# Andragogy as a Scientific Basis for Training Professionals in Information Security

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Abstract. The paper presents the results of research on the use of the basic provisions of andragogy to improve modern systems of training professionals in a particular professional field (information security). To do this, the characteristics of such systems were determined, the classification of trainees according to the criteria of adulthood was carried out, the possibilities of applying the basic provisions of andragogy to the object (an educational system) and the subject (processes, methods, and technologies of training) of research in the selected area were considered.

Keywords: Andragogy · Pedagogy · Adult learning · Adult education · Information security · Training

1 Introduction

The "andragogy" term most often refers to a sufficiently large area of knowledge relevant to adult education. Its history can be divided into several phases [1, 2]:

Phase 1. The emergence of the "andragogy" term. The term as a part of pedagogy relating to adult education was first used in 1833 by A. Kappa, a German high school teacher. The Kappa's "Plato's educational ideas as pedagogy for individuals and as public education" [3] includes a section entitled "Andragogy or education for men in adulthood" ("Die Androgogik uber Bildung im manlichen Alter"). On 60 pages, the author considers the problems of education, characterizes education in the context of the main values of human life and connects these problems with the training of physicians, soldiers, teachers, speakers, rulers and men as fathers of their families. Using the "andragogy" term, the author does not give its definition and does not talk on its authorship. It should be noted that in most of the subsequent works of his followers the priority of this term's usage is given to Kappa. However, he did not develop the theory of andragogy but justified the practical importance and necessity of education for adults. Over the following decades, the "andragogy" term was almost forgotten. This can be explained by the fact that studies conducted actively in this area in Europe and America had their own history and terminology. Therefore, the new term did not have widespread support.

Phase 2. "Andragogy" was reborn. In 1920, adult education became the subject of active research in Germany. In one of the first published works (Lindeman, 1926)

andragogy was considered as a new direction in science without special justification [4]. Most of the works were related to the study of practical problems of adult education. In most studies, andragogy was reduced to the method of teaching of adults, thereby significantly narrowing its subject and weakening its theoretical foundations. At this phase, the important results include not only the initial stage of disclosure of the "andragogy" concept but also the formation on an interdisciplinary basis of a community of researchers from academic and scientific institutions that have begun to work actively in this area.

Phase 3. Formation of andragogy as a separate science. Studies of andragogy in the 2nd phase remained largely unnoticed until the 50s and 60s of the XXth century when in Europe and the US there was a new interest in the formation and development of andragogy as a scientific discipline related to adult education. These two directions of research can be explained by the fact that the accumulation of research results occurred in different conditions (social, economic, due to the end of the 2nd World war, and even geographical) and was based on different needs in adult education. A comparison of these two approaches on a scientific basis can be found in Savicevic's work [5]. We will not consider in detail the differences of scientific schools of the US and Europe but will focus only on the results of research in andragogy, which can form the scientific basis of the development of training of professionals in information security (IS).

A leading scientific school was formed in the US under the leadership of M. Knowles, who called andragogy an art and science of helping adults in learning and a system of statements on adult learners, which should be applied differentially to different adults depending on the situation [6]. The key element of Knowles's works is the justification of differences between pedagogy and andragogy [7] made on the basis of considering the main characteristics of an adult learner. Further, he formulated the basic principles of andragogy, identified the key factors to be taken into account in the development of programmes for adult education and considered the variety of factors motivating adults to learn. The main results, which were obtained by the Knowles's scientific school, are published in [8]. This monograph was reprinted 7 times (last time in 2011)!

In Europe, studies were on a broad front in Germany, Switzerland, the Netherlands, Yugoslavia, Hungary, Finland, Poland, and Russia [5]. Currently, scientific journals are published with the "andragogy" word in their titles. Departments of Andragogy are operating actively in various universities, which teach disciplines related to andragogy. The International Society for Comparative Adult Education (ISCAE) with a recognized leader J. Reischmann as its President unites the scientific community, which carries out research on adult education.

The results, which are useful for our study, can be highlighted as follows [9, 10].

1. The definition of andragogy was clarified. It refers to an art and science to help adults to learn, as well as to study the theory of education, the processes, and technologies associated with it.
2. The statement of the need for continuous adult education was justified.
3. The requirements for teachers to teach adults were defined. These teachers were called "andragogues" that emphasizes their differences from teachers.

4. The necessity of introducing the "Andragogy" discipline into the curricula of academic training of teachers is substantiated in the assumption that universities' graduates can participate professionally in adult education. The latter is implemented in dozens of universities around the world but not always under the above-mentioned name.

