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PEDAGOGICAL FOUNDATIONS OF TEACHING LABOR AND CAREER EDUCATION TO STUDENTS IN TECHNOLOGY LESSONS

B. **Avezov**
Associate Professor, Department of Technological Education, Ajiniyoz Nukus State Pedagogical Institute
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Annotation: This article examines the pedagogical foundations of labor and career education within technology lessons at general secondary schools. The study considers technology education not only as a means of developing practical and technical skills but also as an important pedagogical environment for forming students' attitudes toward work, occupational awareness, self-efficacy, responsibility, creativity, and readiness for future professional activity. The analysis is based on official educational standards of the Republic of Uzbekistan, UNESCO and OECD policy documents, career-development theories, and recent empirical studies in vocational and technology-oriented education. Particular attention is given to the integration of practical activities, project-based learning, career guidance, work-related learning, STEAM approaches, reflection, and cooperation with the world of work. The Uzbek state educational standard defines technology education as an area in which students should apply technical and technological knowledge in independent practical activity and develop competencies related to conscious occupational choice [1]. International evidence similarly indicates that effective career preparation is strengthened when students receive repeated opportunities to explore occupations, interact with people from the world of work, participate in workplace-related activities, and connect curriculum learning with future employment [2; 3; 4]. OECD PISA 2022 data show that, across OECD countries, only 45% of students had visited a workplace or undertaken job shadowing by age 15, while 35% had attended a job fair and 35% had completed an internship; meanwhile, 76% had used the internet to explore possible careers [5]. These findings demonstrate the importance of strengthening school-based practical and career-oriented education. The article concludes that technology lessons can provide an effective pedagogical framework for integrating labor education and career guidance when practical activity, occupational information, project work, reflection, and authentic professional contexts are systematically connected.

Keywords: technology education, labor education, career education, career guidance, vocational orientation, practical skills, project-based learning, STEAM education, employability, technological competence, work-based learning, professional self-determination, secondary education.

Introduction

The relationship between education and future professional activity has become an increasingly important issue in contemporary pedagogy. Technological development, changing occupational structures, digitalization, and the increasing complexity of professional tasks require educational institutions to prepare students not only to acquire academic knowledge but also to understand the world of work and develop competencies that can be transferred to different professional contexts. UNESCO emphasizes that education systems must establish stronger connections between learning and the changing world of work and that young people require opportunities to become familiar with occupations and workplace environments [4, pp. 49–52].

Technology lessons have particular pedagogical potential in this regard because their content is directly connected with materials, tools, technological processes, design, production,

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practical problem-solving, and the application of knowledge. In the Republic of Uzbekistan, the state educational standard explicitly defines the purpose of technology education as enabling students to apply technical and technological knowledge, skills, and competencies in independent practical activity and to prepare them for conscious occupational choice [1, §18].

This orientation is consistent with broader international approaches to career education. The OECD considers effective career guidance to be more than the provision of information about occupations. It should contribute to students' ability to make informed educational and occupational decisions, develop career-management skills, understand labor-market information, and connect learning with professional opportunities [2, pp. 17–39].

The pedagogical significance of labor education is therefore broader than the formation of manual skills. Productive activity may provide a context in which students learn responsibility, accuracy, persistence, planning, cooperation, problem-solving, and quality control. These competencies are relevant both to technical occupations and to wider forms of professional activity. UNESCO's concept of education similarly emphasizes learning to know, learning to do, learning to live together, and learning to be, thereby linking knowledge acquisition with practical activity and personal development [6, pp. 37–48].

The problem is particularly relevant because students frequently possess incomplete or stereotypical information about occupations. Career aspirations may be influenced by family background, social expectations, limited exposure to professional environments, and unequal access to career information. OECD research indicates that career guidance should begin early, be integrated into education, and provide students with repeated opportunities to explore the world of work [5, pp. 60–70].

The purpose of this article is to analyze the pedagogical foundations of integrating labor and career education into technology lessons and to identify evidence-based principles that can strengthen students' professional self-determination.

Methodology

The study uses a theoretical and analytical methodology based on documentary analysis, comparative analysis, synthesis of pedagogical research, and interpretation of empirical findings from international and national sources.

The first methodological component is analysis of normative educational documents. Particular attention is given to the State Educational Standards of the Republic of Uzbekistan, where technology education is associated with technical-technological knowledge, practical operations, creative and technical thinking, evaluation of product quality, and conscious preparation for occupational choice [1, §18].

The second component is comparative analysis of international educational policy documents. OECD and UNESCO reports were examined to identify common principles concerning career education, work-based learning, vocational preparation, labor-market relevance, teacher competence, and practical learning [2; 3; 4; 5].

