



FUTURITY
Education

DOI: <https://doi.org/10.57125/FED.2022.25.03.6>

How to cite: Muchacki, M. (2022). Peculiarities of personality development of the future in the context of information and communication technologies and education system reform (Polish experience). *Futurity Education*. 2(1). 55-67. <https://doi.org/10.57125/FED.2022.25.03.6>

Peculiarities of Personality Development of the Future in the Context of Information and Communication Technologies and Education System Reform (Polish Experience)

Mateusz Muchacki

PhD of Pedagogical sciences, Associate Professor Pedagogical University of Cracow, Cracow, Poland
<https://orcid.org/0000-0002-1772-6719>

***Correspondence email:** mateusz.muchacki@gmail.com.

Received: February 11, 2022 | **Accepted:** March 16, 2022 | **Published:** March 25, 2022

Abstract: Given the intensification of modernization processes in education, the problem of predicting the conditions in which the personality of the future will develop is relevant. Determining the vector of further movement is an important step in the renewal and improvement of educational interaction. In particular, significant for the organization of pedagogical interaction is compliance with the socio-cultural environment. Socio-political changes significantly modify the process of personal formation, which, in turn, requires an adaptive response from specialists in psychological and pedagogical direction. Accordingly, the object of the presented research work is determined by the context of future personality formation. The task of this study is to establish the content and measure of transformative influences in the situation of reforming the educational system, in particular the introduction of information and communication technologies in the educational process. The methodological basis of this work general scientific and scientific-pedagogical methods aimed at forecasting and modeling. The empirical basis for the conclusions provided in the work are the results of the conducted psychological survey and questionnaire survey of participants in the educational process. Accordingly, the article presents a theoretical model of personality development in modern

information society, taking into account the peculiarities of the educational process in which it is located. The category of “information culture” is defined as an integrative concept for the study of the presented topic. The main directions of the modernization of the educational process in the crisis caused by sudden digitalization are defined. In particular, the work reflects the need to improve the digital competence of teaching staff, expanding the technical support of educational institutions, eliminating the limitations of interaction between students and teachers, as well as ensuring inclusiveness and humanistic principles of education. In addition, it is established that the new information context is favorable for the personal development of students. First of all, it is reflected in the increased level of actualization, self-efficacy, and ego-identity of the latter. In addition, the changes in the character profile of teachers are expressed.

Keywords: education, personal self-development, pedagogical support of self-development, information society, ICT in education.

Introduction

Intensification of the process of dissemination of information and communication technologies in the Polish and European educational space requires researchers to update educational strategies and create a new format for determining personal transformations in the context of educational impacts. Moreover, the transition to digital and, in particular, a distant form of learning is an important prerequisite for reforming the existing system of education. Specialists in this field need to have a comprehensive assessment of the influences that the educational process will have on personal development trends in the future. Since only ensuring sufficient information support will give the opportunity to effectively restructure the strategies of pedagogical support of the individual.

The new information-digital technological paradigm in education dictates new conditions for participants in the educational process and shapes new interdisciplinary dimensions in this field. Specifically, a prospective strategy for the education system involves creating a multidimensional structure of the educational environment (Roztocki et al., 2019). Meanwhile, Wasserman and Migdal (2019) highlight the challenge of balancing traditional and innovative aspects of educational development.

New conceptual dimensions are introduced into the educational paradigm that correlates personal and information-technological contexts: energy (Lee et al., 2022), information (Ratheeswari, 2018), and neuroeducation (Espino-Díaz et al., 2020).

Addressing the challenges of personalizing innovative educational development requires considering the potential of diverse social groups differentiated by age (Siren & Knudsen, 2017), existing education, relevant competencies (Wrahatnolo & Munoto, 2018), and alternative learning skills (Tindowen et al., 2017).

The targeted use of ICT resources plays a crucial role in positioning participants in the educational process within the information-technological educational paradigm (Wu et al., 2018), assessing their effectiveness in a practical-oriented education model (Hatlevik et al., 2018).

