

## EMOTIONS IN EDUCATION 2050: A FORECASTING EXERCISE

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**Abstract.** Prediction on emotions in Education 2050 is both an important problem and a guiding force behind the search for the inter-connections that underlie natural and social phenomena. The aim of this work is to analyse the links and regularities between emotions and Education 2050. The present research is prognostic. The methodology in the present work is forecasting. The method of trend analysis, based on expert opinion investigation, was deployed. The research showed the trend - the emotions' shift from a psychological phenomenon to the educational category. The trend is based on the analysis of experts' opinions about the incorporation of "emotional skills" into Education 2050. The forecast for the inter-connections between emotions in Education 2050 is that emotional skills will play the key role in future education as emotions are the drivers of the educational process. During the educational process emotional skills are processed via cognitive evaluation, and, therefore emotional skills become the output/outcome/result of the educational process. Emotional skills will require further investigation of their sub-skills, structure and developmental dynamics. The novel contribution of this research is that the analysis of experts' opinions is revealed as well as trend and forecast for emotions in Education 2050 are proposed.

**Keywords:** Educations 2050, emotions, emotional skills, expert opinion, forecast, prognostic research, trend.

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## Introduction

The future comes with surprises (OECD, 2022). Therefore, already today scientists, researchers, teachers, entrepreneurs, IT specialists, futurists and many other professionals make great attempts to shape Education 2050 in order to gradually evolve trends and to abrupt systemic shocks.

Surprises in education bring challenges to educators and education policy makers (OECD, 2022). It is especially critical to be able to predict the future motions of all relevant agents in complex and dynamic environments (Tang & Salakhutdinov, 2019), e.g. Education 2050.

A challenge is the increasing role of emotions in education (Gryzunov & Gryzunov, 2022; Bachler, Segovia-Lagos, & Porras, 2023; Cristóvão, Valente, Rebelo, & Ruivo, 2023; Ahrens, & Zascerinska, 2023). This increase can be explained by a clear shift in the emotions' status changed

- from being a psychological category
- to the educational phenomenon.

Also, a challenge is that prediction of future is a human ability (Marroquín, Boyle, Nolen-Hoeksema, & Stanton, 2016). Due to this, predictions about the future are susceptible to mood-congruent influences of emotional state (Marroquín, Boyle, Nolen-Hoeksema, & Stanton, 2016).

Another challenge is that while, in the physical and biological sciences, the discovery of strong laws has enabled the prediction of future scenarios with uncanny accuracy, in the social sphere no such accurate laws are known (Chen, Fine, & Huberman, 2003). To

complicate matters further, in social groups, the information relevant to predictions is often dispersed across people, making it hard to identify and aggregate it (Chen, Fine, & Huberman, 2003). Thus, the results obtained suffer in terms of accuracy and ease of implementation (Chen, Fine, & Huberman, 2003).

Accurate predictions are essential to individuals and organizations (Chen, Fine, & Huberman, 2003).

The ability to make good predictions lies at the heart of robust and safe decision making (Tang & Salakhutdinov, 2019).

Hence, the prediction of the future outcomes of uncertain situations is both an important problem and a guiding force behind the search for the regularities that underlie natural and social phenomena (Chen, Fine, & Huberman, 2003).

The aim of this work is to analyse the links and regularities between emotions and Education 2050.

The present research is prognostic. The methodology of the analysis in the present work is forecasting. The method of trend analysis, based on expert opinion investigation, as part of the forecasting methodology was deployed.

### Methodology of Forecasting

When future is discussed in a scientific community, a variety of terms appears. Already in the Introduction section of this contribution, the terms “prediction” and “forecast” have been used.

Table 1, based on the findings of Pirozhkova (2015, 2016), shows the links between the methodologies used in the prognostic research.

