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DEVELOPMENT OF A MODEL OF INFORMATION PROCESS MANAGEMENT IN THE INFORMATION AND EDUCATIONAL ENVIRONMENT OF PRESCHOOL EDUCATION ORGANIZATIONS

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One of the important elements of the information infrastructure of educational institutions is the information and educational environment. The information and educational environment of preschool education organizations has its own characteristics, which must be taken into account when building a model for managing information processes.

The object of study in this work is the information and educational environment for preschool education organizations. The problem to be solved is the need to develop a model for managing data and information processes, which will allow determining the learning outcomes of preschoolers and adjusting individual work with them.

The introduction of the developed model allowed to reduce the time spent on adjusting individual work with students by 30 %. These results are explained by the optimization of information processes, as well as improved monitoring of the formation of skills of preschoolers and a reduction in the time for its implementation. When monitoring for each child, 211 indicators are examined. There are 633 indicators per year for three monitoring, in aggregate, per one child. By default, the data is entered into Microsoft Excel and processed manually. However, a large number of entries slows down the processing of Microsoft Excel data and increases the chance of errors. The use of this model will make it possible to carry out calculations automatically, save data and generate reports for each child or group of children.

The developed model can be used in information and educational environments for preschool education organizations in order to improve the efficiency of monitoring and managing educational processes

Keywords: preschool education, monitoring, information and educational environment, data management, model for assessing the formation of skills, model for assessing progress, correction of skills

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1. Introduction

The need to create an information and educational environment in a preschool organization is caused by digitalization processes at all levels of education. This information and educational environment should help control the development of preschool children in a preschool organization.

The control process is described in the guidelines [1], which present the criteria and indicators, methods and techniques for monitoring the assimilation of the content of the

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Model Program for Preschool Education and Training, as well as the calculation methodology. Monitoring allows to determine the levels of achievement by the teacher of the expected results determined by the standard program for different age groups, and the forthcoming activities of the teacher in conducting individual work with the child.

There are open questions in the study of information processes and the development of data management methodology in preschool educational institutions to eliminate errors in data processing, creation, retrieval and storage of Monitoring results. Therefore, the development and use of the information and educational environment is necessary for quality management not only of technological data processing processes, but also for effective management of the decision-making process in preschool organizations.

2. Literature review and problem statement

In [2], a convergent approach to the synthesis of the information educational environment of higher education is considered, including tools for managing educational content and learning trajectories. The process is presented within the framework of interaction and synchronization of the life cycle models of the components of the learning information environment. However, this approach is not acceptable for the task, because the convergent approach does not take into account individual characteristics and differences enough, it can ignore the individual characteristics of people's views, which usually leads to an underestimation of the real situation.

In [3, 4], the automation of work with data within the framework of a corporate analytical system, the identification of patterns of data analysis, and the design of an information and analytical system of a university are considered.

In [5], a method is proposed for the prompt response of the educational environment to the requirements of the external environment, based on the creation of a pool of demanded learning outcomes. The works [3–5] suggest embedding the information and educational environment into the contour of the corporate information system of the university, which does not help to solve the tasks of the current level, but can be useful for the further development of the information and educational environment.

In [6, 7], the authors cover the issues of constructing a set-theoretical model for managing information exchange in a secure virtual environment in the interaction of scientific and educational organizations. Based on the description of relations between entities and the rules of information exchange, a method is proposed for describing the composition, structure of classes and their hierarchy, which make it possible to present an object with a model of information interaction within the framework of a single control, taking into account the security policy. A model of session access to information resources of a network of corporate portals has been developed. However, the set-theoretical model will complicate the interpretation of the results, which is not quite suitable for solving the problem.

In [8], a new model is proposed that promotes the development of a diagnostic support system based on a multiagent system for the analysis and management of educational institutions in the Moroccan context. However, this model is not suitable for use, as it does not solve the Kazakh context.

In [9, 10], a model for organizing the educational environment for applicants and students is proposed, which includes a program, innovative pedagogical techniques and digital technologies. A limitation for the use of this model is the applied hardware, which increases the complexity of developing an information and educational environment.

In [11], LMS (learning management system) is discussed as part of the educational portal of the university and the main hardware and software components of such an e-learning system are defined. A conceptual model is presented in the form of a queuing network. However, the disadvantages of this model are that it can be strictly specified and cannot be easily modified.

The article [12] analyzes various directions for building a model of information and communication support for managing the quality of education in modern preschool organizations in accordance with international educational standards.

In [13], flow modeling is proposed in the educational context as an interaction tool that allows teachers and students to transfer and generate knowledge within the framework of a joint Master portal. of Information Technology in Education (MITE). Binding to a specific portal makes this solution individual, which narrows the possibilities of using this solution.

The study [14] presents that the environment should include the means of carrying out educational, scientific and managerial activities, as well as supporting the environment for collective and individual communication. The objects of educational activity and interaction and learning platforms and security tools have an important influence on the formation of the information and educational environment. One of the ways to solve the problem of preparing competitive university graduates is to create an effective information and educational environment.

In the article [15], the authors propose an e-learning information system (repository) as a model for the interaction of educational social agents between students and teachers.

In [16], the issue of process control in education in the context of the implementation of the fourth industrial revolution is considered. However, these solutions involve direct interaction of students with the information and educational environment, which does not correspond to the context of our task.