   It should be noted that the experience of teaching such a discipline accumulated at universities does not solve the problem of a universal andragogue [11] as his possible follow-up practical activities, which are associated with adult learning, are significantly influenced by specifics of a professional field, to which the adult learner prepares.

   This conclusion was the basis for research on the use of the recommendations of andragogy to improve modern systems of training of professionals in a particular professional field (IS). To do this, the characteristics of such systems will be determined, the classification of trainees according to the criteria of adulthood will be carried out, the possibilities of applying the basic provisions of andragogy to the object (educational system) and the subject (processes, methods, and technologies of training) of research in the selected area will be considered in the paper.

2   IS Professional Training Systems

IS professional training systems in different countries have their peculiarities. The following is common among them:

- Professional training is conducted within the systems of higher (academic) (1st stage) and postgraduate additional professional (2nd stage) education;
- The system of higher education usually has two levels: Bachelors and Masters;
- The system of postgraduate additional professional education (APE) is based on the short-term professional refresher courses (RC) for obtaining additional professional competencies and retraining (RT) programmes for developing trainees' competencies related to a new type of their professional activity.

   It should be noted that the same features are typical for other professional areas. However, the peculiarity of the IS field is due to the fact that it is constantly changing. This fact leads to the need to correct the content of educational programmes almost every two years that results in the following. It is necessary to adapt constantly the higher education programmes that contradicts the principle of their stability within each curriculum. It increases the APE role, for which it is necessary to develop new educational programmes permanently. If an IS professional wants to meet modern requirements, he must improve constantly his skills through self-education and APE, following the principle of continuous professional learning (learning throughout the whole professional life).

   Differences between countries in their IS professional training systems relate to the presence of separate trajectories of academic education and duration of training for individual educational programmes. For example, in the UK [12] it involves the development of the trajectory of academic education, which includes the implementation of the following programmes (Fig. 1):

- For the Bachelor's degree (B), the duration Tb of training on which is 3 years. On the timeline on Fig. 1, it corresponds to the time difference ($Tb = Tbe-To$). Its volume called laboriousness is 360 credits,
- For the integrated Master's degree (M), the duration Tm of training on which is 4 years ($Tm = Tme-To$) with laboriousness of 480 credits,
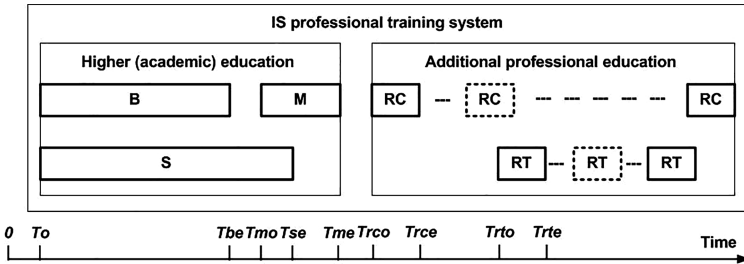- For the Master's degree (M), the duration Tm of training on which is 1 year with laboriousness of 180 credits.

Fig. 1. Structure of the IS professional training system

In the Russian Federation [13], the trajectory of academic Bachelor's and Master's training is also implemented, as well as in-depth engineering education on the basis of so-called Specialitet (S), and additional professional training in the form of RC and RT programmes is traditionally developed (Fig. 1). The implementation of Specialitet programmes forms a separate learning path. In this case, the duration Tb of training of Bachelors (B) is 4 years with laboriousness of 480 credits; for Masters (M) Tm is 2 years with laboriousness of 240 credits, for Specialists (S) Ts it lies in the range of 5–6 years ($Ts = Tse-To$) with laboriousness of 600–720 credits. The duration of various RC programmes Trc is from 16 to 250 academic hours ($Trc = Trce-Trco$) and of RT programmes Trt – from 250 to 1000 h ($Trt = Trte-Trto$).

It should be noted that regardless of the countries the start of training on Bachelor's and Specialist's degree programmes (To) often coincides with the time of graduation from secondary schools (possibly after a period of practical activity). The Master's degree programmes can be implemented immediately after the Bachelor's degree programmes ($Tbe = Tmo$) or at some interval related to professional activities (not always in the field of IS). The RC programmes should be held at least every two years (the interval between the end of academic education should not exceed two years). The RT programmes should be associated with a change in the type of professional activity within the field of IS (for example, from operational to organizational and management, or from operational to teaching).

