
THE PRINCIPLES OF COMPLEMENTARY EDUCATION FOR SUSTAINABLE DEVELOPMENT

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Abstract. Development of the civilization was always accompanied by the knowledge and technological progress. Tools made us more skilful, capable and efficient. we currently observe intensification of transformations. Complementary education is a concept which assumes that the teaching-learning process should flexibly combine traditional education and, characteristic for it, direct communication with remote education, using the Internet and other forms of media. The essence of complementary education for sustainable development is to combine these two modes of education so that the individual elements are matched to each other, complement each other and are tailored to the needs and abilities of the student and teacher. Among these media, the computer and the Internet play a key role.

Keywords: civilization, sustainable development, complementary education, knowledge, technological progress

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1. Introduction

Development of the civilization was always accompanied by the knowledge and technological progress. Tools made us more skilful, capable and efficient. Gehlen, explaining this phenomenon at the level of cultural anthropology, indicates the following: “*A stone in palm relieves it, and also increases the effect of hitting fist; a car or ridden animal, relieves us in pedestrian traffic and far exceeds our efficiency*” (Gehlen, 2001). However, it should be noted, that we currently observe intensification of transformations. As noted by Giddens: “*Modernity inevitably globalizes, and the destabilizing consequences of this phenomenon connect with the circularity of its reflective nature, creating a universe of events, in which the risk and danger take on a new character*”. (Giddens, 2008) These phenomena were also observed in pedagogical sciences (Tanaś, 2007; Tadeusiewicz, 2007; Zaczyński, 1986). The opportunities posed by the spread of the new technology are emphasized, but we should be aware of the existing restrictions. “*ICT (Information and communication technologies) are not a panacea for the of education system problems. However, they may help in overcoming the barriers of conventional education and higher education, and also can contribute to the system of LLL (Lifelong learning, lifelong, life wide, voluntary, and self-motivated)*” (Tanaś, 2011).

The issue of new technologies often also raises concerns about the role of a teacher who “*is needed not only to indicate important information to students or teach them to do a proper use of internet information, but also to authenticate the selected information by his physical proximity and emotional relations with students and to motivate them positively to seek important information*” (Zaczyński, 2001).

Observing the changing world, it encourages us as the teachers, to seek new solutions that will allow, maintaining mutual subjectivity of students and teachers and the personal dimension of the process of teaching and education, to take full advantage of the benefits brought by modernity. We are also looking for the solutions that can protect us against dangers posed by new technology and the associated virtual reality. Respecting our great predecessors, we can say after Bernard of Chartres, that *“We are dwarfs, who climbed up on the shoulders of giants. In this way, we can see more and look further than they had, but not because our sight is sharper or we are taller; but because the giants raise us high and up to their gigantic height”* (Michałowska, 1999). We will be climbing, because we want to know more and look farther.

The essence of complementary education.

It is worth analysing the issues of new technological opportunities (Dhawan, 2020) in the context of the concept of complementary learning. Complementary education concept is an answer to the needs and opportunities of the modern world for the learners and educators. These relate to the learning and teaching experiences.. Expression of these experiences can be Gajewski statement published in the E-mentor journal: *“My over 25 years of pedagogical experience in the individualized learning and adapting forms of communication to the preferences of the students, is very negative. You cannot just do it if there are 30 students and one lecturer in the classroom”* (Gajewski, 2005). The possibilities offered by e-learning, also did not bring a complete solution of the problems. Although it allowed some personalization, but it also provided new difficulties, related in particular to the motivational processes and the limitations of the communication and perception.

The author of the concept of the complementary education is Maciej Tanaś (Mischke, Stanisławska, 2006). The concept itself was born at universities as a result of the analysis of the experiences of lecturers, educators, trainers and teachers and the opportunities that creates modern data communication technology.