The data presented in [17] includes an educational dataset collected from a student information system (SIS), a learning management system (LMS) called Moodle [18], and video interactions from a mobile app called «eDify». The considered solution is correct for universities, but the use of particular solutions complicates the tasks.

The problem [19] of creating an effective model for the formation of a digital trace of projects and programs for the development of educational programs in the context of the digitalization of society is considered. This solution is not suitable for the tasks set, since the application for preschool organizations is not justified.

The study [20] demonstrates the development of a model of algorithms for organizing monitoring and managing the quality of educational programs, which can reduce the time spent on these processes while increasing the objectivity of quality assessment. The results obtained are intended for the audit of educational services, public control over the implementation of educational activities, accreditation of areas of training or licensing of educational organizations.

An analysis of the literature shows a wide variety of existing information and educational environments and their proposed solutions for universities, but each level of education has its own characteristics and requirements, so it is not always possible to simply transfer a ready-made system from one area

to another. Pre-school education requires other methods and technologies that are not provided for in systems for higher education. For example, in a preschool organization, the reporting requirements differ from the requirements for a university, the range of users of the system is different, and simpler forms and interfaces for interacting with the system are needed. In addition, the field of preschool education is not as developed in terms of information technology, so significant refinement or the creation of a completely new system, specially adapted to the needs of preschool education, may be required.

3. The aim and objectives of the study

The aim of the study is to develop a model for managing information processes in the information and educational environment for preschool education organizations. This will make it possible to determine the results of the educational process and adjust individual work with children aged 5–6 years.

To achieve this aim, it is necessary to solve the following objectives:

– analyze the information processes necessary for monitoring the formation of skills in preschoolers;

– develop a structure for presenting data in the information and educational environment;

– develop a scheme for storing data on the level of skill development among preschoolers using a database;

– develop queries for data management, including data storage and retrieval;

– suggest a blueprint data management for the information and educational environment for preschool education organizations, which allows determining the results of the educational process and adjusting individual work with children of 5–6 years of age.

4. Materials and methods of the study

The object of the study is the information and educational environment of preschool education organizations.

The subject of the research is the development and analysis of methods for managing information processes in the information and educational environment of preschool education organizations.

The main hypothesis of the study: the development of data management methods will make it possible to form such an information process management model that will ensure the quality of information processes and the development of recommendations for their optimization in the information and educational environment.

Assumptions accepted in the work:

– the information and educational environment should be able to automate, accumulate and systematize competencies, as well as have recommendations for the training of teachers;

– the practical benefits of the information and educational environment should be measured, for example, by simplifying the work of specific teachers, reducing data losses, reducing time losses and organizational costs.

The following methods were used in the research process:

– systems analysis to study information processes and understand their interactions and influence;

– analysis of monitoring information processes for division into components and study of their interaction;

– synthesis to combine all components into a single integrated system as an information and educational environment;

– a method of structural-logical modeling for modeling the control scheme of the information and educational environment;

– experiment-testing of the prototype of the information and educational environment.

Information Process Modeling is the process of creating an abstract model or models that represent business processes, information flows, systems, and procedures. During the modeling of information processes, the various stages and components of the process are modeled as blocks that are linked to each other. Data exchange between different blocks is part of these models. Modeling and managing data exchange between various system participants allows to determine how data moves during the execution of business processes, and what weaknesses can be identified and eliminated to improve the efficiency and reliability of the system as a whole. The concept of building a model involves:

– analysis of information processes necessary to monitor the formation of skills in preschoolers;

– development of the data presentation structure in the information and educational environment;

– development of a scheme for storing data on the level of skill development among preschoolers using a database;

– development of queries for data management, including data storage and retrieval;

– proposal of a data management scheme for the information and educational environment of preschool education organizations, which allows determining learning outcomes and adjusting individual work with students.

5. Research results of the models of management of information processes in the information and educational environment of preschool education organizations

5. 1. Analysis of information monitoring processes

The analysis of monitoring information processes shows that data collection is carried out for children of preschool organizations and preschool classes of schools (lyceums, gymnasiums). The monitoring criteria contribute to the formation in children, in accordance with the age of their physical development, of communication, cognitive, intellectual, creative skills, research abilities, social and emotional skills, and are the expected results from the content of organized activities:

1) physical culture (adaptive physical culture for children with SEN);
2) swimming (if there is a swimming pool);
3) speech development;
4) fiction;
5) basics of literacy;
6) Kazakh language;
7) sensorics;
8) basics of mathematics;
9) design;
10) familiarization with the outside world;
11) drawing;
12) modeling;
13) application;
14) music.

Methods for obtaining monitoring results:

– supervising children during organized activities and play;

– conversation;

– analysis of children's drawings, crafts and more.

The leading method is observation, which is carried out during the school year, where the teacher monitors the development of the child in a natural setting, in everyday life.

Monitoring stages:

– starting – September;

– intermediate – January;

– final – May.

Monitoring begins with an intermediate control in the early group and with a starting control in the remaining age groups. Since the early group masters the content of the Model Program for the first time, there is no starting control over them.

For other groups (classes), the starting control is carried out using the observation sheet of the previous age (for example, for the older group, the observation sheets of the middle group are used). And for the intermediate and final control, the Observation Sheet corresponding to this age is used. When conducting each monitoring in the Observation List, it is necessary to indicate the stage of monitoring that is currently being carried out (starting, intermediate or final).

5. 2. Development of the data presentation structure in the information and educational environment.