*Table 1 Relationships between the methodologies used in the prognostic research (the authors)*

<b>Research</b>	<b>Prognostic Research</b>				
<b>Methodologies</b>	<b>Prediction</b>	<b>Forecast</b>			<b>Prescription</b>
<b>Sub-methodologies</b>	<b>Prediction</b>	<b>Foresight</b>	<b>Forecast</b>	<b>Futurology / Future Studies</b>	<b>Plan</b>
<b>A short definition of the methodology</b>	Establishment of a fact (Pirozhkova, 2016)	Obtaining ideas about the future due to natural cognitive abilities (Pirozhkova, 2015)	-To fix an object in its development, - Scientifically based description (Pirozhkova, 2016)	A qualitative description of developmental possibilities (Pirozhkova, 2016)	A detailed scheme, method, etc., for attaining an objective (Baporikar, 2015)

Table 2 summarizes short descriptions of the three methodologies, namely prediction, forecast, and futurology/future studies, applied in the prognostic research.

*Table 2 Description of methodologies used in prognostic research (the authors)*

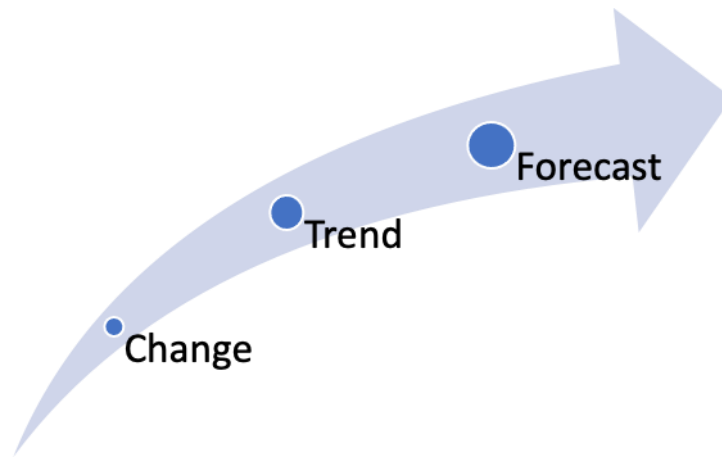
<b>Research Methodologies</b>	<b>Prognostic Research</b>		
	<b>Prediction</b>	<b>Forecast</b>	<b>Futurology / Future Studies</b>
<b>A short description of the methodology</b>	-classical natural science, -concerns closed systems, - based on the universal knowledge and exhaustive information of initial conditions and relevant factors, -realizing by calculation in mathematical or logical sense and gives descriptions of qualitatively, quantitatively, space and time specified events (Pirozhkova, 2016)	-an open system (natural or social), which future state is determined by many factors and critically depends on its values, -information about initial conditions -probabilistic estimation of some parameters, define limit of variables and by mathematical computing, -simulation and modelling produce description of system's dynamics under defined conditions (Pirozhkova, 2016)	- open systems demonstrate self-organizing behaviour, -the principles of functioning can change, - by plausible reasoning and the construction of qualitative models (images) -different ways of its development without knowledge of what will be realized (Pirozhkova, 2016)
<b>Prevailing knowledge</b>	Natural (Pirozhkova, 2016)	Technological (Pirozhkova, 2016)	Social (Pirozhkova, 2016)
<b>Methods to be used</b>	-Historical modes of prediction—speculation, deduction, extrapolation, polling, and modelling—in contemporary digital systems, -Extrapolation, -Polling, -Surveying, -Modelling (Dijck, 2021)	- Delphi method (Anderson and Holt, 1997) -Scenario -Expert knowledge -Quantitative methods (Pirozhkova, 2016) - Trend (Pirozhkova, 2017)	-Futurological scenario -Imagination -Extrapolation -Analogue -Association -Metaphor -Trend (Pirozhkova, 2016)

Forecasting is considered in the historical development (Pirozhkova, 2017):

1. from autonomous practices slightly connected with scientific knowledge as the form of explaining;
2. through activities methodologically oriented to searching for causal laws; and
3. then to activities aimed at describing of the future state of open systems and situations they characterized by uncertainty and dynamics irreducible to the sets of causal laws and initial conditions.