Research Problem

We are witnessing a process of global changes in the educational paradigm, which does not have sufficient justification in the categories of traditional educational strategies. First of all, the reason for these transformations is the change in the socio-cultural context in which educators exist. Moreover, the said innovation is essential in the context of personal development of personality, given the comprehensive nature of the changes taking place in this direction. Studies of this process are widely represented in the scientific and pedagogical environment. However, at the moment important neglected attention is the consideration of emergent qualities and providing meaningful predictions about the personality of the future, which will develop in a given educational environment in the future.

Research Focus

Teachers are focused on providing not only the didactic component of educational interaction but also promoting the personal development of each teacher. However, the educational approaches of today are in crisis, given the pronounced inconsistency of educational principles and approaches with the current societal needs. After all, predicting the process of personality formation in the future is an important component of the preparation of future society.

Research Aim and Research Questions

The purpose of this study is to determine the transformative impact of educational reforms in Poland. In particular, we need to determine the personal correlates reflecting the effectiveness of educational interventions and the actualized needs of teachers, as well as to predict the changes that await the educational system of the country in the future. The final goal of the presented work is defined by the development of a model of pedagogical support for the process of personal development of the personality.

Research Methodology

General Background

The chosen direction of research work requires qualitative modeling of educational interaction, which will allow us to assess the changes that occur at the personal level of each of the teachers. Thus, we can get a forecast concerning the necessary modifications of the educational process in accordance with the obtained results. To embody the research tasks the method of psychological and questionnaire survey was chosen, during which the main personal characteristics of the respondents were determined. In addition, the conditions of educational interaction and the degree of integration of information and communication technologies in the educational environment of Polish educational institutions where respondents receive education were established. A separate element of the modeling is the assessment of the educational process by teachers and testing to determine the level of academic achievement in accordance with the current curriculum. The generalized model of future personality development in the conditions of educational environment reforming includes such components as subjective (characterizing students' peculiarities: characteristic profile of education applicants, self-actualization and ego-identity level, evaluation of self-efficacy in learning, quality of educational services provided and objective evaluation of academic achievements) and objective (covering specifics of educational environment functioning: evaluation of technical and methodological support, professional

competence Thus, we realize the possibility of reconciling qualitative and quantitative methods of research of this problem and have a way of an embodiment of complex modeling.

Sample / Participants / Group

The sample of this study, according to the specified goal, should reflect the tendency of future personality development in the educational process. Accordingly, a group of education applicants was selected, in the age range from 14 to 27 years, studying at different educational degrees and involved in various forms of educational interaction. In addition, a survey was conducted among the employees of the educational institutions among whose students the survey was conducted. Thus, a total of 324 students and 19 educational institutions were involved in the study, including 8 institutions of higher education, 6 colleges, and 5 schools. The survey was conducted from January 12 to February 14, 2022. The respondents were ensured confidentiality and anonymity, and the answers were kept in accordance with the existing norms of personal information protection. It should also be noted that all underage respondents were informed in advance and gave their written consent approved by the signature of their parents to participate in the survey. Given the wishes of the administration of a large number of educational institutions, the names of the latter are not specified in the work.

Instrument and Procedures

According to the research design described above, the tools used can be divided into three main categories: psychodiagnostic (aimed at determining the personal characteristics of the participants of the educational process), quantitative (evaluation of academic performance rating, quality of educational services) and qualitative (evaluation of the functioning of the learning environment). The psychological survey was conducted with the help of the 1Ka platform, the battery of psychometric methods included such methods as: Picture Based Personality Survey for Children (PBPS-C v1) 2001), Objective Measure of Ego Identity Status (OEMEIS) (Kwast-Welfeld et al., 2004). Quantitative assessments were made using tests and questionnaires. Accordingly, several forms of multi-subject tests were developed according to the educational level of the respondents, lasting 40 minutes to assess the educational achievements of the students in a percentage representation. To the questionnaires aimed at assessing the demographic characteristics of the sample and the current well-being of the respondents were also added questions to assess the quality of educational services provided. Administrations of educational institutions were given questionnaires with open-ended questions aimed at determining the measure of technological and methodological support and the main constraints in professional activity faced by teaching staff.