The assessment of the formation of skills is determined using 211 indicators. The structure of data presentation in the information and educational environment has been developed, which made it possible to organize data in such a way that they can be effectively used and processed. The structure of data presentation in the information and educational environment is shown in Fig. 1 and contains 8 categories of data, each of which has its own functional set of tasks. These tasks are interconnected in a certain sequence. All categories are aimed at achieving one goal – high-quality monitoring to track the level of achievement by children and the teacher of the expected results defined in the content of the Model Curriculum for Preschool Education and Training.

The first category includes 5 age groups of a preschool organization.

The second category is «Monitoring». This monitoring is carried out in a preschool organization in three stages. The first stage of monitoring is «Starting monitoring», which is carried out until September 15. The second stage is «Intermediate monitoring», is carried out until January 15, and «Final monitoring» is carried out until May 15.

The third category is «Criteria», these criteria are the same for three types of monitoring. And in all age groups, the criteria are the same, which makes it possible to conduct high-quality measurements and trace the dynamics of a child's development in each year of life.

The next category «Organized and educational activities» presents 12 classes that are held throughout the year in a preschool organization.

The fifth category is «Indicators», in the pre-school group, there are 211 indicators per child for each monitoring. There are 633 indicators per year for three monitoring, in aggregate, per one child. There are at least 25 children in a group. From this, it is possible to draw conclusions about the quality of monitoring in general, given that the working day of a preschool teacher is 4 hours 48 minutes and this information is processed manually.

This automated system for calculating indicators will reduce the burden on the educator and improve the quality of monitoring at any stage.The «Final Report» is presented in the form of a table.

«Individual card» is presented in the form of a table. This individual card of the child provides complete information on the passage of monitoring, measures based on the results of control are developed taking into account the age characteristics of preschool children. Video lessons and video tasks are developed using multimedia technologies, digital competencies appropriate for this age group.

In the last paragraph of the «Video Lessons» scheme, the developed lessons and tasks for corrective work based on the results of monitoring are presented. These classes and tasks can be supplemented and refined, which will make the system more flexible in use and this system will be designed for ease of use. This will reduce the burden on each teacher, which will certainly affect the quality of the educational process in a preschool organization.

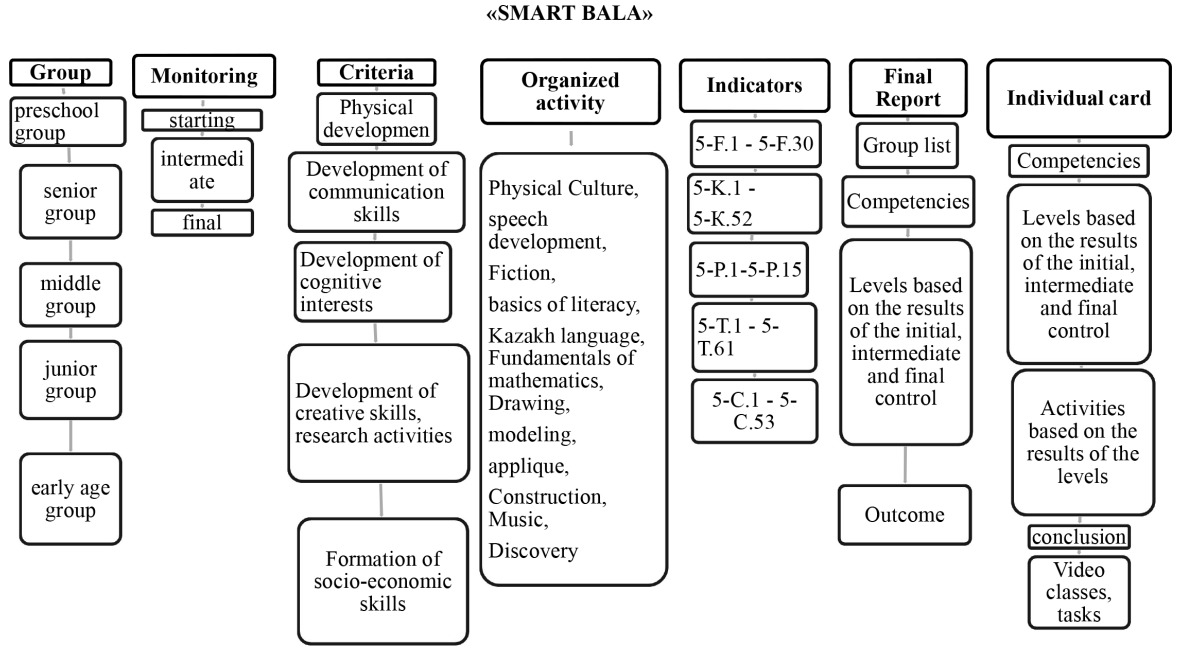

Fig. 1. The structure of data presentation in the information and educational environment

5. 3. Storage and processing of monitoring data

Each element of the presented model (Fig. 1) has a certain functionality.

Data collection. To monitor the assimilation of the content of the Model Program for Preschool Education and Training, a system of indicators has been developed to track the level of development of skills and abilities of preschoolers in accordance with the criteria.

Criteria as indicators are presented as a code in accordance with Table 1.