As it is pointed out by Tanaś *“Computer and Internet should be considered as useful tools in education at university level, supporting the management and administration of the institution, facilitating flexible organization of education and above all, useful in the process of education, self-education and interpersonal communication. They are also tools that facilitate the work of libraries and duplication or distribution of the teaching materials, introducing a new quality of scientific research.”* (Tanaś, 2010). In its essence, the concept of complementary learning is trying to keep the advantages of traditional forms of education, while applying the creative advantages of the of modern technology, especially computer technology and Internet.

The main figures of the educational process are here a student and a teacher, both retaining their identity. They are forming and seeking knowledge together, enjoying the blessings of the technological development (Glavic, 2020) and at the same time being aware of the risks associated with the technology.

Thus, in the concept of complementary education, in the centre of the teaching-learning process are people - the teacher and the student, considered as a conscious entity and also the subject of education. Making these reservations, we accept the basic premise of the concept of complementary education presenting its essence.

Complementary education is a concept which assumes that the teaching-learning process should flexibly combine traditional education and, characteristic for it, direct communication with remote education (Billmeyer, From, Lindberg, & Pettersson, 2020), using the Internet and other forms of media. The essence of complementary education is to combine these two modes of education so that the individual elements are matched to each other, complement each other and are tailored to the needs and abilities of the student and teacher. Among these media, the computer and the Internet play a key role.

It is worth to point out the differences between e-learning, b-learning and complementary education. The concept of e-learning involves the use of Internet technologies for educational purposes (Rosenberg, 2003; Clarke, 2007), while complementary education requires the use of different forms of media, including direct communication. Complementary education concept is an extension of the concept of b-learning, also referred to as hybrid or blended learning. It is the result or effect of demands of integration of the different forms of educa-

tional media (Thorne, 2003). To realize the demands, the alternation (mixing) of various forms of media is not enough. A necessary condition is the complementarity of the means and the student's educational needs.

The concept of complementary education supplements with additional assumptions the existing rules of classical teaching and media education. It is important to emphasize here that the concept of complementary education does not reject, or otherwise, diminish the importance of previous achievements of the general didactic and in particular the work of Polish school, initiated by Kazimierz Sośnicki, Wincent Okoń and their colleagues and students. The concept does not negate the achievements of andragogy, understood here as a theory of adult education. Particularly important here are the assumptions of multilateral educational theory, which also have widespread use in adult education (Pólturzycki, 1991).

The principles of complementary education. As the traditional teaching takes some learning-teaching principles, referred to as "*the most general rules, which the teacher should follow in all his detailed process of teaching*" (Sośnicki, 1948) and called "standard outlining of the educational method for teacher" (Okoń, 1996), the concept of complementary education also defines the principles. However, unlike the traditional systems of teaching, the authors of the concept emphasize that they complete or extend the principles of traditional education, and not attempt to replace them. We accept the following additional principles of complementary education:

- The principle of conscious and independent participation of all participants in the teaching-learning process.
- The principle of educators' and students' cooperation.
- The principle of individualization and optimization of the learning process,
- The principle of comprehensive student's activation for how to use information critically and creatively.
- The principle of creative, combined and alternate using different ways and means of communication so that they supplement each other.
- The principle of efficiency and effectiveness.

These principles of complementary education need to be clarified and the most important dependencies that exist between them and also between traditional education, and the assumptions of the discussed theory needs to be indicated.

The principle of conscious and independent participation of all participants in the teaching-learning process. Both, students and teachers should be involved in the educational process in an independent and conscious way. Each participant of the process should independently determine his willingness to become a part of the teaching-learning. The efficiency of complementary education process depends on the willingness to subordinate to this action. Both, teachers and students should know what goals they set for themselves – why do they participate in the process of education.

It is important to recognize the goals and values connected with them as your own. That interiorization of goals is an important factor of success, contributes to learning motivation, and is an important element in the process of its support. The person, who consciously (in a subjective way) takes on the task or the activities, also takes responsibility for it. Knowledge about the world and people, by the subjective attitude to cognition of the object and by feeling the events connected with it, leads to attaching our emotions and feelings to it and becomes a value for us. Sośnicki writes that it is the value "[...] *which we want to defend, and we want to recruit the others for it*" (Sośnicki, 1963).