Data Analysis

The obtained quantitative results are standardized in accordance with the auxiliary methodological materials provided by the developers of the methods. Thus, the numerical representation of the obtained indicators reflects the manifestation of the relevant characteristics in the walls. Qualitative data were used for categorization, as a basis for further processing. For the quantification of textual responses of employees of educational institutions, the software for textual analysis automation (TextMiner) was used. The corresponding results are presented further in the work in the form of visualizations (diagrams and tables). Data analysis was performed using Jamovi software,

using the following mathematical and statistical methods: descriptive analysis, checking the normality of distribution by the Shapiro-Wilk criterion, checking the homogeneity of variance of the studied groups by the Livin criterion, analysis of equality of mean values by Stu t-criterion by one-factor variance analysis (ANOVA).

Research Results

The work is based on the method of modeling, respectively, the necessary step is to determine the main components of the theoretical model for the purpose of subsequent empirical testing. Thus, during the processing of research publications, it was found that the content category, which has an integrative meaning for the topic under study, is the information society. In particular, the researchers of this direction define the concept of information society as a model of the existence of an active personality under conditions of the wide spread of information and communication technologies as a complementary resource for this activity (Kumar, 2020). In fact, it is a model of society in which ICT-support is a cross-cutting element. This category is important for understanding the features of personal development in the educational process, taking into account the possibility of long-term prediction of the results of educational interaction (Dwivedi et al., 2020). In fact, training in any educational program should provide for a high level of personal functionality in the information society. First of all, this is related to the changes in the reality in which the educational program is formed: digital literacy is now one of the key elements of professional competence. Moreover, this trend has already been implemented within educational institutions, which is reflected in planned and unplanned activities that are implemented by pedagogical staff in order to form relevant competencies in students. However, the question of the impact of such modifications on the personal development of teachers remains open. After all, we can talk about the information society as a new form of existence of social reality, which not only requires new professional skills from the personality of the future but also contributes to the restructuring of its personal narration. So, we can rely on this category when selecting appropriate components for further analysis.

In particular, when considering the procedural dimension of the information environment, the concept of personal information culture should be taken into account. This term embodies the degree of integration of an individual into the information society. Accordingly, we can consider it as a way of conditional scaling of a certain subject's readiness to realize his own needs in a new context, taking into account his ability to use appropriate technological support. In this case, we can integrate the category of applied skills and general abilities of an individual that contribute to his/her adaptability: formation of information culture in the process of obtaining an educational degree is a simultaneous mastering of ICT functionality and retranslation of value orientations associated with the relevant technologies (experience). satisfaction of needs, sense of value, and the possibility of differentiation in relation to information). In this case, we are talking about a significant transformation of the educational process: now teachers are not just mastering ICT skills, but also adapting to life in the new information reality. Consequently, we can interpret information culture not only as the ability to interact with ICTs but also as the ability to develop personally in the context of the information society. Note that we can operationalize this characteristic exclusively through digital literacy indicators; at the same time, we note that this method does not allow us to directly evaluate the formation and development of students' information culture. Nevertheless, we have managed to form a theoretical model, which allows us to conduct a study of personal development processes in the above-mentioned modern conditions of education adaptation to the needs of an information society [Figure 1].

Figure 1

Model for the Study of Personal Development in the Information Society

	The objective aspect	The integrative aspect	The subjective aspect
Theoretical modeling stage	Changes predictors in the educational process	Information society	The new context of personal development
	The purpose of the modern educational process	Personal information culture	Adaptability
	Elements of educational reforms	Elements of information culture	Elements of personal development
Experimental design stage	Technical support	Information security and hygiene	A measure of personal harmony
	Methodical support	Opportunity to satisfy needs	Experiencing fulfillment
	Professional Competences	Information management skills	Identity formation
Operating stage	Qualitative data presentation	Prediction of future personality development: 1. Enriching the environment accelerates the process of personal development 2. The educational system contributes to the implementation in the information society 3. ICT proliferation ensures that resources meet the actual needs of the individual	Quantitative representation of data
	Quality assessment by administrators		Personality disposition profile
	Quality assessment by students		Self-actualization index
	Test assessment of student success		His or her level of identity
	Assessment of students' digital literacy		Self-efficacy index

Source: Drafted by the author based on (Belan, 2018; Kornianwan, 2022; Kruszewska et al., 2022).