Table 1

Fragment of the indicator system

Development of creative skills, research activities of children			
sculpting music			
modeling			
1–T.1	rolls plasticine, clay between the palms:		
	can roll	trying to roll	can't roll
1–T.2	sculpts flat round shapes		
	sculpts forms with interest	sculpts only round shapes	can't sculpt
1–T.3	combines the received forms as shown by the educator:		
	can combine	does not combine all forms	can't combine
Music			
1–T.4	shows interest in music, singing, musical-rhythmic movements		
	Shows interest in music, knows how to listen	dances to music, performs movements	sometimes showing interest
1–T.5	emotionally perceives music		
	takes with interest	listening to music	takes no interest
1–T.6	walks to the music		
	can walk to music	trying to walk to the music	can't walk to music

For example, «3–T.3», the number «3» in the first line indicates the age of the child, that is, the child is 3 years old. The capital letter «T» means the development of creative skills and research activities of children. The next number «3» is a sequence of expected results for the development of creative skills and research activities.

Data storage. The observation sheet consists of fields where information is first filled in about the academic year, the name of the group in which the monitoring is carried out, the period, timing and name of the children (Table 2).

Table 2

Observation sheet

FULL NAME. children	Criteria		
	Pronounces distinct vowel and conso nant sounds, onomatopoeia		
	Indicators		
	speaks clearly	says some of them	can't speak clearly
Serikbai Aidos	0	1	0

The observation sheet presents monitoring criteria (expected results) and 3 related indicators. For example: the younger group, speech development, is evaluated (by number 1) only one indicator out of 3, the other two indicators are not evaluated.

Fig. 2 presents a data schema for storing a system of indicators and monitoring results for tracking the level of development of skills and abilities of preschoolers. Table «Criteria» – created as a reference, includes all indicator systems. «Person» – stores data about the child. «Age_group» – allows to store data about age groups. «Result» – a table that stores weights for analysis for each of the preschoolers.

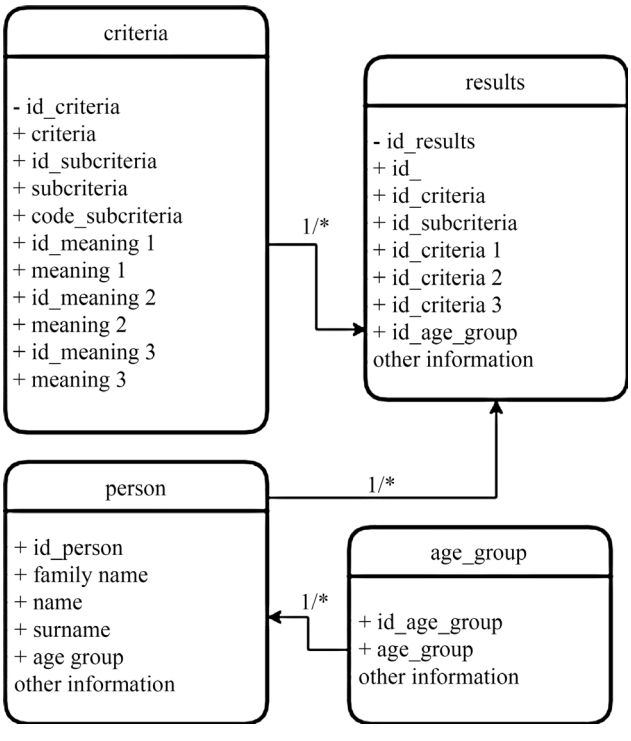

Fig. 2. Organization of research data storage using databases

«Other information» suggests that in addition to the basic information that will be used within this system, the tables may contain a number of additional information that can be used in other studies or predictive models.

Data Analysis. After collecting the data, it is necessary to summarize each indicator. Here, the first indicator of each criterion is high, the second indicator is medium, and the third indicator is low. In the cell presented at the bottom of the Observation Sheet, the percentage of achievement by the children and the teacher of the expected result of the Model Program is automatically calculated. In the cells «high, medium, low», located below, the percentage of children mastering the skills and abilities and the number of children who have reached a certain level by percentage are automatically calculated.

5. 4. Evaluation of the level of skill formation in preschoolers using SQL queries

Monitoring in the information and educational environment allows to quickly calculate the monitoring automatically:

1. Deciphering the designation of the formulas and the calculation method:

– N – the total number of indicators according to the levels of assimilation of the content of VET. The number consists of «1» marked by the teacher according to the list of children;

– N_1 – the number of high-level indicators;
– N_2 – the number of the average-level indicators;
– N_3 – the number of the low-level indicators.

2. The achievement of the expected results by the teacher in the formation of skills and abilities, the competence of children is calculated according to (1)–(3):

$$\text{High-level result, \%} = \frac{N_1}{25} * 100\,\%, \quad (1)$$

$$\text{Average-level result, \%} = \frac{N_2}{25} * 100\,\%, \quad (2)$$

$$\text{low-level result, \%} = \frac{N_3}{25} * 100\,\%, \quad (3)$$

where N_1 – the number of high-level indicators; N_2 – the number of the average-level indicators; N_3 – the number of the low-level indicators.