3   Adult Learners: Who Are They?

Consideration of the features of IS professional training systems taking into account the time scale tied to the trainee's age shows that the minimum age of applicants for the Bachelor's and Specialist's degree programmes is 17–18 years, for Master's - 20–22 years and for RC and RT – 22–24 years correspondingly. If we take into account the fact that in Russia, for example, a young man 18-years old has the right to participate in elections, form a family and be called up for military service, where he will be entrusted with weapons and may die defending his homeland, trainees in any IS professional training programmes can be considered the adult trainees.

To accept only trainees' age as a basis for defining the adulthood, without taking into account their psycho-physiological properties, is not sufficient. For example, one can also consider the basic life tasks that can be set only by an adult. On this basis, Knowles divided the adults into three groups: 18-30, 30–65 and 65+ years [6]. Adults in each group have their own attitude to their profession, career, family, home, development of personality, use of free time, health, public life, etc. Knowles considered an adult a person "who behaves like an adult, i.e. plays adult roles (employee, spouse, parent, responsible citizen, soldier) – the sociological definition" and "whose self-consciousness is the self-consciousness of an adult – the psychological definition". A person is an adult to the extent that he perceives himself responsible for his life [6].

Thus, an adult refers to a person who performs socially significant productive roles (citizen, employee, family member), has physiological, psychological, social, moral maturity, relative economic independence, life experience and a level of self-awareness sufficient for responsible self-governing behavior.

Based on the idea of an adult, we should rely on these characteristics in his training and expect that he will treat the educational process consciously and responsibly. In addition, since an adult is usually engaged in a specific activity, his need for training will be related to some extent to his main professional activity, as well as the performance of other social roles. So he will pursue specific, practical and real goals. It is also obvious that if usually in conditions of well-established life the adult with well-established social roles decides to study, then he has a strong enough interest (i.e. high motivation) to this. It is determined by the urgent need for training to solve an important life problem. At the same time, he seeks to apply immediately his knowledge, skills, personal qualities and value orientations acquired in the educational process to solve the above problem as soon as possible. In learning activities, an adult learner relies inevitably on his life experience (everyday, professional, social), which often serves as an important source of learning for both himself and his colleagues.

Considering all of the above, we can define an adult learner as a person with five fundamental characteristics that distinguish him from the non-adult learners [14]. He is aware of himself as an increasingly independent, self-governing person. He is gaining more and more life experience (everyday, professional, social), which becomes an important source of training for himself and his colleagues. His readiness to learn (motivation) is determined by his desire to solve his vital problems and achieve specific

goals with the help of educational activities. He strives for the immediate implementation of the acquired knowledge, skills, personal qualities, and value orientations. His educational activity is largely due to temporary, spatial, professional, household and social factors (conditions). In this case, if the adult approaches his training consciously, he primarily evaluates his real possibilities and abilities.

Summarizing numerous studies on the definition of human age periods, it can be argued [14] that physiologists, psychologists, sociologists, philosophers and researchers of educational problems have found that a person throughout his life goes through three clearly defined stages with their distinct features. The first stage called "immaturity" is divided conditionally into childhood, adolescence, and youth. According to various expert estimates, it lasts on average up to 20 years. The second stage called "adulthood" lasts from 20 to about 65 years. It is divided into the periods of early adulthood (up to about 35 years), maturity (up to about 50 years) and late adulthood. Finally, after 65 years a period of elderly ("golden" or "third") age comes.

If we apply the description of human adulthood to the modern education system, the following conclusions will be obvious:

1. In the implementation of the Bachelor's and Specialist's degree programmes, the trainee becomes an adult (early adulthood). This process needs help that should correct the trainees' activities.
2. It is necessary to treat training in the Master's degree programmes and APE programmes as adult education (the period of mature and late adulthood).
3. Educational programmes of the appropriate level and their implementation should reflect the characteristics of adult learners.

4   Pedagogy or Andragogy?

The principal features of the andragogical approach to the educational process can be identified by comparing the pedagogical and andragogical learning models [15]. The main differences between these models are presented in Table 1. The table shows that andragogy can be considered as a separate science of adult education, justifying the activities of adult learners and teachers in organizing the educational process.

Like any science, andragogy has its objects (adult educational processes) and subject (patterns of activity of adult learners and teachers while organizing and implementing the educational process) of consideration, as well as its structure, concepts, and terminology. Theoretical statements of andragogy as a science can be formulated and presented in the form of an andragogical learning model (Table 1).