The presented model reflects two main aspects of the studied phenomenon: objective (concerning directly reforms in education) and subjective (concerning personal changes as a consequence). The connection between these components we have formed with the help of the category of the information society, which gives the systematic character to the obtained results. Accordingly, we can proceed to the detailed categories of the proposed theoretical model. In particular, we note that the use of information and communication technologies enhances teachers' self-efficacy by increasing the time resource (Marchlik et al., 2021). Thus, the quality of educational services provided is improved without the need to invest resources in methodological support. A significant number of digital platforms offer didactic designs freely available, which simplifies the process of preparing teaching material. At the same time, it is still possible to modify the material, as templates are widespread to present the necessary information in an accessible format. In this case, we can highlight such positive consequences as: the possibility of developing topics in different forms, techniques; increased time devoted to providing an individual approach; focus on long-term planning; the ability to focus on the process rather than the result; simplification of the evaluation system - all these properties of digitalized education indicate a significant improvement in the quality of educational services and the possibility of balancing the didactic and educational component. The next aspect that has a significant impact on this process is communication accessibility in the information society. Thus, pedagogical workers have the opportunity to exchange professional experience by applying ICT, which significantly increases the speed of selecting effective pedagogical interventions. At the same time, students have the opportunity to receive the necessary psychological stimulation, which will contribute to the formation of appropriate new formations at each age stage and the social adaptation of personality. The information society contributes to the intensification of interpersonal interaction, which simplifies the process of passing the age crisis and at the same time provides a resource for personal development. In particular, through the availability of an enriched environment, referents, psycho-emotional support, formation of "We-experience", awareness of his own state, and the possibility of mastering new skills and abilities. Thus, we can accentuate the positive psychological and pedagogical significance of the use of ICT in the

modern educational context (Kowal et al., 2021). In addition, there is a significant expansion of the edutainment space beyond educational institutions. Students are gaining access to the necessary resources for personal development for the use of ICTs without mandatory mediation. In addition, it should be noted that the transition to the information society contributes to the development of personal agency and stimulates it to self-movement in the cognitive process. It is important to note that the use of ICTs gives access to a new way to meet the needs of the individual, accordingly it is reasonable to talk about the enrichment of its environment, which is the basis for the development of a harmonious personality. Thus, let us note again that the information culture of the individual is a cornerstone property, which determines the possibility of its self-realization in an innovative society.

In conclusion, we note that educational institutions in Poland need to modify the existing educational strategies because the cornerstone of providing quality educational services is the selection of standards and norms of professional activity. Accordingly, it is appropriate to consider the development of the individual in the context of reform, taking into account the new context in which that individual will exist. And at the same time, we should consider the information society as an important stage of social development in the future, which should already be the basis for educational and professional training.

Accordingly, based on the presented theoretical model, we can proceed to highlight the results of its empirical testing. The processed data are given in the corresponding visualization [Table 1]. It should be noted that only statistically significant indicators, reflecting trends characteristic of the general population in the context of Poland, are presented below. The obtained data should be interpreted with caution, taking into account the characteristic sociocultural context and the possibility of methodological bias.