However, we should remember that experiences resulting from the activities, are not always associated with the content of undertaken activities themselves, but also the circumstances of cognition.

The principle of cooperation between educators and learners. It is hard to imagine the realization of the concept of complementary education without the cooperation of learners and teachers. It is a necessary part of maintaining the subjectivity of the participants and an essential factor for the attractiveness and flexibility of the process itself. The form of cooperation, its character can be obviously different and must be adapted

to the needs and situation of students and teachers. Using the metaphor of the road, we can say that walking next to each other is not enough. It is necessary to go together (which does not mean that we have to walk in pairs).

Partnership and cooperation of the participants of complementary education process, consequently leads to a situation in when all the participants become partly teachers and students. The teacher's role here is not to be a guardian or an administrator of knowledge. He should be rather a champion, a guide, or even "older brother". Being a role model for a student, his authority is mainly based on the attitude complied with proclaimed beliefs and the truth. Teacher does not always have to be omniscient, but he must be real in what he says and how he acts. He must be open to exploration and searching knowledge, which skills he should continually improve.

Joined searching for the knowledge, cooperative learning and teaching, leads not only to cognition, but also feeling together, sharing the successes and failures with teacher and other members of the group. This also leads to a common experience and acknowledging the values, combining education and upbringing process with the process of self-education and self-upbringing. In this perspective the complementary education process becomes also "*a meeting of people [...], which opens the horizon of values when a man becomes a man, regardless of ideology or social system*" (Zaczyński, 1990).

In its practical aspect, cooperation may be only a form of gathering feedback. However, regardless the form it is important to work together consciously towards achieving the goals, and not providing information about the impressions of classes. It is difficult to expect a competent evaluation of their quality from the participants of classes or materials' users. The impressions and feelings of the participants are also important for the concept of complementary education. Therefore, the feedback is a part of their conscious participation in the process of teaching-learning.

The principle of individualization and optimization of the education process. The concept of complementary education is focused on the personal and individual development of every student. It means that educating in this spirit, we adjust the expectations to every student's capabilities and skills. We build his individual attributes to help him to achieve full personal development and realize goals. The optimized effort is important to obtain broad and lasting effects of effort incorporated in the teaching-learning process.

It also means a significant role of diagnosis and not only the initial one. In fact the diagnosis is inseparable part of the process of individualization of learning. The diagnosis should be done carefully and regularly to become the part of everyday teaching-learning processes. This requires the rhythmic and precise work of student and teacher, as well as awareness of the realized goals (check the rule of conscious and independent participation). Neglecting these duties may cause the failure of the whole process. These deficiencies and failures have a negative impact on students (lowering the general level of knowledge, undermining wellbeing, reducing interest).

The principle of cooperation, previously discussed, as well as the principle of individualization and optimization, emphasize the importance of consciously provided feedback. It may be a part of the diagnosis, and also important premise for the optimization of the learning process, significantly supporting the optimal organization, selection of methods or ways of formative and summative evaluation.

Conscious realization of the principle of individualization and optimization means also a necessity to prepare a variety of teaching materials and regular extension of their base. It seems to be appropriate to note, that the preparation of educational materials filling in the planned process of complementary education requires analogical action described in the manual of Gagne, Briggs, Wagner as "management in the individual teaching" (Gagne, Briggs, Wagner, 1992).