In the previous section, we came to the conclusion that IS professional training must be approached as to the implementation of adult educational processes. Further, we consider the possibility of applying the andragogical model directly to our case.

Table 1. A comparison of the pedagogical and andragogical learning models

Characteristic	Pedagogical model	Andragogical model
Trainee's self-awareness	Feeling of dependence	Awareness of increasing self-government
Trainee's experience	Low value	Rich source of learning
Trainee's readiness to training	Determined by physiological development and social compulsion	Determined by the tasks of personal development and mastering social roles
Application of acquired knowledge	Deferred	Immediate
Orientation in training	On the subject	To solve the problem
The psychological climate of learning	Formal, teacher's authority-oriented, competitive	Informal, based on mutual respect and collaboration
The educational process's planning	By the teacher	Together with the trainees
Identification of training needs	By the teacher	Together with the trainees
Formulation of learning objectives	By the teacher	Together with the trainees
The educational process's construction	The logic of the subject, meaningful units	Depending on the trainee's readiness to learn, problem units
Educational activity	Technology of knowledge transfer	Technology of searching new knowledge on the basis of experience
Assessment	By the teacher	Joint identification of new training needs and evaluation of training programmes

5   Andragogical Approach to the Preparation of Training in the Field of IS

Preparation of training for any programme (including the field of IS) involves the following steps:

1. Definition of goals, objectives and expected learning outcomes.
2. Development of curriculum and syllabus for its components (disciplines, modules).
3. The choice of technologies for the educational process implementation.

4. Determining the curriculum for the training implementation.
5. Formation of the trainees.
6. Formation of the teaching staff.

Let us apply these steps to IS professional training using the adragogical model. In this case, the experience gained in the Russian Federation in the creation and implementation of the system for IS professionals training in general and at the National Research Nuclear University MEPhI (Moscow Engineering Physics Institute) in particular will be taken into account.

5.1 Definition of Goals, Objectives and Expected Learning Outcomes

The learning objectives, the tasks to be addressed to achieve these goals and the expected learning outcomes will be different for different educational programmes in IS.

For the Bachelor's and Specialist's degree programmes in the first years of training (basic training), a pedagogical model is applicable. The second half of training (teaching professional disciplines, Internship) includes the transition to the andragogical model in terms of the formation of trainees' awareness of increasing self-government, the acquisition of modern learning experience and practice of solving problems related to either IS ensuring basic issues (for Bachelors), or practical (engineering) issues (for Specialists).

The andragogical model is fully applicable to the Master's degree programmes and APE programmes. It is assumed that the trainee has a certain level of self-awareness in relation to readiness for training (including on the basis of practical problem solving), understanding of the role of self-management in training, a positive learning experience, and he is ready to apply immediately in practice the knowledge gained.

When defining the goals, objectives and expected learning outcomes, it is also necessary to take into account the qualification requirements formed by the professional community, for example, in the form of a model [16] or professional standards [17].

Thus, the purpose of training will be the formation of certain professional competencies in terms of the development of the learner's understanding that he is an adult (Bachelors and Specialists), or in terms of the implementation of educational processes that take into account the fact that the learners are adults (Masters and APE).

It can be recommended to formulate the goals, objectives and expected learning outcomes for a specific programme in IS in the form of a trainee's model, which should also reflect the characteristics of those entering the training.

5.2 Development of Curriculum and Syllabus for Its Components

A specific curriculum in IS should contain a list of disciplines with an indication of their volume (laboriousness in credits or in academic hours), forms of control of knowledge and place in the schedule of classes (in the curriculum).

The curriculum of any programme contains the following modules (cycles): Basic (General), General professional, Professional, Internship, and Control (current, final).

In accordance with the andragogical model (Table 1), one of the principles of adult education is the joint learner-trainee activity, related to the planning of the educational process, the definition of learning needs and the formulation of learning objectives. This means that the curriculum of a specific educational programme should include all the appropriate forms of individual training:

- Blocks of several elective disciplines. The trainee has the right to choose one of them; after that it becomes mandatory for him. His teacher should help him in choosing such disciplines. Our experience shows that the total laboriousness of these disciplines can reach half of the laboriousness of the Professional module. For example, if the curriculum includes a unit related to ensuring IS of automated systems (ASs), then it can include such disciplines as "IS of Automated Banking Systems", "IS of Automated Control Systems for Technological Processes", "IS of Decision-making AS", etc. This choice can also be ensured by the availability of elective disciplines in both Professional and Basic modules;
- Internship module. The Internship topic is chosen by the trainee and his teacher jointly. Its implementation is controlled by the teacher. For example, the Internship topic may be related to a certain type of professional activity (production, organizational and management, information and analytical, research, teaching);
- Trainee's independent work, the content of which is consistent with his teacher. Its volume (laboriousness) is included in the volume of a particular discipline (up to 50% of its volume) and in the volume of a particular Internship;
- Implementation and protection of a final qualifying work (FQW) with the topic selected by the trainee with his teacher. It is reasonable to involve in the supervision of FQW implementation not only the leading teachers of an educational institution but also the leading employees of the organizations-potential consumers of the graduates trained under the specific programme. The volume of FQW's implementation and protection is defined by the type of training programme.

Syllabus of disciplines from the curriculum are formed on the basis of determining their content (sections, topics), forms of training (contact or classroom work, independent work, monitoring of learning outcomes), the information base (mandatory and additional) and the forms and content of intermediate and final control of knowledge. In the discipline's syllabus, the requirements for the initial educational level of the trainee (for example, the level of knowledge and skills) should be defined and the levels of professional competencies, which should be formed during the discipline's mastering, should be formulated. This information should be consistent with the goals, objectives and expected learning outcomes generated during the phase of training preparation (for example, in the trainee's model).

Disciplines' syllabus of the Professional module in IS should have a practical orientation. Therefore, the acquired professional competencies should include a set of abilities (practical skills) that can be applied not only after graduation from the programme but also in the FQW's implementation. This can be done if the discipline's programme includes laboratory work, practical (case) training, homework followed by public protection of the results of their implementation [13].

Taking into account the peculiarities of adult education, it is possible to allow the development of individual curriculum and disciplines' syllabus, which correspond to the peculiarities of the andragogical model (Table 1).

5.3 The Choice of Technologies for the Educational Process Implementation

When choosing a technology for the implementation of the educational process, it is necessary to take into account not only the features of adult learning but also modern trends in the development of IT and IS areas. The IT development in general and, especially, the formation of information resources on the Internet have made a significant change in educational technology. The use of distance learning technologies (DLT) becomes relevant. The IS professional training is characterized by regular changes in the content of training, the presence of case training and the importance of teacher-trainees contacts. This imposes certain restrictions on the breadth of DLT usage. For example, in the Russian educational standards, there are restrictions on the volume of disciplines that can be implemented using DLT (not more than 25% of the volume of the Professional module), as well as a complete ban on distance learning.

The formation (implementation of Bachelor's and Specialist's degree programmes in IS) and the presence of a trainee's certain level of awareness of increasing self-government and readiness for training (implementation of Master's degree programmes and APE programmes in IS) justifies the high role of the trainee's independent work (discussed in Sect. 5.2) with the support of his teacher in the education process. This form of training allows to implement such element of the anragogical model as of how to apply the technology of searching new knowledge (Table 1). Public protection of the results of independent work in the framework of practical training allows to form a mechanism for joint assessment of the effectiveness of the training programme that also corresponds to the andragogical model.

5.4 Determining the Syllabus for the Training Implementation

When forming the curriculum for implementation of any training programme in IS, it is necessary to consider the following: features of the curriculum; the contact educational forms used (lectures, practical classes -seminars, and laboratory works); teachers' individual consultations; the content of the syllabus of individual disciplines (modules); presence in the curriculum of such forms as independent work and Internship; and the possibility of DLT usage. You should also consider the fact that trainees in senior courses in Bachelor's and Specialist's degree programmes as well as studying in Master's degree programmes very often combine training and work as interns or employees. At the same time, it is necessary to strive to ensure that the place and content of such work correspond to the specifics of the implemented programme.

As a rule, RC programmes are implemented in isolation from practical activities. Therefore, their curriculum is formed within the framework of intensive training in the time interval of 6-8 academic hours per day, 5-6 days per week.

The implementation of RT programmes can be associated with either full or partial separation from practical activities and the use of mixed (part-time) technology. Therefore, it is necessary to design the duration of this training up to 6 months.

5.5   Formation of the Trainees

The trainee decides to study under the Master's degree programme or APE programme in IS guided by the task to improve his skills to a level that is in demand in this labor market. Thus, he shows his readiness for training, which is determined by the tasks of its development. This is fully consistent with the andragogical model.