Table 1

Results of the Mathematical and Statistical Analysis of the Data Obtained

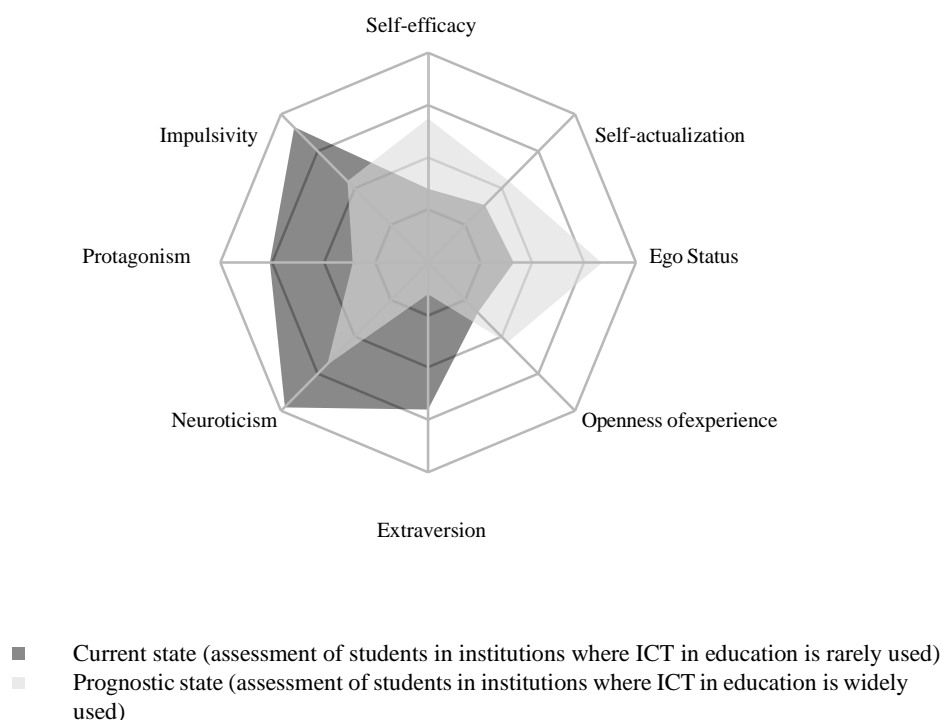
Indicator	Grounds	<i>p, Shapiro-Wilk</i>	<i>p, Levene</i>	<i>p, t-Student</i>	<i>p, ANOVA</i>
Self-Efficacy	Administration assessment	0.249	0.002	0.023	—
Self-Efficacy	Use of ICTs	0.081	0.012	0.004	—
Ego Identity	ICT Usage	0.382	0.028	0.002	—
Ego Identity	Academic performance	0.114	0.034	—	0.001
Self-Actualization	Digital Literacy	0.290	0.023	—	0.004
Self-Actualization	Academic performance	0.311	0.007	—	0.048
Self-Actualization	Student assessment	0.104	0.019	0.035	—
Introversion	Digital Literacy	0.073	0.023	—	0.014
Introversion	Evaluation by students	0.425	0.013	0.022	—
Neuroticism	Administration assessment	0.091	0.011	0.005	—
Openness of experience	ICT Usage	0.112	0.009	0.017	—

Source: compiled by the author based on empirical research.

Based on the obtained results, we can characterize the process of personal development under the conditions of information and communication transformations in the educational environment. In particular, we note that the teachers' assessments of educational groups offered by the administration did not correspond to the results of the psychodiagnostic survey of teachers. Thus, self-efficacy and inferior neuroticism are more pronounced in the educational group, which is evaluated as ineffective and neurotic ($p < 0.05$). At the same time, the students who evaluate the educational process as ineffective have pronounced extravertedness and do not feel actualized at the moment of diagnosis ($p < 0,05$). Thus, we can talk about a certain limitation of communication channels of students and teachers, which is signaled by the obtained values. The problem of mutual understanding and the formation of a favorable psychological climate in the study group is characteristic. Complementing these conclusions, we note that a higher rate of academic performance in the groups with higher ego-identity and self-catalyzed, which confirms the discrepancy between the administration's assessments and the actual skills of students ($p < 0.05$). In addition, we were able to find that the use of ICT in learning and high digital literacy scores contribute to students' self-efficacy, ego-identity formation, and experience of self-actualization ($p < 0.005$). In conclusion, we note that the use of information and communication technology is more effective among students who are introverted and open to new experiences ($p < 0.05$). Below we offer a profile of the personal development of students in the specified conditions [Figure 2].

Figure 2

Psychodiagnostic Profile of Personality Development of the Future Personality



Source: compiled by the author based on the results of empirical research.

We can generalize the following forecast of personal development in the new context of the educational process: the use of information and communication technologies and the corresponding processes of educational reform will be the basis for faster and better passage of the identity crisis among high school and higher education students; ICTs in the educational process inside and outside the educational institution serve as an environment for teachers' self-actualization; moreover, in student groups that effectively apply these technologies, the index of introversion and openness of experience will be higher. We may say that in general, the community of educators tends to individualistic development in the conditions of the formation of the information society. In addition, it is advisable to reform the evaluation system and introduce measures aimed at improving differentiation skills among educators.