Consequently, the use of the trend method as part of the forecasting methodology proceeds in three phases as illustrated in Figure 1:

- Phase 1 refers to change's identification as changes reshape the world in general and education in particular. For this, expert opinion expressed in published works is analysed.
- Phase 2 aims at trend outline. Some changes become pervasive and persistent that make them a trend.
- Phase 3 relates to a scientifically based description of future. A trend helps describe the development of education in future.



*Figure 1 The inter-connections between change, trend, and forecast (the authors)*

### **Research Results**

Emotions are an extraordinarily complex issue (Jantzen, 2019). It is worth noting that “complexity” characterizes transforming structures oriented toward an unpredictable future while “simplicity” is inherent in systems oriented toward immutability and conservatism (Asmolov, Shehter, & Chernorizov, 2018; Asmolov, Shehter, & Chernorizov, 2020). Complexes do not offer a sequential continuum of a phenomenon, while systems are of a cyclical nature (Khoshkish, 2003).

Analysis of medical literature allows finding out the definition of emotions as a person’s brain function (Singh & Singh, 2011). In order to specify the function of emotions in education, it is important to describe the difference between brain and mind. Brain is the structure that carries out the functions like thinking, emotions, problem solving, sum total of a person’s personality including moral standards/judgements/reasoning etc, language/speech, hearing, vision, making sense of perceptions and regulating motor activities, balance/coordination, heartbeat/respiration/other vital functions, hormonal and related balances, mind - a collection of its functions (Singh & Singh, 2011). Brain and Mind, though connected concepts, are not synonyms (Singh & Singh, 2011). Like eye is the structure, sight its function (Singh & Singh, 2011). They should not be used interchangeably (Singh & Singh, 2011). Brain is the producer, mind its product (Singh & Singh, 2011). Without a brain, there is no mind (Singh & Singh, 2011). Mind is the product of brain activities (Singh & Singh, 2011). It is worth pointing that consciousness is one of the functions of mind (Singh & Singh, 2011). And, it is consciousness, then, that can guide or misguide us in our experiences (Singh & Singh, 2011). It is the brain and nervous system which run the rest of the body and all its activities, including thinking and action in all their forms, not the mind (Singh & Singh, 2011). Mind is just the sum total of all brain functions (Singh & Singh, 2011). The main function of emotions in education is to drive the evolution of person’s consciousness and, consequently, activity of person’s processes (Berman, 2019).

A biological approach considers that the innate, possibly genetic mechanisms of emotions’ origin is applicable (Pyrev, 2019). According to this approach, emotions may have neurophysiological foundations and emerge from the neural processes in the reticular formation of the medulla oblongata (Pyrev, 2019). What is important for education here is that emotion itself has an involuntary effect on the cognitive apparatus of the human psyche and its motor skills (Pyrev, 2019). It means that cognitive structures do not directly invoke emotions (Pyrev, 2019). Moreover, the emergence of basic emotions triggered by innate stimuli is generally not consciously recognised by an individual (Pyrev, 2019).

In the cognitive approach, emotions are defined as “secondary” and dependent, since they act as an aftereffect of cognitive evaluation (Pyrev, 2019). The cognitive process takes significantly longer to evaluate emotions in comparison to the emotional process (Pyrev, 2019).

The psychological system approach proposes that the change in the relationship between functions is of a great importance for the individual development, and not the development of each function (Vygotsky by Leontiev, 1982).

The social approach to emotions discloses that there are socially banned negative emotions (anger, rage, etc) (Pyrev, 2019).

Analysis of literature allows finding out that the term “emotional intelligence” is used in psychology, and “emotional skills” – in education.

We are currently experiencing an emotional turn in education (Dernikos, Lesko, & McCall, 2020), a trend that, a priori, can be assessed as positive, since it breaks the historical denial of emotions in our culture (Bachler, Segovia-Lagos, & Porras, 2023), and consequently, in education.

When related to education, emotional skills are discussed from two perspectives as revealed in Table 3.