The principle of comprehensive activating the students to critical and creative using of the information. Information is undoubtedly the main good in the society of knowledge. Fundamental role in the development of economy in such society, as its name implies, plays knowledge. Knowledge should be treated as a major factor

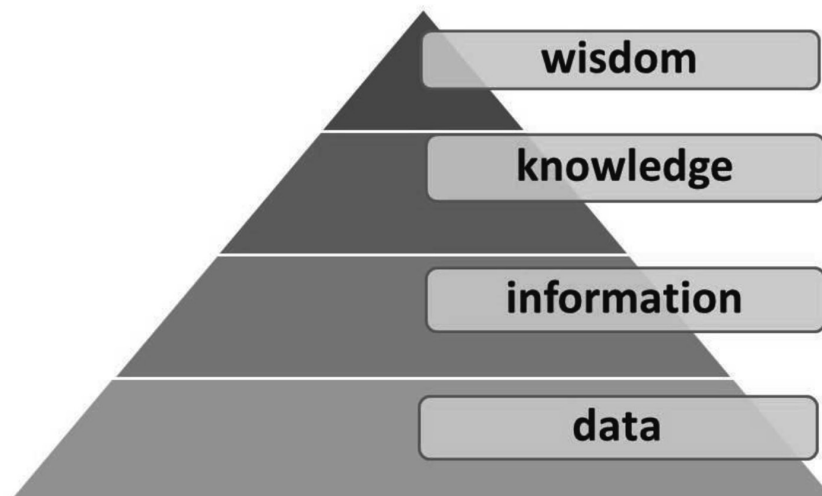
affecting the structure of production, as well as the economic progress and social development. Obtaining the information is valuable and essential skill, as well as connecting the information with systems and multiplying to use it creatively.

In the society of knowledge, learning is broadly defined as a consequence of the different ways of acquiring knowledge and it is the most important process, also economically. This process leads to revolutionary changes in education.

The words “information” and “knowledge” should not be connected with such terms as “data” or “wisdom”:

- Data is the simplest object existing outside the specified context.
- Information is data placed in the context or related to each other (dependent), having any significance, often supplemented by data supporting its later interpretation.
- Knowledge can be defined as a structure that contains certain information obtained and interpreted by a specified person for a particular reason or use.
- Wisdom means the ability of efficient applying knowledge in practice.

Figure 1. Mountain of information.



In that way, a word “wisdom” from the Bible, so carefully exalted by ancient philosophy, gains new, quite mercantile meaning in the society of knowledge.

A wise man is the one, who can creatively, so also efficiently use knowledge, and therefore he is the one, who is well adapted to function in society.

Next to him, appears new technology dealing with knowledge and information, based not on the books, but on the networks and digital communications. It is called information technology. Analysing this phenomenon, it is worth noticing that, like a pile of bricks is not a house, also the stack of information or data is not knowledge or wisdom. It should be noted that creative attitude to information is the best way to cope with the information stress.

To achieve student’s creative attitude to information, a comprehensive activating them in that direction is necessary. In the first place, it is a critical approach to information. It depends on their skilful separating the important; the urgent one from the interesting and finally from the least useful information. Considering the current mass information noise, the segregation principle refers not only to the information, but also to the sources (according to the principle that not everything that is spoken is worth to listen to). Creating the habit of active, critical and creative attitude to the surrounding information reality is the foundation of future permanent education of the educated person. A student who can naturally evaluate and process information creatively, in practice is able to learn much faster and more efficiently.

The principle of creative, combined and alternate using different ways and media of communication so that they could complement each other. Saying that some ways should be used alternately, and at the same time jointly, seems to be an oxymoron. In addition, using the combined means of education or communications technology is a feature of many systems of teaching, both traditional ones, like multilateral education concept, and modern ones, like b-learning. However, it is important to use them not only combined and alternately. The essence is complementing forms of media in order to achieve the possible goals and predicted learning contents for all participants, taking into consideration their differences in the educational experience, preferences in perception or abilities.

We can assign certain features to any form or method used during the process of education, e.g. auditory, kinaesthetic, well-organized, etc. Sometimes these features can be perceived as the certain dimensions, e.g. activity - passivity. This can affect the perception channel, attitude to information, way of realization etc. A man in natural way prefers some forms or ways of recognition, what is associated with his cognitive style and individual character. It should also be noted that long-term homogeneous activity is always wearisome for the attention and learning process. Therefore, choosing the forms in way, so that they will have different described features, is an important key to success. Information technologies, including the Internet, are symbol of many opportunities and supplement incredibly the catalogue of traditional methods.

