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ORGANIZATION OF A PRACTICE-ORIENTED APPROACH IN THE STUDY OF SMART TECHNOLOGIES

Currently, special attention is being focused on to the application of a practice-oriented approach in the educational process. The article examines the organization of a practice-oriented approach in the study of SMART technologies in educational institutions. In the context of rapid technological progress and digitalization of the economy, the training of specialists with not only theoretical knowledge, but also practical skills in working with modern SMART technologies is of particular importance. The main attention is paid to the methods of introducing SMART technologies into the educational process, their impact on the motivation and academic performance of students, as well as on the development of key competencies needed in the modern world. Examples of successful application of these technologies in an educational institution are given and the results of their use are analyzed. As a result of this study, the following conclusions can be drawn that the practice-oriented approach contributes to the application of solving practical problems, as well as develops the professional experience of future computer science teachers in the organization of modeling practice-oriented tasks.

Keywords: Project-oriented approach, SMART technologies, higher education institution, project work, practical assignment

Introduction

Improving the efficacy of education is one of the primary goals of contemporary education. In this context, higher education institutions have

academic freedom to develop the content of their programs and choose teaching technologies [1, p. 96]. This privilege allows each educational institution to select successful strategies tailored to their specific needs. A vital component of teacher preparation is the creative enhancement of values and attitudes multiplied to professional foundational knowledge and abilities [2].

The use of a practice-oriented approach in teaching «SMART technologies» forms the basis of this research. Analyzing this approach, we can distinguish two main directions. The first direction involves practice conducted at the university to familiarize students with the industrial or professional environment of their specialties. This involves students entering into agreements with specialized organizations, visiting these institutions, and participating in internships. The second direction is considered as part of the teaching method, serving as an effective approach for teachers and students to achieve educational goals. This direction emphasizes the formation of functional responsibilities and competencies in their specialty [3; 4]. In this study, a practice-oriented approach is seen as a method of professionally oriented learning in the educational process.

The relevance of this study lies in demonstrating the influence of a practice-oriented approach on students when teaching SMART technologies, as well as its potential for future implementation in this field. Therefore, the purpose of the article is to describe the work aimed at implementing a practice-oriented approach in teaching computer science to future teachers of at universities as a practice-oriented method.

As a result of this study, the high productivity among students in the development of practical tasks related to the study of SMART technologies has been noted. During the training project, future teachers and educators demonstrated targeted and values-based approaches to success in vocational education. These include productivity at work, self-discipline, diligence, and knowledge expansion.

Current article is organized into the following sections: Introduction, Literature review, Methods for conducting the empirical part, Presentation of the results of empirical research work, and finally Conclusion.

Literature review

The application of a practice-oriented approach at the university, from the earliest stages, allows student to adapt to the subject area, improve the quality of education, as well as organize and perform teamwork. Among the many factors contributing to the widespread introduction of a practice-oriented approach into learning processes, the effectiveness of this approach in consolidating and developing students' practical skills stands out.

The goal of high-quality teacher education is to ensure that university teachers possess strong academic teaching skills, as well as take care of student learning

process. This involves students' own experiences and ideas and supporting pedagogical practice, which includes a good integration between theory and practice [5, p. 30–38].

The effectiveness of the practice-oriented approach in the training of future specialists lies in the development of a fundamental scientific knowledge base along with the acquisition of practical competencies by students [6, p. 409–418]. A practice-oriented approach involves performing specially prepared tasks to form skills and knowledge. When studying a specific topic, this approach allows for a visual demonstration of the result, as well as ways to correct mistakes. It focuses on combining theoretical and practical skills acquired during the training of future teachers with a professional environment [7, p. 4–8].

Teaching students' practical skills [8, p. 850–866], and project work plays a key role in their preparation for a future specialty in computer science. This is due to the high level of organizational skills required in is field. Consequently, this influences significantly on teaching students how to design ideas and how to execute them quickly and methodically. As demonstrated by Muller and co-authors [9, p. 14-19], practical methods were employed to create design works.

Materials and methods

In this study, various materials and methods were used to analyze the organization of a practice-oriented approach to the study of SMART technologies. Experimental studies were organized to identify the impact of the practice-oriented approach in the study of SMART technologies in several study groups. Experimental studies were conducted to identify the impact of this approach on students. The experiment involved 2nd and 3rd year students from the 2023-2024 academic year, enrolled in the bachelor's program «6B01511 – Computer science» at the Faculty of Information Technology of the L. N. Gumilyov Eurasian National University, the country's leading university. A total of 57 students participated in the experiment, including 22 boys and 35 girls. The work with the students lasted for 7 weeks and was conducted in three stages.