The trainee decides to study under the Bachelor's or Specialist's degree programme taking into account the peculiarities of his physiological development and under the influence of the social environment. It can include, for example, the pressure of parents' opinion and the prevailing opinion that exists in his information environment, which determines the prospects for the acquisition of professional competencies in IS. Therefore, these trainees can be attributed either to the late stage of immaturity (youth) or to the early stage of adulthood. Training in these programmes should be aimed not only at the formation of certain professional competencies but also to transform him into an adult learner in the view of the andragogical model. The consequence of this may appear in the trainee's opinion that he choose the wrong field of study. The experience gained by the authors in the MEPhI shows that the proportion of trainees who have interrupted their studies can reach several tens of percent.

The solution lies in the introduction of a special system of vocational guidance for the selection of young people on the basis of the formation of a culture of IS (inclusion of disciplines related to the IS basics in the school curriculum), the organization of Olympiads in IS, as well as the introduction of methods of psychophysical testing.

It is very important to connect to this system organizations interested in getting trained professionals of a certain level and specialization. The ideal is the formation of a contingent of trainees within the target order of a particular organization, which can participate in the formation of the goal, objectives and expected learning outcomes, as well as in the development of curricula and harmonization of disciplines' syllabus. It can be useful to send trainees to Internship to these organizations - the future place of work of graduates, as well as the inclusion of representatives of these organizations in the Commission for public protection of the results of their FQWs.

5.6   Formation of the Teaching Staff

The above analysis of the stages of preparation of training programmes in IS has shown that the teacher must have certain specific professional competencies in the field of training programmes in IS. Our studies have shown the lack of information on the existence of current operational systems of teacher training for the implementation of General professional and Professional modules in IS. Most often we are talking about the selection of such teachers. Based on our experience, which is not very different from the experience of other educational centers, we can identify the following main factors that are taken into account in the selection of teachers:

- Practical experience in the field of designing or usage of IS maintenance systems;
- Experience in carrying out research taking into account the specifics of an individual training programme;
- Teaching experience in the framework of similar educational programmes.

Here, the requirements for andragogues can be present only in relation to the teaching experience, and not to the presence of basic education in andragogy (even in relation to the RC in this field).

6   Conclusion

The analysis of the andragogical learning model conducted in conjunction with the consideration of the main stages of preparation for training programmes of academic and additional education in IS allows us to formulate the following conclusions:

1. An important reason for the need to move from the pedagogical to the andragogical model is the presence of factors that determine the attitude to trainees as adults. In this case, the role of the educator (teacher) also changes dramatically.
2. The level of applicability of the andragogical model will be different for different educational programmes.
3. The andragogical model is fully applicable to Master's degree programmes and APE programmes.
4. The andragogical model can be applied for the educational process of Bachelor's and Specialist's degree programmes in the senior courses.

Further research can be aimed at the development of andragogical models of trainees in various training programmes for IS professionals and appropriate models of teachers.

The development of the system of teacher-andragogue training is urgent. Fundamental is the availability of the professional competencies not only in IS relevant to the implementation of specific programmes but professional competencies in andragogy. Training of such teachers is possible in three directions. Firstly, in the framework of the curriculum of the Master's degree programme, which aims to form trainees' professional competencies for two areas of professional activity, for example, organizational and managerial (or project or operational) and teaching. Secondly, conducting RC for teachers with experience in the implementation of specific IS professional training programmes with the inclusion in the curriculum of the RC programme of disciplines on various aspects of andragogy. Thirdly, the implementation of RT programmes for IS specialists (possibly in IT too) with the inclusion in their curricula of a module related to andragogy. In all these cases, it is necessary to develop appropriate training programmes and corresponding methodological support.

The quality of teacher-andragogue training can be controlled if the evaluation system of teachers similar to the system of IS professional certification will be established. The appropriate programmes should be developed to do this.

The features of the results obtained in this research should also be noted. Foremost, they have a novelty in terms of the integrity of the chosen model, based on the

andragogical approach. Separate elements of the andragogical model without its designation were used earlier in practical educational activities in the field of IS. However, we are not aware of publications in which the features of the use of the scientific foundations of andragogy in this field were considered. Secondly, the results obtained are systematic in terms of applicability to various educational programmes in the field of IS. Thirdly, the results obtained are universal. They can be applied with a certain correction for the training of professionals in other areas for which the essential features are the need for continuing education and the high dynamics of the development of the subject area (for example, information technology).

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