-immigrants. Hours spend with the laptop per day, digital self-efficacy and media appraisal positively predicted digital career aspirations on the individual level, while a higher number of immigrants in the classes and higher levels of teacher discussions about media were significant positive predictors on the class level. The model explained 17% of the individual level and 52% of the class level variance. Cross-level interactions were nonsignificant.

**Conclusions:** These results have major implications for educational practice. Most importantly, educational interventions should enhance girls' digital self-efficacy believes and media appraisal. Furthermore, teachers should increase their discussion about digital media as they foster adolescents' digital career aspirations and might prevent future gender segregation in the ICT sector.

## KEYWORDS

digital career aspirations, digital self-efficacy, gender inequalities, media appraisal, situated expectancy-value theory

## 1 | INTRODUCTION

Rapidly developing technological innovations are changing the communication, networking, and participation patterns of children, adolescents, and young adults, and they have a profound impact on their development. Mediatization is the metaprocess that increasingly shapes everyday practices and social relationships via mediating technologies and media organizations (Livingstone, 2009). The increased use of the Internet of children and adolescents that has been largely driven by the rapid spread of smartphones during the last decade (Paus-Hasebrink et al., 2019), creates amplified opportunities for adolescents' engagement with digital communication. However, computers, technology, and digital media are still perceived as a male domain and this “digital gender gap” offers boys more opportunities to develop competences in the field of

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information and communication technology (ICT) compared to girls (Korlat et al., 2021). These gendered perceptions serve as critical filters regulating access to high-status and high-income occupations because they lead females and males to pursue different educational and occupational trajectories. Not surprisingly, boys aspire careers in the ICT branches much more than girls (Korlat et al., 2023), thereby reinforcing gender stereotypes and gender socialization (Kollmayer et al., 2018). It is well-researched that gender stereotypes are associated with gender inequalities that have negative consequences for the occupational aspirations of girls and women (Schoon & Eccles, 2014). Because the importance of digital media will even increase in the future, a better understanding of factors that are associated with digital career aspirations is of high scientific and societal relevance.

The present study aims to predict the digital career aspirations of adolescents who are about to decide on their future educational and occupational trajectories. The expectancy-value theory (EVT) of motivated behavioral choices guided the selection of the predictor variables because the EVT was originally developed to better understand gendered career choices (Eccles et al., 1983). The *situated* expectancy-value theory (SEVT) acknowledges the importance of different socialization experiences on achievement-related choices (Eccles & Wigfield, 2020). For instance, previous research has documented that the opportunities parents provide are associated with the development of success expectancies and subjective task values of their children that are the most proximal determinants of their achievement-related choices (Simpkins et al., 2015). Teachers are also important socialization agents because they have direct influences on the development of the expectancies (e.g., self-efficacy beliefs) and values (e.g., appraisals) of their students via their teaching (Eccles & Wigfield, 2020). The Internet represents a very interesting developmental context, because adolescents spend a lot of time there unsupervised (Smahel et al., 2020). Consequently, adolescents also self-socialize with digital media by trying out different online behaviors and by avoiding and recognizing online risks. Applying SEVT to the digital domain, the present study aims to contribute to a better understanding of the relative importance of these different socialization experiences for adolescents' digital career aspirations.

## 1.1 | Gendered career aspirations

Thinking about and acting upon the future is a key characteristic of the human mind that makes individuals direct their development and actively select their life trajectories (Nurmi, 2005). Thus, future aspirations are genuine expressions of human agency, for example, of autopoietic, open, complex, and coacting dynamic systems (Overton, 2015). Various conceptualizations described this fundamental human capacity that captures consciously self-constructed images of the future (Seginer, 2009). Individuals shape their lives' courses regarding their goals, possible selves, or personal projects and research showed that these goals are age-dependent (Nurmi, 1991; 1992). Future aspirations are future-oriented representations of what individuals strive for in various life domains, like education or occupation (Salmela-Aro, 2009).

A large developmental literature shows that career paths are gendered (Eccles et al., 1983). Girls tend to underestimate their abilities in maths and sciences (Kollmayer et al., 2018) and these gendered perceptions of competencies lead females and males to pursue different educational and occupational trajectories in countries all over the world. A large-scale study that analyzed the career aspirations of 473,260 adolescents aged 15 years located in 80 countries and economic regions within the 2018 Program for International Student Assessment demonstrated that in each country and region, more boys than girls aspired to a things-oriented (e.g., mechanic) or science, technology, engineering, and mathematics (STEM) (e.g., mathematician) occupation and more girls than boys aspired to a people-oriented (e.g., nurse) occupation (Stoet & Geary, 2022). Another study that used the German Socio-Economic Panel data showed that 44% of 17-year-old young women and 64% of 17-year-old young men aspired to a gender-typical occupation, while only 8% of young women and men aspired to a gender-atypical occupation (Law & Schober, 2022). Also in Austria, where the present study has been conducted, gender-stereotypical occupational aspirations are very common, for example, boys aspire careers in the ICT branches much more than girls (Korlat et al., 2023).