In the first stage, students were familiarized with the Arduino microcontroller, studying the individual properties of sensors and their applications. During the second stage, students worked on integrating multiple sensors. In the third stage, students engaged in group design projects, consolidating their knowledge to create SMART objects.

During the learning process, interactive whiteboards were used for lectures and practical classes. It made it possible to demonstrate materials in an interactive form, discuss materials together and actively involve students in the learning process. A special platform was used to organize the educational process, store

educational materials and additional information. In the course of working with practical tasks, students worked individually, in pairs and in groups.

The main purpose of the experimental work was to improve students' skills in selecting microcontrollers and sensors, programming, and drawing up circuits using a practice-oriented approach. Questionnaires and surveys were conducted to obtain results and collect data on students' perceptions. The questionnaires included questions about usability, the impact on motivation and academic performance, as well as general impression of using new technologies.

The use of these materials and methods made it possible to obtain a comprehensive assessment of the effectiveness of the practice-oriented approach in the study of SMART technologies and to develop recommendations for its further improvement

Results and discussion

Among the literature studied, there are no studies that consider teaching SMART technologies using Arduino with a practice-oriented approach. To address this gap, we conducted experimental studies involving 57 students. The results were summarized through pre-experimental and post-experimental surveys administered to students at the L.N. Gumilyov Eurasian National University. The main purpose of the survey was to evaluate the effectiveness of the training content used in teaching SMART technologies, the use of Arduino in the context, and to identify the impact and features of a practice-oriented approach, emphasizing the importance of practical work.

As illustrated the diagram in Figure 1, the latest survey shows a 62 % increase in the number of students who rate the learning materials and process as high and very high. This relates to learning SMART technologies, students get acquainted with new materials, as well as enjoy working with Arduino and practical work. General course materials and practical tasks.

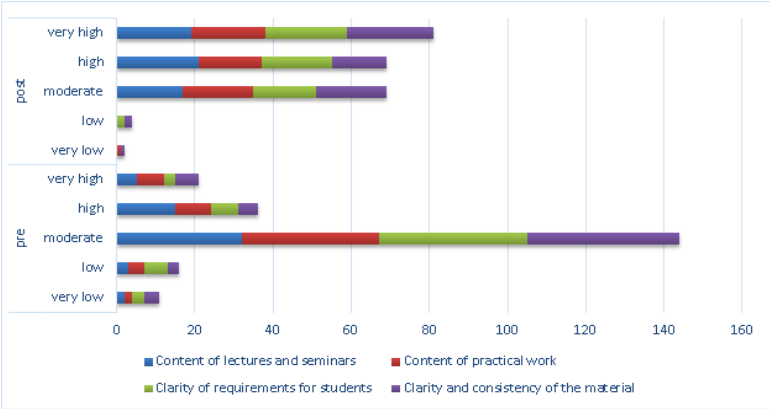

Figure 1 – Students' assessment of the educational material and process

Assessing the success of the course results compared to initial expectations, it is evident that students showed positive dynamics in evaluating their own progress. Initially, students answered survey questions based on their prior knowledge. After seven weeks, they assessed their performance level with the experience gained from the course. In the initial survey, nearly 28 % of students rated their performance as either very low or low. However, in the second survey, this figure decreased to 5 %. Conversely, after the experiment, the number of students who rated the course highly increased to 89 %. The students noted that the classes were more interesting and motivating compared to traditional teaching methods.