3. The formula for determining the assimilation level of the content of the Model Curriculum according to the criteria based on one of the areas is calculated according to (4)–(6):

$$F_{high} = \frac{N1_{f1} + N1_{f2} + N1_{f3} + \ldots + N1_{fn}}{n}, \quad (4)$$

$$F_{average} = \frac{N2_{f1} + N2_{f2} + N2_{f3} + \ldots + N2_{fn}}{n}, \quad (5)$$

$$F_{low} = \frac{N3_{f1} + N3_{f2} + N3_{f3} + \ldots + N3_{fn}}{n}, \quad (6)$$

where $N1$ – the number of high-level indicators; $N2$ – the number of indicators of the average level; $N3$ – the number of low-level indicators; $f1, f2, f3,..., fn$ – criteria for the direction of the child's development.

For reporting and analysis, the educator or administrator can sort the data according to the following criteria:
– by date of testing;
– by group;
– by criterion or sub-criterion.

The calculations described above are implemented using a SQL query. The operation of a SQL query can be described in this way:

1) form an intermediate table from the data containing the age group, criterion, subcriterion;

2) set the dates that are necessary for the study;

3) supplement the table with three columns sorted in descending order: the indicator, its average value and the number of people:

```
SELECT age_group, criterion, subcriterion, meaning,
AVG(result) AS average_result, COUNT(person_id)
AS person_count
FROM people p
JOIN results r ON p. id_people = r. id_people
WHERE date BETWEEN start_date AND end_date
GROUP BY age_group, criterion, subcriterion, meaning
ORDER BY age_group, criterion, subcriterion;
```

– person – table with data about a person;
– result – table with results;
– age_group – age group;
– criteria – criterion;
– subcriteria – subcriteria;
– meaning – indicator;
– _ people – person identifier;
– date – testing date;
– start_date – start date of the period;
– end_date – end date of the period;
– AVG(meaning) – average value of the indicator;
– COUNT(DISTINCT id_people) – number of people;
– GROUP BY – data grouping by age group, criterion, sub-criterion and indicator;
– ORDER BY – sort data by age group, criterion, sub-criterion and average value.

To calculate the percentage of the quality of assimilation of certain criteria (skills) with such a data structure, let's use the following query:

```
SELECT
person.name,
criteria.name,
SUM(result.score)/(criterion.total_points
*COUNT(DISTINCT result.testing_date))*100 AS
percentage
FROM
result
JOIN person ON result.person_id = person.id
JOIN criterion ON result.criterion_id = criterion.id
GROUP BY
person.name,
criterion name.
```

This query joins the results table with the new face and criteria lookup tables using the person and criteria IDs stored in the results table, respectively. The SUM function is used to calculate the total score for each person and criterion, and the COUNT function is used to calculate the number of test dates. Finally, the percentage is calculated by dividing the total score by the total score for the criterion and the number of test dates, and then multiplying by 100. The query is grouped by person name and criterion name to get a percentage for each person and criteria combination.

Python graphics packages are used to automate the visual presentation of information about the study. This procedure has 2 stages:

1. A query has been written that retrieves the necessary data based on filtering criteria, group, criterion, sub-criteria and indicator level. Here example in Python with using matplotlib libraries:

```
# Count the number of people participating in the study
participants = pd.read _sql_query («SELECT
COUNT(DISTINCT person_id) as count FROM
results», con)
# Add the number of participants to the plot title
plt.title ('Histogram of Level of Indicator by Criterion,
Subcriterion, and Group\ nNumber of Participants: {}'.
format(participants['count'][0])).
```

In this example, con is the database connection object. DataFrame data – contains filtered data based on the group, and the histogram is based on the level_of_indicator column. The user can further customize the histogram according to specific requirements.

2. The number of people participating in the study is calculated, which is displayed next to the filter as follows:

```
# Count the number of people participating in the study
participants = pd.read _sql_query ("SELECT
COUNT(DISTINCT person_id) as count FROM
results", con)
# Add the number of participants to the plot title
plt.title ('Histogram of Level of Indicator by Criterion,
Subcriterion, and Group\ nNumber of Participants: {}'.
format(participants['count'][0])).
```

These requests allow to automate data processing and facilitate the work of the educator.

5. 5. Data management scheme for information and educational environment

Data management scheme for the information and educational environment (Fig. 3).