Developmental research shows that gender stereotypical differences in educational and occupational choices result from both agency and socialization experiences that reinforce gendered attitudes, perceptions, and behaviors (Schoon & Eccles, 2014). The SEVT of motivated behavioral choices provides an integrative socioecological framework for studying gendered digital career aspirations (Eccles & Wigfield, 2020). The SEVT considers broad sociocultural influences like the cultural (or national) context as well as different socializers' behaviors like parents and teachers. Thus, in addition to focussing on individual expectancies for success and subjective task values that are the most proximal determinants of achievement-related choices according to SEVT, it is also important to better understand the relative importance of different socialization experiences. Eccles and Wigfield (2020) discussed the conceptual overlap between individual expectancies for success with Bandura's (1997) concept of personal self-efficacy and conceptualized intrinsic task values as the overall appraisal of a specific activity that includes liking, enjoyment, and interest.

## 1.2 | Digital socialization experiences

According to the SEVT of motivated behavioral choices, processes underlying career aspirations are domain specific (Eccles & Wigfield, 2020). Thus, to identify possible predictors for digital career aspirations it is necessary to focus on different digital socialization experiences.

Parental strategies related to their children's Internet and digital media use have been heavily studied (Livingstone & Helsper, 2008). As a recent review and content validation of 10 different measurement scales for parental mediation shows, parents apply three broad types of strategies (Kuldass et al., 2021). They actively monitor their children's online activities, they restrict what their children are doing online, and they discuss options how their children can use the Internet safely (Sasson & Mesch, 2017). Several studies showed that girls are differently socialized into digital media by their parents than boys, indicating that parents are more protective of their daughters on the Internet compared to their sons (Livingstone & Helsper, 2008; Milosevic et al., 2022). For instance, girls reported more parental monitoring and restrictive behavior regarding digital media compared to boys. These gender-specific digital socialization experiences have been discussed in relation to gender role socialization that might undermine the development of autonomy of girls (Sasson & Mesch, 2016). Therefore, it was suggested that *more* parental interventions are not necessarily better (Dotterer, 2022). Especially during adolescence when the need for autonomy development is high, too much of restrictive parental interferences might undermine intrinsic motivation.

In line with this reasoning, it was shown that the *type* of parental communication was related to adolescents' future goals. Adolescents whose parents communicated the importance of hard work and school success to a higher extent, nominated more intrinsic future goals and had higher levels of academic achievement (Suizzo et al., 2022). Parental digital mediation strategies were associated with higher levels of learning-related Internet use, when adolescents perceived the overall parenting as supportive instead of controlling (Ren & Zhu, 2022). Thus, adolescents might not show higher levels of digital career aspirations when parents monitor and restrict what their children are doing online, but rather find a future digital career more attractive when parents supportively discuss how their children can best use the Internet.

The question how teachers manage their students' online behaviors received much less attention (Strohmeier et al., 2022). Teachers are not in the position to monitor and restrict the Internet use of their students after or out of school, yet they are still able to discuss how adolescents can use the Internet safely during their lessons. We are not aware of any measurements capturing teachers' digital mediation strategies, although online teaching received considerable attention during the COVID-19 pandemic. Because teachers are in a very strong position to influence their students' self-efficacy beliefs and subjective task values (Eccles & Wigfield, 2020), it is reasonable to assume that their digital mediation strategies are associated with their students' digital career aspirations.

Another socialization experience that has not been investigated yet are digital self-socialization behaviors. Adolescents might use the Internet for different purposes, like for instance for information management (e.g., to find some information), exchange (e.g., to discuss something online), or content production (e.g., to produce a text, video, or photo). Furthermore, adolescents might be less or more able to recognize and to avoid online risks. Having in mind that adolescents spend most of their time on the Internet unsupervised (Smahel et al., 2020), the present study explores whether these different online behaviors are associated with digital career aspirations.

## 1.3 | The Austrian context

The SEVT of motivated behavioral choices assumes that the broad cultural milieu needs to be considered as well to better understand career choices (Wigfield & Eccles, 2020). Therefore, it is important to situate the present study within the national context where the present data has been collected. Austria is an interesting national context to study digital career aspirations because gender inequality is a rather big societal issue. With 65.3 out of a maximum of 100 points Austria ranked 13th in the European Union on the Global Gender Gap Index in 2019 when the data of the present study were collected. The country's mediocre ranking has remained the same since 2005. Austria's gender equality scores are the lowest in the domain of power and highest in the domain of health (European Institute for Gender Equality, 2019). Like in many other countries, also in Austria computers are perceived as a male domain: adolescent boys were found to spend more hours with computers, report higher self-concepts regarding ICT, display greater digital skills, and be more attracted to computers than girls (Korlat et al., 2021).

Furthermore, the developmental transition that has been chosen to study digital career aspirations among Grade 7 and 8 vocational school students is directly related to the Austrian school system. In Austria, compulsory schooling starts with a child's sixth birthday and lasts 9 years and there are two critical school transitions. All children are enrolled in primary schools for 4 years (Grades 1–4). The first transition for all children in Austria takes place between Grades 4 and 5 when students are around 10 years old. Starting in Grade 5, students can be enrolled in two different school types, and they are usually grouped according to their academic ability in either academic or vocational secondary schools. Students in the

academic track attend 8 years of academic secondary schooling before they are qualified to enter universities. For students in the vocational track, the second normative school transition takes place between Grades 8 and 9. After Grade 8, vocational secondary school students can either enroll in 1-year prevocational schools that qualify them for starting their apprenticeship and related vocational training, or they can choose different types of vocational high schools that might also certify them to enter universities after attending them for 5 years.