The essence of this rule is the term “creative”. The teacher who plays a role of facilitator is postulated particularly to organize learning process, so that the process should not only be diverse, or internally various, but also to make a constructive material, which allows to creative activity of the teacher and student. It is worth here to recall the ideas from the work of Jarmuż and Witkowski “*During creative training, the coach should invent new tasks, especially for needs of the training situation and try to perform the tasks with courage.*” (Jarmuż, Witkowski, 2004) .

The principle of efficiency, effectiveness and regularity. Teachers’ work in adult education must be efficient, but also impressive. Emphasizing the efficiency of learning is not a novelty, however, connecting it with the assumption of impressive learning is an important element. Impressive education attracts potential participant, it is attractive (engaging), encourages to enter into a situation of learning, exploring the world and stimulating self-education. In this kind of education teacher plays not only traditional role, but he is also the facilitator of the process - the person who stimulates students to develop and search. At the same time knowledge should be transferred to adults regularly – according to the plan and repeated as it was planned (repetition is mother of learning). The adult student should have a possibility to consolidate and integrate it with the knowledge he already possessed. Repeating and revising information should also be attractive, which is easier with the usage of the information and communication techniques.

Modern technologies, including the Internet, thanks to its’ wealth of sources offers such opportunities to well-prepared andragog. As specialists emphasize (regardless the teaching subject), teachers should be able to integrate methods and computer techniques in the pedagogical process (Kędzierska, 2005).

The precise combination of regularity with effectiveness and efficiency seems to be quite difficult or even impossible without the using appropriate teaching methods. This suggests the conclusions for the selection of means offered by media, especially new media. It is important here to avoid an excess of complicated forms and tools, which are in their essence empty dishes (without content). Deliberate and well thought adaptation of simple and attractive tools, which are friendly (especially for students) and using them in conjunction with traditional learning process is the main issue of this principle.

2. Complementary education in the research perspective

An example of the practical application of supplementary education techniques in the conditions of scientific research is an experiment carried out at the Central Training Center of the Prison Service in Kalisz. The cited experiment is a good example of adult improvement and training (MacKenzie, 2019), using complementary education methods, and due to its rare specificity, it can be considered exceptional. The starting point of the

undertaken research was the search for new, more effective forms of training in the situation of previous experience of imperfections and external limitations that prevent its effective implementation. The pedagogical experiment was carried out in 2011 2012 2013. The research and control groups were students of vocational training. Its aim was to compare the effectiveness and efficiency of training with traditional and complementary methods (Czarkowski, Strzelec, 2018).

In the study conducted by the method of didactic experiment, the results of group K considered as control were compared with the results of the experimental group E1. Both groups were comparable. The participants of the experiment were recruited from random groups of training participants in the following years, observing ethical principles.

The hypothesis was assumed that the results of the experimental groups (E) carried out using complementary method will be better than the control groups (K). The research confirmed the assumption accepted ($KT < E1T$). It should be added that this dependency was confirmed in three subsequent years of the experiment. Statistical analyses of the above data show a significant statistical difference of results, that is, arithmetic average of the marks of subjects and exams from the theoretical set between groups K and E1 ($t(868) = -6.049$ $p < 0.001$) the experiment referred to (Czarkowski, Strzelec, 2018).

In addition, evaluation surveys were also used in research. As part of their analysis a positive evaluation of complementary forms of training given by listeners was obtained and the recognizing it as a friendly form of education. This technique of diagnostic survey applied and implemented in conditions of confidentiality and anonymity allows to know the sensations and opinions of listeners (adults) about the form of education in which they participated. At the same time, it is worth noting that the survey study a significant number of respondents indicated the problem of the need of independent organisation of learning time, which is an important element of this education system and indicates the important role of the teaching persons in supporting the learning persons with the use of complementary methods.

The cited experimental studies confirm the effectiveness of the complementary education model in adult education and the positive impact of this method of organizing education on its effectiveness, measured by students' achievements in the form of average grades in final exams and final results. The research also allowed to evaluate the essential part of the training system for officers of the Prison Service. Which gives them a practical dimension.