*Table 3 Two perspectives on emotional skills (the authors)*

<b>Perspective</b>	<b>Intrapersonal</b>	<b>Interpersonal</b>
<b>Aspect</b>	Socio-emotional skills (Danner, Lechner, & Spengler, 2021)	Cognition-emotion interaction (Pessoa & Pereira, 2013)

In education, the individual emotions of teachers and learners can be different and even contradictory in one and the same situation (Leont’ev, 1978; Ahrens & Zascerinska, 2022). The complexity of emotions in education is increased by different and contradictory emotions between the teacher and learners or, in other words, from the interpersonal perspective (Ahrens, Zascerinska, Filimonova, & Bikova, 2023).

Today education is required to be obtained by all people. Education is defined by Vygotsky as the artificial development of the individual (Vygotsky, 1982-84). Education and learning are the emotional processes (Ahrens & Zascerinska, 2023). And emotions are the drivers of the educational process (Leont’ev, 1978), also known as teaching, peer-learning, and learning (Zašcerinska, 2011). The emotional dimension of teaching, peer-learning and learning processes should be addressed without the biases of emotional intelligence and positive psychology (Bachler, Segovia-Lagos, & Porras, 2023).

In education, emotions are mostly linked to individual’s cognition (Osika, MacMahon, Lodge, & Carroll, 2022). At the same time, emotions are closely related to creativity, communication, problem solving (Hannula, 2015), and other aspects of individual’s functioning.

Since excessive emotions can block the cognitive abilities of students, lead to emotional “sticking”, methods of harmonizing the cognitive and emotional components in the educational process are needed (Gryzunov & Gryzunov, 2022).

In education, four groups of academic emotions are especially relevant for students’ learning (Pekrun, 2014):

- Achievement emotions relate to achievement activities and to success and failure resulting from these activities. Examples are enjoyment of learning; hope and pride related to success; and anxiety and shame related to failure. Achievement emotions are pervasive in academic settings, especially so when the importance of success and failure is made clear to students.

- Epistemic emotions are emotions triggered by cognitive problems, such as surprise about a new task; curiosity, confusion and frustration about obstacles; and delight when the problem is solved. Epistemic emotions are especially important in learning with new, non-routine tasks.
- Topic emotions pertain to the topics presented in lessons. Examples are empathy with the fate of one of the characters portrayed in a novel, anxiety and disgust when dealing with medical issues, or enjoyment of a painting discussed in an art course. Both positive and negative topic emotions can trigger students' interest in learning material.
- Social emotions relate to teachers and peers in the classroom, such as love, sympathy, compassion, admiration, contempt, envy, anger or social anxiety. These emotions are especially important in teacher/student interaction and in group learning.

When discussing Education 2050, the idea that emotional learning is as important as the development of cognitive domains is gaining traction (OECD, 2022). Emotions' functions relate to the motivational and wellbeing conditions for learning to be effective and sustainable (OECD, 2022). Therefore, emotional conditions are considered for effective teaching and learning in the frameworks for assessing students' learning outcomes (OECD, 2022).

Another function of the emotions in Education 2050 is proposed by futurist Leonhard (2023) that emotions in education, training and learning will be needed to unlock skills, minds, and bodies.

Considering our development model demonstrated in Figure 1 that proceeds from change through trend to forecast, our findings are presented in Table 4.

*Table 4 Change, trend, and forecast related to emotions in Education 2050 (the authors)*

Nr.	Phenomenon	Emotions in Contemporary Education	Emotions in Education 2050
1	Change	Function of emotions is to mobilise the body's reserves for activity	Function of emotions is - to ensure individual's wellbeing and - to unlock individual's skills, minds, and bodies
2	Trend	Use of emotions, as a psychological phenomenon (Ahrens & Zaščerinska, 2014), defined as nerve impulses (Kriumane, 2013) and similar	The increase in leveraging of emotions as an educational category, namely emotional skills (OECD, 2019)
3	Forecast	Emotions are factors that impact the educational process	Emotions in education are - skills (OECD, 2019) and - learning outcome (OECD, 2022)

To sum up, the research interest to emotions is increasing. The scientific developments and findings in the research area on emotions facilitate the change in the role of emotions in education

- from the neglected one
- to the embedded into educational processes.