## 2 | THE PRESENT STUDY

Assuming that career aspirations are a result of both individual agency and different socialization experiences (Schoon & Eccles, 2014), the present study investigates whether demographic variables (e.g., gender, migration, family status), digital variables (e.g., possession of laptop, hours spent online), digital expectations and values (e.g., digital self-efficacy, media appraisal), digital self-socialization processes (e.g., online behaviors, perception of online risks) as well as parental and teachers' mediation (e.g., monitoring, advice, discussion) predict digital career aspirations of adolescents.

Because this is the first study that examines predictors of digital career aspirations, the main analysis was exploratory. However, it was possible to formulate the following hypotheses based on results from previous studies.

**Hypothesis 1.** Because gender stereotypes are highly prevalent in Austria, we hypothesized that boys would report higher levels of digital career aspirations compared to girls (Kollmayer et al., 2018; Korlat et al., 2023). We controlled for age, first- and second-generation immigrant status, and family structure to rule out their potential effects.

**Hypothesis 2.** According to the SEVT domain specific expectancies (e.g., digital self-efficacy) and values (e.g., media appraisal) are the most proximal processes that underly career aspirations. Therefore, we hypothesized that higher levels of digital self-efficacy and higher levels of media appraisal would predict higher levels of digital career aspirations (Eccles & Wigfield, 2020).

**Hypothesis 3.** Because the SEVT emphasizes the importance of different socialization experiences on achievement-related choices, we hypothesized that digital socialization experiences that we differentiated into self-socialization behaviors, parents', and teachers' behaviors would be associated with digital career aspirations. Because restrictive parental behavior was found to undermine rather than to foster online behavior among girls (Sasson & Mesch, 2016), we hypothesized that higher levels of encouraging (e.g., discussion and advice) but lower levels of restrictive (e.g., monitoring) parental mediation would predict digital career aspirations. However, because no study to date investigated this topic, these analyses were exploratory.

## 3 | METHODS

### 3.1 | Procedure

After all necessary ethical permissions were obtained and the directorates of education of the federal states of Upper and Lower Austria approved the study, a convenience sample of 17 vocational secondary schools were invited and agreed to participate. Three schools were located in a medium-sized town with around 200,000 inhabitants, two schools were located in a small town with around 60,000 inhabitants, the other 12 schools were located in villages with not more than 20,000 inhabitants. All Grade 7 and 8 students enrolled in these schools were invited to participate. Participation was voluntary and confidential and active parental consent was obtained. The parental consent rate was 83.5% and the participation rate of the consented adolescents was 96.6%. Teachers were trained to collect the data with an Internet-based survey in the school's computer labs between March and June 2019. To avoid any systematic order effect, items within scales were counterbalanced across participants.

### 3.2 | Participants

In total, 1018 adolescents (52.3% girls) aged 12–17 years ( $M = 13.55$ ,  $SD = 0.88$ ) from 61 different classes participated. In total, 8.3% were 12 years old, 43.1% were 13 years old, 36.8% were 14 years old, 9.2% were 15 years old, 2.2% were 16 years old, and 0.3% were 17 years old. Most adolescents were non-immigrants (72%), 10.8% were first-generation and 17.2% were second-generation immigrants. The number of immigrants sampled is representative for Upper Austria (Statistik Austria, 2022). The majority (78.4%) lived together with both of their parents, 18.8% lived together with their mother, 2.2% with their father, and

0.6% did not live with one of their parents. The majority had employed fathers (94.2%) and mothers (86.7%), and rated the financial situation of their family as good (43.8%) or very good (34.8%).

### 3.3 | Measures

#### 3.3.1 | Demographic variables

Gender, age, country of birth, and living condition were measured with multiple-choice items. Living condition was measured with the question "With whom are you living together?" with the answer options "my mother," "my father," "my siblings," "my grandmother," "my grandfather," "somebody else, namely:" Parental occupational status was measured with two items "Does your father/mother work?" with the answer options "yes, full time," "yes, part time," "no." The subjective financial situation was measured with the question "How is the financial situation of your family?" with the answer options "very bad," "bad," "medium," "good," "very good."

#### 3.3.2 | Digital variables

The possession of a smartphone or a laptop was assessed with two multiple-choice items. "Do you have access to the Internet via a smartphone/laptop?" Answer options were "Yes, I have my own device," "Yes, I can use the device from somebody else," "No." Descriptive analyses revealed that 98.5% of adolescents possess a smartphone and 64.2% possess a laptop. The hours spend online per day with the smartphone or laptop were assessed with two open-ended questions. "How many hours per day are you online with the smartphone/the laptop?"

#### 3.3.3 | Digital career aspirations

Three items were developed. "In my future job, I would like to do something with digital media," "I would like to pursue a vocational training that is related to digital media," "I would like to pursue a higher education that is related to digital media." The five-point response scale ranged from 1 (*not at all true*) to 5 (*very true*). The items were averaged and formed a reliable scale,  $\alpha = .76$ .