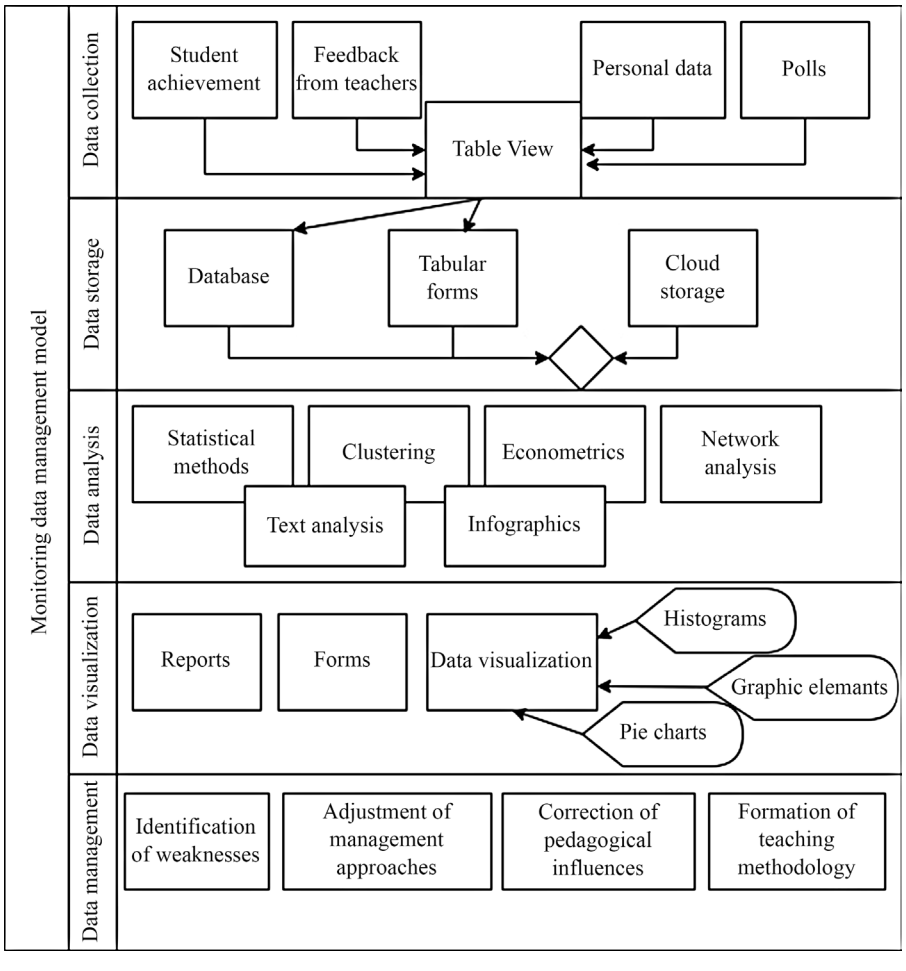

Fig. 3. Data management scheme for information and educational environment (compiled by the authors)

The data management scheme for the information and educational environment can be represented using the following components:

1. Data collection. Data from various sources such as student achievement data, demographics, teacher reviews, and other relevant sources. This data may be collected through surveys, assessments, and other assessment tools.

2. Data storage. Storing data in a secure centralized repository such as a database or cloud platform. It is necessary to make sure that the data is properly organized and can be easily retrieved and analyzed.

3. Data analysis: data analysis methods such as descriptive statistics should be used. This analysis can be used to identify strengths and weaknesses in student performance, as well as identify patterns and trends in the data.

4. Data visualization. Data visualization tools such as charts, graphs, and dashboards should be used to present the results of data analysis. This can help educators and administrators understand the data more effectively and make informed decisions about how to improve student learning outcomes.

5. Correction mechanism (Management): Integrate a corrective mechanism to address any identified weaknesses in student performance. This can be done through targeted interventions such as one-on-one training, targeted learning support, or through the provision of additional resources such as online learning materials.

6. Discussion of the results of designing an information and analytical system

After analyzing the information processes for monitoring the formation of skills among preschoolers, a model for managing information processes in the information and educational environment for preschool education organizations was developed (schematically shown in Fig. 2). This model will ensure the quality of information processes and develop recommendations for their optimization in the information and educational environment of preschool education organizations, as well as determine the results of the educational process and adjust individual work with children 5–6 years of age.

Developed information and educational environment, including a database (Fig. 1) for storing the results of monitoring the skills of preschoolers. This database is used for data storage and retrieval, data management and analysis, and reporting.

The experimental work involved 14 preschool organizations, 620 children of 5–6 years of age, 60 teachers of a preschool organization, 4 heads of a preschool organization, 4 methodologists.

Control and experimental groups were created. In the control group there are 310 children aged 5–6, 30 preschool teachers, 2 heads, 2 methodologists.

In the experimental group there are 310 children aged 5–6, 30 teachers of a preschool organization, 2 heads, 2 methodologists.

To confirm the research hypothesis put forward by us, let's analyze monitoring in a preschool organization. Analyzing monitoring in a preschool organization and taking into account the characteristics of children aged 5–6 years, an experimental study was conducted.

The experiment was carried out in 3 stages:

The first stage is ascertaining. Its purpose, firstly, is to conduct a survey of teachers of a preschool organization, heads and methodologists on monitoring in a preschool organization. It is necessary to determine their attitude to the problem of organizing the educational process on the basis of a competency-based approach in the context of the difficulties experienced and ways to solve the problem under study.

Also, at the ascertaining stage of the experimental study, let's solve the problems that made it possible to develop a model.

Secondly, to investigate the initial state of the effectiveness criteria in the control and experimental groups in the following areas:

1) analysis of the organization of monitoring according to the algorithm for organizing monitoring of a preschool organization;

2) quality of knowledge (based on monitoring analysis).

The second stage is formative. The goal is to introduce a model of information process management in the information and educational environment for preschool education organizations in the educational process in the experimental group.

To develop this model at the ascertaining stage of the experiment, an analysis of the information processes necessary for monitoring the formation of skills among preschoolers was carried out, and a structure for presenting data in the information and educational environment was developed. Monitoring the formation of skills in preschoolers based on the results of the analysis has a number of problems associated with the storage, use and management of data, on the basis of this, a scheme was developed for storing data on the levels of skill formation in preschoolers using a database, as well as queries for data management, including data storage and retrieval. Teachers of the preschool organization took an active part in this pilot study, showed all the problems associated with monitoring in preschool education organizations. In the process of analyzing these problems, it became obvious that a data management scheme is needed for the information and educational environment for preschool education organizations, which makes it possible to determine the results of the educational process and adjust individual work with children aged 5–6 years.