Discussion

It should be noted that according to the results obtained, the use of information and communication technologies and related processes of education reforms significantly change the conditions of students' personality formation. In contrast to the mentioned transformations do not provide an opportunity to solve the cornerstone methodological and applied problems, which confront the specialists in this direction. In particular, we can talk about the likelihood of rejection of the latest didactic approaches and information resources used by teachers by co-researchers. In addition, the issue of limited contact between teachers and students remains open, which complicates the process of creating a favorable environment for the effective personal development of the latter. Since ICT-oriented reforms are a response to societal and, in particular, socio-cultural transformations, we have to realize that the personality of the future, as well as the educational paradigm, are not fully integrated into the new context and the priority is to develop resources for successful adaptation in the new information society. Although the widespread use of ICT in the Polish educational environment will be beneficial for the psychological development of applicants for education, the tangential processes outlined above should be considered, which hampers the overall learning process and excludes the possibility of realizing the positive effects of the digitalization of education.

Accordingly, the issue of person-centeredness and compliance with the humanistic approach in education remains relevant. Currently, this principle is embodied in the possibility of a conscious choice of teachers to use the latest technological support. At this stage of education reform in Poland, ICT-based learning plays the role of an alternative form of organization of the educational process, providing freedom for participants in the educational process. Nevertheless, the dissemination of relevant technologies and their inclusion into the general didactic contour significantly transforms psychological and pedagogical strategies. Moreover, given the psychological profile based on the results of the proposed study, it can be noted that digital literacy and information culture will become one of the components of the professional and personal development of students. Thus, the key issue is to find ways to reconcile the actual needs of ICT application while maintaining sufficient plasticity in the educational process.

Considering the broader context of these processes, we can talk about the presence at this stage of a significant imbalance in the contact between teachers and students due to the urgent transition to distance learning in the period of the COVID-19 pandemic (Bogdandy et al., 2020). The crisis caused by these circumstances requires a meaningful revision of current pedagogical methods. We can now speak of a pronounced unpreparedness of the psycho-pedagogical sector to provide the necessary conditions

for the realization of the future personality potential (Tomczyk & Oyelere, 2019; Tomczyk & Eger, 2020). Cyber-education cannot guarantee a sufficient level of effectiveness and learning material assimilation. At the same time, we see from the results that the potential of these transformations is significant, and it is only necessary to determine the best ways to solve the crisis. In particular, we can talk about the need to develop teachers' digital competence (Durek et al., 2018).

It is obvious that ICT-based learning can be a resource for improving the quality of educational services. First of all, it is associated with an increase in teachers' time resources and the possibility of applying new approaches to learning. Thus, the developments of Educhain, the Dokuchain project, which provide digitalization of documents and reduce the workload of the administration of educational institutions, are now functional. The development of so-called academic passports may become a resource for eradicating the bureaucratization of the educational system. We can prognostically note that such software will be a prerequisite for the resolution of the educational crisis and will contribute to the realization of the positive effects of the introduction of ICT (Tomczyk et al., 2019). Obviously, this crisis is not limited only to the complicated paperwork, but we refer to the experience of these initiatives, considering their functionality and real consequences for the Polish education system at this stage. To summarize, we can point out that increasing digital literacy and the diffusion of ICT beyond the didactic component is a primary goal for future educational strategies.

Finally, this paper does not present the process of personal development in the context of inclusive education and the promotion of personal development through the implementation of the principles of lifelong learning. Nevertheless, we can talk about the consistency and coherence of the results obtained with the available information regarding these aspects. In particular, this is evidenced by the results of the software (e.g., OCR (Optical Character Recognition), public sector initiatives (e.g., Panstwowy Fundusz Rehabilitacji Osób Niepełnosprawnych, Pfron, the Digital Poland operating program). With the help of such developments educational workers with disabilities or disabilities, individual or collective, directly necessary to provide a functional educational environment (Tomczyk et al., 2019). Thus, the next goal in the development of educational strategies of the future can determine the removal of barriers to the use of ICT in the educational process. such important components as the availability of actual technical support for participants in the educational process, the digital adaptation of people with disabilities or sensory disabilities, the digital literacy of teachers, and the implementation of a humanistic approach through ICT channels.