#### 3.3.4 | Online behavior

Nine items were developed to measure three aspects of online behavior. "How easy or difficult is it for you to do the following things on the Internet?" Information management was measured with three items, for example, "to find suitable information." Exchange was measured with three items, for example, "to discuss something with others." Content production was measured with three items, for example, "to create own texts." The five-point response scale ranged from 1 (*very difficult*) to 5 (*very easy*). Exploratory factor analysis confirmed the three-factor structure that explained 62.53% of the variance. The reliabilities of the scales were acceptable for information management (three items,  $\alpha = .78$ ), exchange (three items,  $\alpha = .65$ ) and content production (three items,  $\alpha = .72$ ). The items are displayed in the Supporting Information: Table S1.

#### 3.3.5 | Online risks

Fourteen items were developed to measure two aspects of online risks. Recognition was measured with seven items. "How easy or difficult is it for you to recognize the following things on the Internet?," for example, "fake photos." Avoidance was measured with seven items. "How easy or difficult is it for you to avoid the following things in the Internet?," for example, "unwanted spread of your private information." The five-point response scale ranged from 1 (*very difficult*), to 2 (*difficult*), 3 (*neutral*), 4 (*easy*) to 5 (*very easy*). Two factors emerged with an Eigenvalue > 1.00. The two-factor structure was theoretically meaningful and explained 56.29% of the variance. The scales were (1) recognition (seven items,  $\alpha = .84$ ) and (2) avoidance (seven items,  $\alpha = .89$ ). The items are reported in the Supporting Information: Table S2.

### 3.3.6 | Digital self-efficacy

Three items were developed to measure expectancies. “I can find a solution for any problem that might arise with digital media,” “In unexpected situations with digital media, I always know what to do.” “If I have a problem with digital media, I can solve it.” The five-point response scale ranged from 1 (*not at all true*) to 5 (*very true*). The items were averaged and formed a reliable scale,  $\alpha = .76$ .

### 3.3.7 | Media appraisal

Three items were developed to measure values. “Digital media is cool,” “I like digital media,” “To be knowledgeable about digital media is important to me.” The five-point response scale ranged from 1 (*not at all true*) to 5 (*very true*). The items were averaged and formed a reliable scale,  $\alpha = .81$ .

### 3.3.8 | Parents' behavior

Seventeen items were developed to measure three aspects of parental mediation. Monitoring was measured with six items, for example, “How often do your parents control which webpages you visit?” Advice was measured with five items, for example, “How often do you ask your parents for their advice when you want to download something from the Internet?” Discussion was measured with six items, for example, “How often do your parents explain you why some webpages are good or bad?” The five-point response scale ranged from 1 (*never*), to 2 (*rarely*), 3 (*sometimes*), 4 (*often*) to 5 (*very often*). Three factors emerged with an Eigenvalue  $> 1.00$ . The three-factor structure was theoretically meaningful and explained 59.64% of the variance. The scales were (1) monitoring (six items,  $\alpha = .86$ ); (2) advice (five items,  $\alpha = .85$ ); and (3) discussion (six items,  $\alpha = .82$ ). The items are reported in the Supporting Information: Table S3.

### 3.3.9 | Teachers' behavior

Six items were developed to measure “discussion.” These items were identical with the items developed for parents, for example, “How often do your teachers explain you why some webpages are good or bad?” The five-point response scale ranged from 1 (*never*), to 2 (*rarely*), 3 (*sometimes*), 4 (*often*) to 5 (*very often*). One factor emerged with an Eigenvalue  $> 1.00$  and explained 57.60% of the variance. The reliability of the scale (six items,  $\alpha = .85$ ) was very good. The items are reported in the Supporting Information: Table S3.

## 4 | RESULTS

### 4.1 | Missing data

The data quality in this data set was exceptionally good, most likely because trained teachers collected the data in their classes (see Section 3.1). There were no missing values in none of the variables. Thus, all results are based on the answers of 1018 adolescents.

### 4.2 | Gender and immigrant status differences

The means and standard deviations of the study variables depending on gender and immigrant status are displayed in Table 1. To check for main effects, a series of  $2 \times 3$  univariate analyses of variance were performed with gender and immigrant status as the independent variables and all study variables as the dependent variables. The results of the univariate tests are displayed in Table 1.

Confirming Hypothesis 1, boys reported higher levels of digital career aspirations compared to girls. More boys than girls reported that they have their own laptop. Boys also reported to spend more hours per day online with their laptop compared to girls who reported to spend more hours per day online with their smartphone compared to boys. Boys reported higher levels of online risk recognition and higher levels of digital self-efficacy compared to girls. Interestingly, boys reported lower levels of parental monitoring, parental advice, as well as parental and teachers' discussions compared to girls.