The changing role of emotions in education will impact the shift in the design and implementation of the educational practice towards ensuring individual's well-being.

## Discussion

The emotional dimension of teaching and learning processes is colonized by approaches lacking the necessary scientific substantiation required by educational practices based on evidence (Bachler, Segovia-Lagos, & Porras, 2023).

There is a close interweaving between emotional and cognitive processes (Bachler, Segovia-Lagos, & Porras, 2023). The links between emotions and cognition are grounded on the assumption that the relationship between functions that is of a great importance for the individual development, and not the development of each function (Vygotsky by Леонтьев 1982).

The inter-connections between emotional and cognitive processes have recently been structured in the way that emotions at the biological level are primary in relation to cognition (Pyrev, 2019). It means that emotions are the drivers of the educational process. Emotional engagement of teachers and learners into the educational process is of a great importance for reaching the educational objectives.

The prevailing emotional culture that claims that feeling good should be always privileged (Bachler, Segovia-Lagos, & Porras, 2023) can become an obstacle to learning, generally because positive emotions hamper a slow and reflective analysis of the learning content (Anaya-Durand & Anaya-Huertas, 2010). In order to avoid any delay in learning and increase the learners' involvement into the educational process, it was opined that for learners the emotions, they experience, are not important but the crucial for learners is the emotions' change (Gryzunov & Gryzunov, 2022). "Emotional swing", a change of positive and negative emotions, was proposed (Gryzunov & Gryzunov, 2022). It should be emphasized that, although negative emotions are not pleasant to experience, negative emotions really are necessary for a healthy life (Ackerman, 2019). Based on the finding that teaching is to be started with making learners' dissatisfied with their existing experience (Stepans, 2005), learners' emotions proceed in the educational process (Zascerinska, 2023): from negative emotions in Phase 1 Teaching through neutral emotions in Phase 2 Peer-learning, and to positive emotions in Phase 3 Learning.

## Conclusions

The theoretical analysis of the expert opinion expressed in their published works allows concluding that education should be grounded on the biological nature of emotions, being a brain function (Singh & Singh, 2011), in comparison to emotions as nerve impulses (Kriumane, 2013) defined by the psychological approach. The biological nature of emotions allows drawing a conclusion that, in education, emotions are primary in comparison to cognition. Due to this we conclude that emotional skills should be developed together with other brain functions. In education, emotional skills are often linked with cognitive skills and social (communication) skills. The combination of emotional, social and cognitive skills in education is important for learner's development. The educational process has to be based on the shift between negative, neutral, and positive emotions.

The trend here is the shift in the emotions' status from a psychological phenomenon to the educational category. The trend is based on the analysis of expert opinions about the deeper incorporation of "emotional skills" into Education 2050. Consequently, the forecast for the inter-connections between emotions in Education 2050 is that emotional skills will play the key role in education due to the emotions determined to be the driver of the educational process. Another aspect of the forecast for emotions in Education 2050 is that, during the educational process emotional skills are processed via cognitive evaluation, and, therefore emotional skills become the output/outcome/result of the educational process. The

forecast is that emotional skills will require further investigation of their sub-skills, structure and developmental dynamics.

The novel contribution of this research is that the analysis of experts' opinions is revealed as well as the trend and forecast proposed for emotions in Education 2050.

The present research has some limitations. The biological, psychological, social and other links between emotions and education have been set. Another limitation is the consideration of only the biological, cognitive and psychological approaches to emotions in Education 2050. A limitation is also that only theoretical methods were deployed in the present work.

Further research intends to enrich the presented forecast with the implementation of other methods, e.g. Delphi method, scenario, quantitative methods, and expert group knowledge.

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