The third stage is control. Its purpose is to investigate the final state of the effectiveness criteria in the control and experimental groups through a survey of preschool teachers, methodologists and managers. In the process of questioning, on the basis of monitoring analysis, assess the quality of knowledge. These stages are necessary to study the monitoring system in preschool organizations based on the applied algorithm. Then, based on the data obtained, to draw a conclusion about the effectiveness of the implemented information process management model in the information and educational environment for preschool education organizations of a preschool organization in the experimental group.

In order to qualitatively trace the objectivity of the study and the dynamics of the development of the educational process in a preschool organization, a phased and periodic activity was observed. This was due to the need to study not only the initial state of this monitoring, but also intermediate and final results.

620 children aged 5–6 years, 60 preschool teachers, 4 heads, 4 methodologists participated in the monitoring.

The purpose of this observation was to study the time spent on filling out forms in Excel in the course of filling out tables. Errors were noticed during the work:

– when entering data into an Excel form, due to the inconvenience of entering table data;

– loss of data due to the appearance of empty cells;

– impossibility to calculate data using formulas;

– file freeze;

– problems with opening the file;

– data loss;

– accidental deletion. One wrong click disables the spreadsheet and preschool teachers are forced to fill in the values for the indicators from the very beginning. This takes extra time;

– there is no help line, which plays a big role for teachers of preschool organizations who do not have the skills to work in this system;

– there is no automation of the analytical activities of teachers;

– an individual card for each child is filled out independently based on the results of monitoring manually;

– there is no availability and timeliness of information on the quality of education.

The management of modern preschool education is not possible without obtaining systematic, reliable and operational information as a means of figurative communication about the achievements of the child. The information-educational environment can serve as a means for obtaining such information. For teachers of a preschool organization, this information and educational environment is the creation of a single holistic – semantic base for the implementation of pedagogical activities, the optimization of the educational process. For parents – the creation of favorable conditions and equal starting opportunities, full-fledged and high-quality preschool education and upbringing. For the management system – purposeful activity, quality of data filling, reliability, reduction of time costs, reduction of material costs.

For example, filling out 211 indicators for 1 child (Tables 1, 2) takes from 15 to 20 minutes; for a group of 19 people, it takes about 5 hours. After testing the information and educational environment, the time spent on a group of 19 children averaged 3.5 hours. For one student 11–12 minutes, which indicates an increase in the efficiency of the work of the educator and time savings by 30 %.

It should be taken into account that each teacher develops tasks for monitoring independently, which affects the quality of education, since it does not always correspond to the age characteristics and requirements of preschool children. The teacher prepares individual cards for each child independently by typing information manually. This work takes a lot of time, and thus the quality of monitoring is reduced, given that the working day for a preschool teacher is 4 hours 48 minutes.

An information and educational environment in which competencies are divided according to their purpose into innovations and industry competencies. The activities of the former are aimed at promoting solutions for specific actions with preschool children and teachers of a preschool organization. The second – to carry out work or provide automation services at a specific stage of monitoring. This separation significantly affects the results of work, functions and organizational structure of the information and educational environment.

This information and educational environment in preschool education is relevant. Monitoring of preschoolers using information technology and automation solutions

has not been provided in the required volume to date. This makes it difficult for teachers and children in the perception and quality of data. Preschool organizations use programs for qualitative calculation, but this is not a way out of this situation, since it is not convenient and accurate. Analyzing methodological recommendations for monitoring the development of children's skills and abilities in mastering the content of the Model Program, which clearly spells out the main problem of the lack of unified diagnostic approaches in a preschool organization. The diagnostic methods used do not meet the requirements of the updated content of regulatory documents in the field of preschool education.

These methodological recommendations have been developed with the aim of providing methodological assistance to teachers in monitoring the assimilation of the content of the Model Program by children.

Tasks:

– development of a unified approach to the implementation of a system of indicators for tracking the development of skills in children in preschool organizations;

– carrying out diagnostics (starting, intermediate and final control) on mastering the content of the Model Program;

– automation of monitoring the development of preschool children.

The guidelines include the following sections:

– «Basic requirements for monitoring»,

– «Organization and conduct of diagnostics to track the development, skills and abilities of preschool children»,

– «On the main methods for measuring the level of development of the child»,

– «Automation of monitoring the development of preschool children».

The information and educational environment is a kind of response to the requirements of modern society, because it is necessary to navigate the problems of a rapidly changing and becoming more complex process in education and teacher training. The information and educational environment should be able to automate, accumulate and systematize competencies in increasingly complex technologies and automation tools, as well as have recommendations for the training of teachers.

In order to become truly in demand, the information and educational environment must offer solutions that increase the effectiveness of automated monitoring. Practical benefits are needed, such as simplifying the work of individual teachers, reducing data loss, reducing wasted time and organizational costs - that is, a benefit that can be measured.

Automation of the work of a preschool organization should be aimed at reducing the number of labor force per teacher. Understanding by preschool teachers of this dependence generates trust and a desire to work, since it is obvious that with a significant increase in the efficiency of the work of a preschool organization, it will be able to compensate for the decrease in the need to spend time on monitoring. This circumstance imposes certain obligations on the organizational and educational environment. They consist in the fact that the key competencies that a preschooler should have affect the child's socialization in society and success in acquiring knowledge, skills and abilities. The fate of the child depends on how accurately and efficiently it will be organized.