**TABLE 1** Gender and immigrant status differences of study variables (*M*, *SD*).

	Whole sample ( <i>N</i> = 1018)	Girls ( <i>N</i> = 532)	Boys ( <i>N</i> = 468)	<i>F</i> (1, 1012)	Non-immigrants ( <i>N</i> = 733)	First generation immigrants ( <i>N</i> = 110)	Second generation immigrants ( <i>N</i> = 175)	<i>F</i> (2, 1012)
Digital career aspiration <sup>1</sup>	2.38 (1.07)	2.21 (1.01)	2.57 (1.10)	32.37**	2.31 <sup>a</sup> (1.04)	2.46 (1.08)	2.64 <sup>b</sup> (1.13)	9.95**
Digital variables								
Possession of own laptop (yes = 1, no = 0)	0.64 (0.48)	0.58 (0.49)	0.71 (0.46)	8.06**	0.62 <sup>a</sup> (0.49)	0.72 (0.45)	0.69 <sup>b</sup> (0.47)	2.89
Hours spend on smartphone per day	3.53 (2.75)	4.15 (3.09)	2.84 (2.13)	36.15**	3.22 <sup>a</sup> (2.44)	4.20 <sup>b</sup> (2.79)	4.38 <sup>b</sup> (3.59)	13.65**
Hours spend on laptop per day	1.26 (1.76)	0.91 (1.22)	1.64 (2.13)	26.09**	1.18 <sup>a</sup> (1.52)	1.92 <sup>b</sup> (2.93)	1.17 <sup>a</sup> (1.61)	8.94**
Online behaviors <sup>2</sup>								
Information management	3.80 (0.83)	3.75 (0.77)	3.85 (0.88)	0.59	3.81 (0.80)	3.73 (0.92)	3.77 (0.90)	0.54
Exchange	3.59 (0.86)	3.54 (0.86)	3.64 (0.86)	1.21	3.57 (0.82)	3.61 (1.00)	3.62 (0.90)	0.22
Content production	3.44 (0.95)	3.48 (0.88)	3.41 (1.03)	0.01	3.42 (0.95)	3.43 (0.99)	3.53 (0.95)	0.99
Online risks <sup>3</sup>								
Risk avoidance	3.64 (0.92)	3.62 (0.90)	3.65 (0.95)	0.01	3.69 <sup>a</sup> (0.88)	3.40 <sup>b</sup> (0.89)	3.56 (1.00)	5.48**
Risk recognition	3.38 (0.79)	3.28 (0.74)	3.48 (0.84)	12.53**	3.33 <sup>a</sup> (0.77)	3.40 (0.89)	3.54 <sup>b</sup> (0.79)	6.19**
Digital expectancies and values <sup>4</sup>								
Digital self-efficacy	3.44 (0.86)	3.25 (0.80)	3.64 (0.88)	46.07**	3.43 (0.86)	3.28 <sup>a</sup> (0.87)	3.56 <sup>b</sup> (0.84)	5.48**
Media appraisal	4.03 (0.90)	3.99 (0.85)	4.08 (0.96)	1.14	4.03 (0.90)	3.87 <sup>a</sup> (1.00)	4.16 <sup>b</sup> (0.87)	3.83**
Parents' behavior <sup>5</sup>								
Parental monitoring	1.71 (0.82)	1.78 (0.89)	1.64 (0.74)	24.40**	1.64 <sup>a</sup> (0.79)	2.03 <sup>b</sup> (1.01)	1.82 <sup>b</sup> (0.94)	12.77**
Parental advice	2.04 (1.00)	2.25 (1.05)	1.81 (0.90)	46.34**	2.09 <sup>a</sup> (1.02)	2.04 (1.03)	1.83 <sup>b</sup> (0.89)	7.05**
Parental discussion	2.30 (0.86)	2.34 (0.81)	2.26 (0.92)	17.26**	2.26 <sup>a</sup> (0.84)	2.49 <sup>b</sup> (0.99)	2.36 (0.85)	3.68**
Teachers' behavior <sup>6</sup>								
Teachers' discussion	2.22 (0.82)	2.34 (0.82)	2.10 (0.81)	18.79**	2.18 <sup>a</sup> (0.81)	2.37 (0.88)	2.35 <sup>b</sup> (0.84)	2.87**

Note: Numbers 1–6 are rating scales ranged from 1 to 5.

Means with different superscripts differ from each other at the  $p < .05$  level.

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

Bonferroni adjusted mean comparisons revealed that second-generation immigrant adolescents reported higher levels of digital career aspirations and online risk recognition compared to non-immigrant adolescents. Second-generation immigrant adolescents reported higher levels of digital self-efficacy and media appraisal compared to first-generation immigrant adolescents. First- and second-generation immigrant adolescents reported higher levels of parental monitoring compared to non-immigrant adolescents.

### 4.3 | Correlations of study variables

When inspecting the bivariate correlations, digital career aspirations were moderately positively associated with digital self-efficacy and media appraisal, while small positive associations were found with hours spent on the laptop per day, all three types of online behaviors (information management, exchange, and content production) and recognition of online risks (see Table 2). Digital self-efficacy and media appraisal were moderately positively associated with online behavior (information management, exchange, and content production) as well as with avoidance and recognition of online risks. Online risk recognition was also moderately positively associated with information management, exchange, and content production. These patterns were the same for boys and girls (see Supporting Information: Table S4).