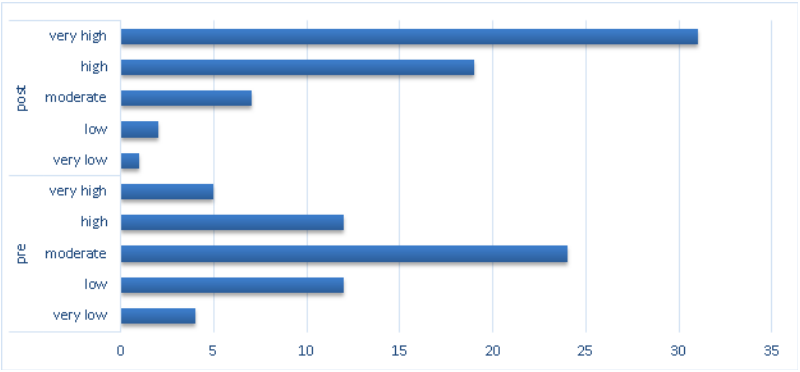

Figure 2 – Assessment of students' own progress

Assessing how successful the results of the course were for students compared to your expectations, you can see that the students showed positive dynamics in assessing their level. While the students answered the survey questions through their previous knowledge in the initial survey, they assessed the level of performance of the expected results with the experience gained 7 weeks after the experiment. More than 70 % of students indicated that they feel more confident in applying theoretical knowledge in practice after working with practical tasks.

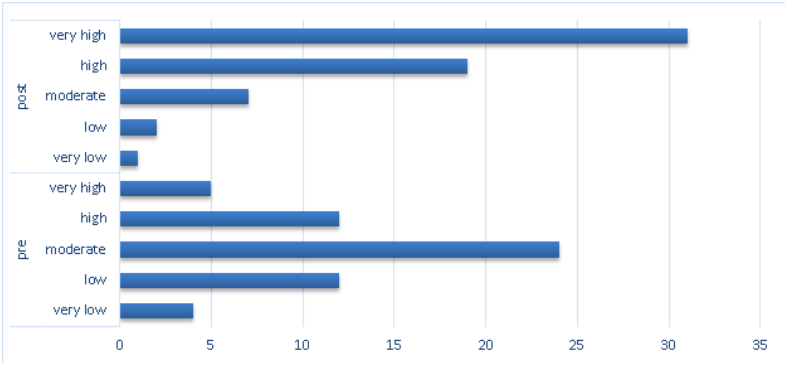

Figure 3 – Evaluating students by course expectations

One of the main requirements for applying a practice-oriented approach is not merely the mechanical accumulation of seemingly useful knowledge, but the formation of skills for practical application in everyday and professional activities [10]. When explaining SMART technologies through examples, it is important to note that while the areas of application and benefits are often fully considered, information on how to create SMART objects hands-on is not always available or sufficient. This gap might be a reason why SMART technology does not effectively shape practical thinking. Therefore, it was proposed to create realistic SMART objects using an Arduino microcontroller and sensors.

Completing practical tasks helps students better understand the training topics and work out mistakes. Additionally, selecting the right practical tasks increases student interest. This is evidenced by the results shown by the students in 3rd diagrams.

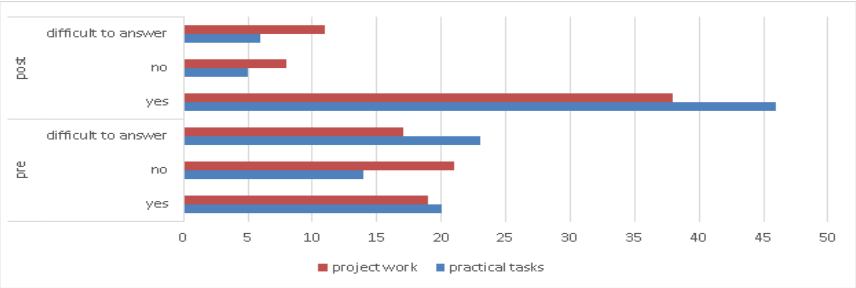

Figure 4 – Assessment of project and practical work

When teaching SMART technologies, the provision of project work to students using a practice-oriented approach also had a positive impact. As the last work during the experiment, students were given teamwork to create SMART objects. The students worked on creating a project to summarize their knowledge. Students not only get a notion of the project when they create a project, but they also define methods for virtually fully knowledge can be clarified with practical application through practical assignments in the project development process.

One of the tasks when creating a project is mentoring [11, p. 90–95], that is, orienting students. Working with a mentor helps to increase students' competence, collect reliable data, and improve communication skills [12, p. 1–10].

When creating a project work, future teachers may face the following difficulties [13, p. 208–230].

– Issues with the structure level
– Coping mechanisms at the structural level
– Difficulties at the taskwork level
– Coping mechanisms at the task-level
– Obstacles at the individual level

Digital devices and time are additional factors to take into account while planning project training. Zh. Nurbekova and co-authors organized project training in microcontroller programming, which will be divided into three stages: Project organization, execution, and assessment of the project. The project training provided the participants with a thorough comprehension of the project. The project training provided the participants with a through comprehension of the project's creation, teamwork skills, and the ability to completely apply theoretical information in a practical form [14, p. 218-227].