It is very important that the tasks are understandable, the assessment criteria are accurate, and there is consistency and consistency in the selection of tasks, taking into account age characteristics and methodological recommendations. Educators and parents need to be fully confident that, as a result of automation, the data obtained will be available for viewing and correlation. Then the need for the services of the information and educational environment will continue or increase. The key to the successful operation of the information and educational environment is its demand among users (teachers, parents). The basis for this is a high level of expertise in sectoral issues that are important to users.

The work on creating an information and educational environment is of a design-systematic nature: at the first stage, it is project-based, and at the second, after the launch of the prototype, it is systematic (development and enlargement by teachers and managers). The internal process of creating an information and educational environment is the core of practical work on automating the production processes of preschool organizations. The results of activities should be divided into two parts: internal and external. The external ones include the results of project activities in the interests of teachers and parents. Internal – intellectual assets, methodological recommendations, methodological developments (directly competence, various psychological, pedagogical and methodological documentation, models, proven solutions, etc.), reused as part of external results.

A model for managing information processes in the information and educational environment for preschool education organizations is presented, which can be used to optimize the processes of managing information resources in educational institutions and improve the quality of education.

The presented model allows to determine the learning outcomes and adjust individual work with children 5–6 years of age. Also, the results stored in the database will allow for the analysis of both criterial and indicative indicators. This, in turn, will lead to an increase in the quality of education in preschool organizations.

The introduction of the developed model allowed to reduce the time spent on adjusting individual work with children by 30 %. These results are explained by the optimization of information processes, as well as improved monitoring of the formation of skills of preschoolers and a reduction in the time for its implementation.

The developed add-on for information systems of preschool organizations is designed for 3 main levels of users. Let's describe their data access levels depending on its role and responsibilities.

Methodists in preschool education and upbringing: as specialists in this field, they will have the highest level of access to data. They will be able to view, analyze and manipulate data to evaluate the effectiveness of various training and nutrition programs. They will also be able to use the data to inform the development of new programs and provide guidance to caregivers and education analysts.

Caregivers: will have a limited level of access to data. They will be able to view data related to the children they care for, fill out student cards for only their group, and have a characteristic description of the criteria and sub-criteria. They will not be able to view or analyze other children's data or manipulate their data in any way.

Education analysts will have access to mid- level data. They will be able to view and analyze data from education and nutrition programs, but will not be able to make changes to the data or programs. Their role will be to interpret the data and provide recommendations for program improvement based on the results.

The results of a study conducted within a number of preschool organizations indicate the effectiveness of the pro-

posed model for managing information processes in the information and educational environment for preschool education organizations. The model was developed taking into account the analysis of information processes for monitoring the formation of skills in preschoolers and includes a data storage algorithm. Data management queries, including data storage and retrieval, data management and visualization significantly reduce the time spent on data analysis and management decision making. A feature of the proposed model is the ability to determine learning outcomes and adjust individual work with preschool children. Compared to existing approaches, the information process management model in the information and educational environment for preschool education organizations provides more accurate results that can be used to improve the quality of education for preschool children.

However, this study has some limitations, such as the limits of applicability of the proposed solutions and the conditions for applicability of the results obtained. For example, the results may only be applicable to early childhood education organizations and may not be generalizable to other levels of education.

The disadvantage of this study is the limited sample of children studied, which may reduce the overall reliability of the results. In the future, shortcomings can be eliminated by expanding the sample and more detailed data analysis.

In a future study, it is planned to conduct a deeper analysis of information processes for monitoring the formation of skills in preschoolers, as well as expand the sample of children to obtain more accurate results. The difficulty may be the development of more complex mathematical models for describing information processes in the information and educational environment.

7. Conclusions

1. As a result of the analysis of information processes for monitoring the formation of skills among preschoolers, the main stages and methods of monitoring have been identified, and indicators characterizing the level of skill formation among preschoolers have been determined. These indicators include knowledge, skills and abilities are developed during preschool education. The results of the analysis help to determine the main requirements for the model of the information and educational environment, which must be taken into account when developing it.

2. A structure for providing data has been developed. To date, this structure is the only one in preschool education in Kazakhstan, which makes it possible to systematize and automate the process of organizing monitoring. This structure makes it possible to qualitatively and accurately determine the levels, as well as tools for adjusting work with these children based on the results obtained.

3. The developed data storage scheme for studying the level of skill formation in preschool children using a database allows to effectively store and process data on the formation of skills in preschool children. This scheme includes methods for assessing the level of skill development, as well as tools for storing and analyzing them. The developed scheme allows summing up the results of each observed indicator, calculating the percentage of achievement of the expected result by the children and the teacher.

4. Queries for data management have been developed, including data storage and retrieval, data management. The developed requests make it possible to effectively manage information processes related to the processing and storage of data on the educational process in preschool organizations. They also provide the ability to adjust individual work with children aged 5–6, as well as generate reports to analyze the effectiveness of the work of preschool teachers.

5. A scheme has been developed data management for the information and educational environment for preschool education organizations, which allows to determine the results of the educational process and adjust individual work with children 5–6 years of age. This scheme provides convenient access to information about the educational process and the state of skill development among preschoolers. This allows teachers of a preschool organization to receive the necessary information to adjust their work, as well as parents and legal representatives to receive information about the progress of the educational process of their children.

Conflict of interest

The authors declare that there is no conflict of interest regarding this research, including financial, personal nature, authorship or other nature that could affect the research and its results presented in this article.

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Data Availability

The manuscript has associated data in the data store.

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