### 4.4 | Predictors of digital career aspirations

Individual and class-level predictors of digital career aspirations were investigated with multilevel modeling (Hox et al., 2018). Models were built up from the null model by adding sets of student-level and class-level predictors to a previous model at each step. In the first model, demographic variables were added (Model 1), digital variables were added in the second step (Model 2), online behaviors, risks and attitudes were added in the third step (Model 3), parents' and teachers' behaviors were added in the fourth step (Model 4), and predictors on the class level were added in the last step (Model 5). All predictors on the student level were centered within classes, while predictors on the class level were centered at the grand mean (Enders & Tofighi, 2007). A series of  $\chi^2$  difference tests were conducted to test for random slope variance of each predictor at the student level (Supporting Information: Table S5). To rule out biased estimations, parents' and teachers' behaviors were also estimated separately (Models 4a and 4b, Supporting Information: Table S6). Results of the  $\chi^2$  difference test were all statistically not significant indicating no random slope variance of any predictor at the individual level. Note that cross-level interactions cannot be investigated given that there is no statistically significant slope variation across classrooms (Hox et al., 2018). Note that random slopes are required for testing cross-level interactions, which explains heterogeneity in the slope parameter between classes. We estimated all models in Mplus 8.6 (Muthén & Muthén, 1998) using maximum likelihood estimation with robust standard errors. All analyses were conducted using two-tailed tests and all significance testing was performed at the  $\alpha = .05$  level.

TABLE 2 Correlations between study variables.

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Digital career aspirations	.13**	.04	.18**	.11**	.10**	.12**	.03	.17**	.33**	.31**	-.03	-.05	.07*	.06*
2. Possession of own laptop	–	.05	.33**	.15**	.15**	.11**	.08*	.18**	.17**	.12**	-.08*	-.18**	-.06	-.04
3. Hours spend on smartphone per day		–	.12**	-.12**	.07*	.04	-.07*	.01	-.03	.06	-.03	-.09**	-.05	.04
4. Hours spend on laptop per day			–	.04	.08*	.08*	.08*	.15**	.16**	.07*	-.09**	-.18**	-.08*	-.04
5. Information management				–	.43**	.55**	.31**	.40**	.36**	.26**	-.01	.01	.07*	.08*
6. Exchange					–	.54**	.17**	.37**	.32**	.24**	-.05	-.14**	.03	.05
7. Content production						–	.28**	.44**	.35**	.30**	-.05	-.09**	.03	.07*
8. Risk avoidance							–	.41**	.23**	.20**	-.13**	-.08*	-.05	.03
9. Risk recognition								–	.38**	.27	-.05	-.17**	.03	.07*
10. Digital self-efficacy									–	.49**	-.10**	-.16**	.05	.03
11. Media appraisal										–	-.11**	-.15**	.02	.07*
12. Parental monitoring											–	.42**	.49**	.29**
13. Parental advice												–	.47**	.29**
14. Parental discussion													–	.38**
15. Teachers' discussion														–

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



#### 4.4.1 | Intraclass correlations (ICCs)

The ICC of the model was .023 indicating that 2.3% of the variance of digital career aspirations are on the class level.

#### 4.4.2 | Individual level predictors

As shown in Table 3, being a boy, being younger and being a second-generation immigrant were significant predictors on the individual level in all five models. Confirming Hypothesis 2, adolescents who reported to spend more hours per day on the laptop and who reported higher levels of digital self-efficacy and higher levels of media appraisal also reported higher levels of digital career aspirations.

#### 4.4.3 | Class level predictors

The ICCs of potentially relevant predictors were estimated. The ICC for immigrant status was .289 and the ICC of teachers' discussion was .105 indicating that 28.9% and 10.5% of the variance of these variables are on class level, while for all other variables the ICCs were nearly constants (ICCs < .050). Therefore, only class level aggregated immigrant status (i.e., proportion of immigrant students) and teachers' discussion (i.e., average teacher discussion), and class size were included as class level predictors. On the class level, a higher proportion of immigrant students and more discussions with the teacher were associated with higher levels of digital career aspirations.

## 5 | DISCUSSION

The underlying processes for gendered career aspirations have been investigated in the past 40 years (Eccles et al., 1983), and the SEVT of motivated behavioral choices has been developed based on this large body of research (Eccles & Wigfield, 2020). Thus, the SEVT provides a powerful socioecological framework for studying gendered digital career aspirations, because in addition to focusing on individual expectancies for success and subjective task values, SEVT also considers broad socio-cultural influences like the national context as well as different socializers' behaviors like parents and teachers. Applying SEVT to the digital domain, the present study contributes to a better understanding of adolescents' digital career aspirations.

This research is important, because gendered career aspirations are still highly prevalent among adolescents (Stoet & Geary, 2022), even though there have been some improvements towards more gender equality regarding occupational choices in the last four decades. The information and communication technology (ICT) sector represents such a gendered job segment that systematically disadvantages girls (Korlat et al., 2021). Not surprisingly, boys had higher levels of digital career aspirations compared to girls also in the present study. This result is remarkable because digital career aspirations as we conceptualized them in the present study comprise even a broader occupational segment than the ICT sector. Instead of just focusing on information and communications technology, we operationalized digital career aspirations much broader, and our items covered a future dream job, a future higher education or a future vocational training related to the much broader field of digital media.

Overall, the present analyses showed that digital media are gendered developmental contexts that contribute to this gender inequality.