Every student can now take part in particular practice-oriented activities thanks to the introduction of methodologies based on their research and design project. This helps foster the autonomous work skills necessary to learn new

information and put it to use. Additionally, it makes students more engaged with the outcomes and guarantees that they will participate in introspection, reflection, and the creative application of newly acquired knowledge [15, p. 994–1015].

In general, the results of the study demonstrated that a practice-oriented approach to the study of SMART technologies contributes to improving the quality of education and preparing students for modern professional challenges.

Conclusion

The use of a practice-oriented approach in the study of SMART technologies in the educational institutions is an important area of modernization of the educational process. This study has shown that using this approach significantly improves student academic performance, increases their motivation and engagement, and promotes the development of practical skills. During the experiment, students honed their knowledge by performing theoretical and practical tasks on SMART technologies, and they believe they will apply these skills in their future teaching profession. Additionally, completing practical tasks as a team project has demonstrated significant benefits for students. This approach helps future computer science teachers develop their practical skills and knowledge in a professional environment. The primary benefit of a practice-oriented approach in the educational process is the acquisition of practical skills, which can only be achieved by solving specific tasks.

The continuous development and improvement of this approach will contribute to the further modernization of the educational systems and increase the competitiveness of graduates in the labor market.

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SMART ТЕХНОЛОГИЯЛАРДЫ ОҚЫТУДА ТӘЖІРИБЕГЕ БАҒЫТТАЛҒАН ТӘСІЛДІ ҰЙЫМДАСТЫРУ

Қазіргі таңда оқу процесінде тәжірибеге бағытталған тәсілді қолдануға ерекше назар аударылуда. Мақалада білім беру мекемелерінде SMART технологияларды оқыту кезінде тәжірибеге бағытталған тәсілді ұйымдастыру қарастырылады. Жылдам технологиялық прогресс пен экономиканы цифрландыру жағдайында теориялық білім ғана емес, сонымен қатар заманауи SMART технологиялармен жұмыс істеудің практикалық дағдылары бар мамандарды даярлау ерекше маңызға ие. Негізгі назар SMART технологияларды оқу орындарында оқытудың тәсілдері, олардың студенттердің мотивациясы мен үлгеріміне әсері, сондай-ақ негізгі құзыреттерді дамытуға аударылды. Бұл технологияларды білім беру мекемесінде сәтті қолдану мысалы келтіріліп, оларды қолдану нәтижелері талданды. Осы зерттеудің нәтижесінде

тәжірибеге бағытталған тәсіл практикалық мәселелерді шешуге ықпал етеді, сонымен қатар болашақ информатика мұғалімдерінің тәжірибеге бағытталған міндеттерді модельдеуді ұйымдастырудағы кәсіби тәжірибесін дамытады деген қорытынды жасауға болады.

Кілтті сөздер: тәжірибеге бағытталған әдіс, SMART технологиялар, жоғарғы оқу орны, жобалық жұмыс, практикалық тапсырма.

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ОРГАНИЗАЦИЯ ПРАКТИКО-ОРИЕНТИРОВАННОГО ПОДХОДА ПРИ ИЗУЧЕНИИ SMART ТЕХНОЛОГИЙ

В настоящее время особое внимания уделяется применение практико-ориентированного подхода в учебном процессе. В статье исследуется организация практико-ориентированного подхода при изучении SMART технологий в образовательных учреждениях. В условиях быстрого технологического прогресса и цифровизации экономики особое значение приобретает подготовка специалистов, обладающих не только теоретическими знаниями, но и практическими навыками работы с современными SMART технологиями. Основное внимание уделяется методам изучение SMART технологий в учебный процесс, их влиянию на мотивацию и успеваемость студентов, а также на развитие ключевых компетенций, необходимых в современном мире. Приводится примеры успешного применения данных технологий в образовательном учреждении и анализируются результаты их использования. В результате данного исследования можно сделать следующие вывод, что практико-ориентированный подход способствует применению решение практических задач, а также развивает профессиональный опыт будущих учителей информатиков по организации моделирования практико-ориентированных задач.

Ключевые слова: практико-ориентированный подход, SMART технологии, высшее учебное заведение, проектная работа, практическое задание

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