3. Student and teacher in complementary education - a new relationship

Based on the concept of supplementary education, it seems reasonable to expect that all learners will be able to achieve the same or similar results in equal learning conditions for all. Although this is contrary to the assumptions of traditional teaching (Mieszalski, 2001; Bloom, 1976), it is nevertheless justified in the paradigm of the concept of complementary education. The basis here is the reversal of assumptions. Based on the assumption that the individual characteristics of learners are key to learning outcomes, we will make them the main axis and organize the teaching-learning conditions so that everyone can find the best way to achieve their goals.

The concept of complementary learning is especially friendly for an adult learner (Siegel & Daumiller, 2021; Valverde-Berrocso, Garrido-Arroyo, Burgos-Videla, & Morales-Cevallos, 2020) who, in addition to traditional developmental elements determining the education process, also includes factors related to his life experiences, social position, role or age. Flexibility, attractiveness and accessibility are important features of further education that make it so friendly to adult learners.

- **Flexibility** - The multitude of the media and forms of communication used in complementary education allows quick and easy adaptation of the teaching-learning process to changing external conditions and to individual features of students and teachers. That means large facilitation in modifying learning process relating to the changing conditions (sometimes even during the process).
- **Attractiveness** – Complementary education allows to organize the process of teaching-learning in a way that provides students with multiplicity and diversity of experiences and feelings, while preventing from set-

ting into routine and mobilizing them to creative behaviour (both student and teacher). Also, it is a challenge for human mind.

• **Accessibility** – Free and dynamic combination of various ways of communication in the teaching-learning process makes it accessible to students with different needs, preferences, as well as learning opportunities. Thanks to this, the education process becomes open both for those who have a need to know more, and for those who have to work and bring up children, so they have limited time for learning. It becomes open also for those who have the best developed auditory skills, visual skills or kinaesthetic skills and finally for those who have problems with specific parts of material and need more time to learn it.

In pedagogical practice, starting from the assumptions of complementary education consequently leads to constant reminding of the role which media should serve for people. They are the tool of communication between people, but not with its creator. They are the carrier of knowledge, rather than its source. Behind every text, image, film or any other form of media expression there is a person - good or bad, wise or foolish, honest or morally degenerate. Realizing the assumptions of the concept, we present their servient role in the processes of teaching-learning and we make them a tool of education and self-education. We should accustom students to critical and subordinate treatment of the media.

It is worthy to mention that in the process of complementary education, teacher is the key person on the way to knowledge. As Tanaś notices: *“Using ICT, human created cyberspace and virtual world. Nowadays he moves there well-known institutions, writes down knowledge which was collected through the ages, places there his art and directs dreams. Virtual reality is trying to imitate the real world, but it is different, as different as education which uses digital media. Our - educators’ and teachers’, thing is that education was not crippled and mindless”*. (Tanaś, 2010)

Conclusions

The concept of complementary education (perhaps unexpectedly) turns to these models of relationship between teacher and student, that emphasize its personal and individual character. Therefore, in particular, this problem is connected with the identity of teacher. It seems necessary to refer to this problem on basis of various theories and different points of view. Subjectivity of the teacher is an important aspect, because only the teacher, who knows and understands himself, can effectively support education of other people and can be a facilitator of the others’ development. The process of learning is the meeting of people – a teacher and a student. Tadeusz Gadacz describes it in quite poetic but accurate way: *“teacher, who is a master, is able to open his home for a student and invite him inside. The teacher finds a place for the student in his life’s ethos”* (Gadacz, 1991).

The implementation of the assumptions of the concept of complementary education in the practice of adult education leads to the restoration of the teacher model taken from the times of Plato, who was a master and a guide on the paths of knowledge for his students. The difference between the ancient prototype and its modern counterpart in the humanistic and personalistic offerings is that the modern student and his master walk together through the virtual Akademos grove.

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