### 5.1 | Digital media as gendered developmental context

Our descriptive analyses demonstrate that boys are more likely to possess an own laptop and they spend more hours per day online on the laptop compared to girls. Girls on the contrary spend more time with the smartphone compared to boys. The most plausible explanation of this gender pattern is that boys and girls differ regarding the motives of digital media use. A recent study showed that the main motive for using digital media for boys is playing online games via laptops and consoles, while girls mainly use digital media to be in contact with others with their smartphones (Strohmeier et al., 2022). It also is possible that boys are more able to develop digital competences (or at least their digital self-efficacy as indicated in the correlation table), because they are using the laptop more often than girls. Because boys are also more likely to possess an own laptop compared to girls, this gendered pattern might also be produced by parents or other caretakers who are seemingly more willing to buy a laptop to their sons compared to their daughters.

Boys report higher levels of digital self-efficacy, and they are more confident to recognize digital risks compared to girls who reported higher levels of parental monitoring, advice, and discussion as well as higher levels of teachers' discussions about digital media compared to boys. Taken together, these results suggest that boys are more able to develop digital media competencies than

TABLE 3 Prediction of digital career aspirations.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.
Intercept	<b>2.38</b> (0.04)		<b>2.38</b> (0.04)		<b>2.38</b> (0.04)		<b>2.38</b> (0.04)		<b>2.38</b> (0.04)	
Demographic variables										
Gender (0 = girls, 1 = boys)	<b>0.38</b> (0.07)	0.36	<b>0.31</b> (0.07)	0.30	<b>0.19</b> (0.07)	0.18	<b>0.23</b> (0.08)	0.22	<b>0.23</b> (0.08)	0.22
Age in years	<b>-0.14</b> (0.05)	-0.08	<b>-0.16</b> (0.05)	-0.09	<b>-0.12</b> (0.05)	-0.07	<b>-0.12</b> (0.05)	-0.11	<b>-0.13</b> (0.05)	-0.07
First generation immigrant (0 = no, 1 = yes)	0.11 (0.13)	0.10	0.09 (0.13)	0.08	0.16 (0.13)	0.16	0.17 (0.13)	0.16	0.14 (0.13)	0.13
Second generation immigrant (0 = no, 1 = yes)	<b>0.35</b> (0.11)	0.33	<b>0.33</b> (0.11)	0.32	<b>0.28</b> (0.10)	0.26	<b>0.31</b> (0.09)	0.29	<b>0.28</b> (0.09)	0.27
Parents (0 = single parent, 1 = two parents)	0.00 (0.08)	0.00	0.03 (0.08)	0.03	0.01 (0.08)	0.01	0.00 (0.08)	0.00	0.01 (0.08)	0.01
Digital variables										
Possession of own laptop (0 = no, 1 = yes)			<b>0.16</b> (0.06)	0.16	0.07 (0.06)	0.07	0.09 (0.06)	0.09	0.08 (0.06)	0.08
Hours spent on smartphone per day			0.01 (0.02)	0.02	0.00 (0.01)	0.01	0.01 (0.01)	0.01	0.01 (0.01)	0.02
Hours spent on laptop per day			<b>0.07</b> (0.02)	0.11	<b>0.05</b> (0.02)	0.09	<b>0.06</b> (0.02)	0.06	<b>0.06</b> (0.02)	0.09
Online behavior										
Information management					0.00 (0.05)	0.00	-0.02 (0.05)	-0.02	-0.02 (0.05)	-0.01
Exchange					-0.04 (0.04)	-0.03	-0.04 (0.04)	-0.04	-0.04 (0.04)	-0.03
Content production					0.00 (0.05)	0.00	0.00 (0.05)	0.00	0.00 (0.05)	0.00
Online risks										
Avoidance					-0.05 (0.03)	-0.05	-0.05 (0.03)	-0.05	-0.05 (0.03)	-0.04
Recognition					0.04 (0.05)	0.03	0.05 (0.05)	0.05	0.04 (0.05)	0.03
Digital expectancies and values <sup>4</sup>										
Digital self-efficacy					<b>0.25</b> (0.05)	0.20	<b>0.25</b> (0.05)	0.23	<b>0.25</b> (0.05)	0.20
Media appraisal					<b>0.24</b> (0.05)	0.20	<b>0.24</b> (0.05)	0.23	<b>0.24</b> (0.05)	0.20
Parents' behavior										
Monitoring							-0.07 (0.04)	-0.06	-0.06 (0.04)	-0.05
Advice							0.08 (0.04)	0.07	0.08 (0.04)	0.07
Discussion							0.04 (0.05)	0.04	0.04 (0.05)	0.03
Teachers' behavior										
Discussion							0.03 (0.04)	0.03	0.04 (0.05)	0.03
Class variables										

TABLE 3 (Continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.	Est. (SE)	Std. est.
Proportion of immigrant students									<b>0.48</b>	0.47 (0.14)
Average teachers' discussions									<b>0.26</b>	0.50 (0.13)
Class size									0.02 (0.01)	0.35
Model summary										
Deviance	2970		2930		2815		2806		2760	
R <sup>2</sup> at the student level	.04		.07		.17		.17		.17	
R <sup>2</sup> at the class level	.00		.00		.00		.00		.52	

Note: Statistically significant results at  $\alpha = .05$  are boldface.