Conclusions and Implications

Reforming the educational system of Poland associated with the spread of information and communication technologies currently causes an educational crisis. The resolution of this crisis requires a high level of adaptability and readiness of the specialists in this direction to significant changes in educational strategies. At the same time, with a qualitative transformation of the current paradigm of psychological and pedagogical support for teachers, we can speak of the significant positive effects of ICT application in education. In particular, students will be able to effectively integrate into the new information society, to obtain a sufficient level of professional training for professional self-realization under conditions of significant digitalization. Ultimately, the new educational context greatly contributes to the personal formation of the latter. Yes, we can talk about optimizing the passage of age crises among students (in particular, the identity crisis among high school and university students). Access to information and communication technologies allows participants in the educational process

to self-actualize and increase their efficiency. Characterological changes among educators are pronounced: reduction of neuroticism and impulsiveness, orientation and individuality, and lower need for dopamine satisfaction testify to a greater possibility of meeting the needs of an individual included in the ICT-oriented educational process. Moreover, the information society is an environment that promotes openness to new experiences. To summarize, we can speak of significant prospects for education in Poland if the crisis is resolved in a timely and effective manner, due to the need for a sudden transition to the distance form of learning.

References

- Belan, V. (2018). Europejska strategia w dziedzinie informatyzacji edukacji: Przejście do otwartej edukacji [European strategy in the field of informatization of education: Transition to open education]. In A. Ostenda, M. Ekkert, & P. Mikos (Eds.), *Information and innovation technologies in education*, (pp. 16–25). Katowice School of Technology. URL: <https://lib.iitta.gov.ua/id/eprint/712004>
- Bogdandy, B., Tamas, J., & Toth, Z. (2020, September). Digital transformation in education during COVID-19: A case study. In *2020 11th IEEE international conference on cognitive infocommunications (CogInfoCom)* (pp. 173–178). IEEE. <https://doi.org/10.1109/CogInfoCom50765.2020.9237840>
- Đurek, V., Kadoic, N., & Ređep, N. B. (2018, May). Assessing the digital maturity level of higher education institutions. In K. Skala, M. Koracic, T. G. Grbac, M. Cicin-Sain, V. Sruk, S. Ribaric ... M. Janjic (Eds.), *2018 41st international convention on information and communication technology, electronics and microelectronics (MIPRO)* (pp. 671–676). IEEE. <https://doi.org/10.23919/MIPRO.2018.8400126>
- Dwivedi, Y. K., Hughes, D. L., Coombs C., Constantiou, J., Duan, Y., Edwards, J. S. ... Upadhyay, N. (2020). Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. *International Journal of Information Management*, 55, Article 102211. <https://doi.org/10.1016/j.ijinfomgt.2020.102211>
- Espino-Díaz, L., Fernandez-Caminero, G., Hernandez-Lloret, C.-M., Gonzalez-Gonzalez, H., & Alvarez-Castillo, J.-L. (2020). Analyzing the impact of COVID-19 on education professionals. Toward a paradigm shift: ICT and neuroeducation as a binomial of action. *Sustainability*, 12(14), Article 5646. <https://doi.org/10.3390/su12145646>
- Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers & Education*, 118, 107–119. <https://doi.org/10.1016/j.compedu.2017.11.011>
- Korniawan, R. (2022). Analysis of digital education constraints during the Covid-19 pandemic in G20 member countries. *Wacana Publik*, 16(1), 49–58. <https://wacanapublik.stisipoldharmawacana.ac.id/index.php/politik/article/view/33>
- Kowal, J., Keplinger, A., Klebaniuk, J., Mäkiö, J., & Soja, P. (Eds.) (2021). Digitalisation, innovation and education for socioeconomic development. *SSRN*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3941737
- Kruszewska, A., Nazaruk, S., & Szewczyk, K. (2022). Polish teachers of early education in the face of distance learning during the COVID-19 pandemic – The difficulties experienced and suggestions

for the future. *Education* 3-13, 50(3), 304–315.
<https://doi.org/10.1080/03004279.2020.1849346>