Abbreviations: Est., unstandardized parameter estimate; SE, standard error; Std. Est., standardized parameter estimate.

girls and to actively use the freedom and opportunities that are offered by this developmental context. Girls on the contrary might experience some kind of parental overprotection which might not help them to develop the same levels of digital self-efficacy beliefs and digital media competencies as boys (Kollmayer et al., 2018). Research suggests that gender gaps in STEM fields are not necessarily the result of girls or women underestimating their abilities, but rather they may be the result of boys and men overestimating their abilities (Bench et al., 2015).

That more parental interventions are not necessarily better has already been discussed in the literature (Dotterer, 2022), and it was argued that too much parental involvement might undermine the development of autonomy of adolescents. It is possible that exactly this happens with girls and that this socialization experience constrains girls to fully capitalize on the opportunities offered on the Internet and with digital media (Sasson & Mesch, 2016). The inspection of the bivariate correlations supports this interpretation. Online behaviors and the recognition and avoidance of online risks were moderately positively, while parental monitoring and advice, but not teacher discussions were negatively associated with digital self-efficacy and media appraisal among both boys and girls.

## 5.2 | Predictors of digital career aspirations

We hypothesized that higher levels of digital self-efficacy and media appraisal are associated with higher levels of digital career aspirations (Eccles & Wigfield, 2020) and explored whether digital socialization experiences that we differentiated into self-socialization behaviors, parents', and teachers' behaviors are also associated with digital career aspirations. Multilevel modeling was applied, and five models of increasing complexity were estimated. Boys, second-generation immigrants, and younger adolescents had higher levels of future digital career aspirations compared to girls, non-immigrants, and older adolescents. In line with our hypothesis (H2), digital self-efficacy and media appraisal were positively associated with digital career aspirations. Furthermore, adolescents who spend more hours with the laptop per day reported higher levels of digital career aspirations. As hypothesized (H3), higher levels of teacher discussions about media a higher number of immigrants in the classes were significant predictors on the class level. It is possible that teachers and immigrant adolescents themselves believe that jobs related to digital media are ideally suited to achieve an upward social mobility, this could explain why a higher proportion of immigrants on the class level is associated with higher levels of digital career aspirations. It is also possible that teachers and immigrant adolescents themselves believe that jobs related to digital media are particularly open for immigrants. Future studies could shed light on this issue.

All other variables did not predict digital career aspirations. It is important to note that even in the most complex statistical model, the observed gender differences could not be fully explained.

Why did digital self-socialization practices and parental mediation not predict digital career aspirations? The most plausible explanation for this result is that socialization experiences might have an indirect rather than a direct effect on digital career aspirations. It is possible that socialization experiences impact digital self-efficacy and media appraisal which in turn predict digital career aspirations. Future studies could apply more complex statistical models to also test indirect effects, for instance by testing a more complex path model in which digital self-efficacy and media appraisal are modeled as mediators in between socialization experiences and digital career aspirations. Another statistical method could be to directly explain gendered digital career aspirations by modeling socialization experiences, digital self-efficacy, and media appraisal as indirect effects mediating the association between gender and digital career aspirations.

### 5.3 | Limitations and future research

There are plenty of avenues for future studies that might be able to overcome some of the limitations of this study. To begin with, most of the scales were developed for the purpose of the present study. Although we developed them based on good reasoning and adapted them from existing studies wherever possible, construct validity was established with exploratory factor analyses only. For instance, we only measured teachers' discussion in the present study and therefore we might have overlooked that teachers might also be able to give their students advice how to use the Internet safely. Future studies should develop and validate more comprehensive measures to be able to answer this kind of question.

The second limitation is that all constructs were measured with self-reports at one wave of measurement. Although we purposefully selected Grades 7 and 8 vocational track students, future studies should collect longitudinal data and should gather teacher or parent ratings in addition to adolescents' self-assessments. Even more importantly, future research should directly assess how adolescents perceive societal digital gender norms and gender stereotypes related to digital media. Such a study could find out whether and to what extent these perceptions are associated with digital career aspirations. Finally, future studies could also investigate the role of peers for digital career aspirations.

### 5.4 | Practical implications

Our results have major implications for educational practice. Most importantly, educational interventions should enhance girls' digital self-efficacy beliefs and media appraisal. There is a large literature on how self-efficacy beliefs and task values might be fostered in educational contexts (Eccles & Wigfield, 2020). Teachers should actively encourage girls to consider jobs in the digital domain and they should give them plenty of success experiences on the Internet to increase their digital self-efficacy. To invite female role models in schools might help to increase digital media appraisal. As the present analyses show, teachers should increase their discussion about digital media in their classrooms as adolescents were more likely to consider digital careers in classes in which teachers actively discussed this topic. However, these educational interventions are only one part of the story, because gender essentialism and gender stereotypes are constructed on the societal level (Schoon & Eccles, 2014). As long as the Internet and digital media are gendered developmental contexts that offer boys more opportunities to develop competencies compared to girls (Korlat et al., 2021), there is a structural problem that needs to be tackled as well to promote gender equality.

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#### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

#### ETHICS STATEMENT

The authors declare that the study was conducted according to the 1964 Helsinki Declaration and its later amendments.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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