- Kumar, K. (2020). From post-industrial to post-modern society. In R. Blom, E. Karvonen, H. Melin, K. Nordenstreng, E. Puoskari, F. Webster, & F. Webster (Eds.), *The information society reader* (1st ed.) (pp. 103–120). Routledge.
- Kwast-Welfel, J., Boski, P., & Rovers, M. (2008). Intergenerational value similarity in Polish immigrant families in Canada in comparison to intergenerational value similarity in Polish and Canadian non-immigrant families. In G. Zheng, K. Leung, & J. G. Adair (Eds.), *Perspectives and progress in contemporary cross-cultural psychology: Proceedings from the 17th International Congress of the International Association for Cross-Cultural Psychology* (pp. 192–210). https://scholarworks.gvsu.edu/iaccp_papers/13/
- Lee, C. C., Yuan, Z., & Wang, Q. (2022). How does information and communication technology affect energy security? International evidence. *Energy Economics*, 109, 105969. <https://doi.org/10.1016/j.eneco.2022.105969>
- Marchlik, P., Wichrowska, K., & Zubala, E. (2021). The use of ICT by ESL teachers working with young learners during the early COVID-19 pandemic in Poland. *Education and Information Technologies*, 26(6), 7107–7131. <https://doi.org/10.1007/s10639-021-10556-6>
- Ratheeswari, K. (2018). Information communication technology in education. *Journal of Applied and Advanced Research*, 3(1), S45–S47. <https://dx.doi.org/10.21839/jaar.2018.v3S1.169>
- Roztocki, N., Soja, P., & Weistroffer, H. R. (2019). The role of information and communication technologies in socioeconomic development: towards a multi-dimensional framework. *Information Technology for Development*, 25(2), 171–183. <https://doi.org/10.1080/02681102.2019.1596654>
- Siren, A., & Knudsen, S. (2017). Older Adults and Emerging Digital Service Delivery: A Mixed Methods Study on Information and Communications Technology Use, Skills, and Attitudes. *Journal of Aging & Social Policy*, 29(1), 35–50. <https://doi.org/10.1080/08959420.2016.1187036>
- Tindowen, D. J. C., Bassig, J. M., & Cagurangan, J.-A. (2017). Twenty-first-century skills of alternative learning system learners. *SAGE Open*, 7(3). <https://doi.org/10.1177/2158244017726116>
- Tomczyk, Ł., & Oyelere, S. (2019). *ICT for Learning and Inclusion in Latin America and Europe. Case Study From Countries: Bolivia, Brazil, Cuba, Dominican Republic, Ecuador, Finland, Poland, Turkey, Uruguay*. Pedagogical University of Cracow. <https://doi.org/10.24917/9788395373732>
- Tomczyk, Ł., Wnek-Gozdek, J., Mroz, A., & Wojewodzic, K. (2019). ICT, digital literacy, digital inclusion and media education in Poland. In Ł. Tomczyk & S. S. Oyelere (Eds.), *ICT for learning and inclusion in Latin America and Europe* (pp. 160–190). Pedagogical University of Cracow. <https://doi.org/10.24917/9788395373732.7>
- Tomczyk, Ł., & Eger, L. (2020). Online safety as a new component of digital literacy for young people. *Integration of Education*, 24(2), 172–184. <http://hdl.handle.net/11025/39557>
- Wasserman, E., & Migdal, R. (2019). Professional development: Teachers' attitudes in online and traditional training course. *Online Learning*, 23(1), 132–143. <https://doi.org/10.24059/olj.v23i1.1299>

- Wrahatnolo, T., & Munoto, M. (2018). 21st centuries skill implication on educational system. *IOP Conference Series: Materials Science and Engineering*, 296, Article 012036. <https://doi.org/10.1088/1757-899X/296/1/012036>
- Wu, J., Guo, S., Huang, H., Liu, W., & Xiang, Y. (2018). Information and communications technologies for sustainable development goals: State-of-the-art, needs and perspectives. *IEEE Communications Surveys & Tutorials*, 20(3), 2389–2406. <https://doi.org/10.1109/COMST.2018.2812301>