The third component is theoretical analysis of career-development approaches. Social Cognitive Career Theory emphasizes self-efficacy, outcome expectations, and goals as important mechanisms in career interest, choice, and performance [7, pp. 79–122]. Career Construction Theory, in turn, emphasizes the active construction of career identity through experiences, adaptation, and the interpretation of personal and social experiences [8, pp. 144–180]. These theories are relevant to technology education because practical tasks can provide students with direct experiences through which they assess their abilities, interests, and expectations.

The fourth component is analysis of recent empirical research. Recent research involving vocational students has investigated the relationships among teacher competence, 21st-century

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IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

skills, project-based learning, work readiness, employability, and career interest. For example, Sudarsono, Pratama, and Arroyo studied 174 students from nine vocational schools and found that teacher TPACK and professional competence significantly predicted students' 21st-century skills, while 21st-century skills had a significant positive relationship with career interest [12, pp. 44–56].

The methodology therefore does not rely on a single educational theory or a single research tradition. It combines normative requirements, international comparative evidence, career-development theory, and empirical studies of technology- and vocational-oriented education.

Results

The analysis identifies several pedagogical foundations for effective labor and career education through technology lessons.

The first foundation is the unity of knowledge and practical activity. Technology education is particularly suitable for this principle because students can transform theoretical knowledge into observable products or technological processes. The Uzbek state standard requires students to understand materials and their properties, perform technological and general labor operations, manage technological processes, analyze the quality of products, and develop competencies necessary for conscious occupational choice [1, §18].

Consequently, technology lessons should not be limited to explaining technological procedures. Students need opportunities to plan, construct, manufacture, test, evaluate, and improve products. Such activities make the relationship between knowledge and practical performance visible.

The second foundation is systematic career orientation. Career education should not be reduced to occasional conversations about professions. OECD research recommends integrating career education into the curriculum and providing students with regular opportunities to reflect on their future and explore the labor market [5, pp. 69–70].

This principle is particularly compatible with technology lessons. For example, a lesson involving woodworking can introduce occupations related to carpentry, furniture production, industrial design, engineering, construction, and manufacturing. Textile-related activities can be connected with tailoring, fashion design, textile engineering, production management, and entrepreneurship. Electronics and digital design can provide an entry point into electronics, automation, programming, robotics, engineering, and digital production.

The third foundation is learning through authentic tasks. OECD research shows that young people need work-related competencies that cannot be developed exclusively through theoretical education. Work experience allows learners to encounter practical expectations and professional environments [5, pp. 11–14].

This does not mean that every school technology lesson must become workplace training. Rather, authentic professional situations can be reproduced through educational projects. Students can receive a practical problem, identify requirements, select materials, calculate resources, develop a technological sequence, create a product, test it, and justify their decisions. Such activities reproduce several elements of professional problem-solving.

The fourth foundation is project-based learning. Recent empirical research involving 120 Grade XII vocational students found significant relationships between project-based learning and field-work readiness, employability, self-confidence, and career adaptability. The reported coefficients were $\beta = 0.478$ for field-work-practice readiness, $\beta = 0.412$ for employability, $\beta = 0.380$ for self-confidence, and $\beta = 0.414$ for career adaptability, all statistically significant at $p < 0.001$ [11].

ISSN: 2224-6878 | Pakistan Volume 6, No. 10.

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These findings support the pedagogical argument that project-based activity can connect practical learning with career-related competencies. However, the evidence should be interpreted within the limits of the study's sample and vocational-school context rather than generalized automatically to all school systems.

The fifth foundation is STEAM integration. Recent research on project-based collaboration in career guidance argues that STEAM environments can connect students with professionally meaningful activities by integrating science, technology, engineering, arts, and mathematics [10, pp. 58–66].

Technology lessons are naturally compatible with this interdisciplinary approach. A student designing a simple product may need mathematics for measurement and calculation, science for understanding material properties, technology for production procedures, engineering principles for structural design, and artistic principles for appearance and usability.

The sixth foundation is reflection. Practical activity alone does not automatically produce conscious career development. Students need to analyze what they did, what they succeeded in, what difficulties they experienced, which skills they used, and which professional activities they found interesting. Career Construction Theory supports the importance of interpreting experience in the development of career identity [8, pp. 144–180].

The seventh foundation is teacher competence. Technology teachers need not function exclusively as instructors of technical operations. They also need to help students understand how classroom competencies relate to occupational activities. Evidence from vocational education demonstrates the importance of teacher technological, pedagogical, and professional competence. In the study by Sudarsono, Pratama, and Arroyo, TPACK had a significant positive relationship with students' 21st-century skills ($\beta = 0.43$, $p < 0.001$), while professional competence also had a significant positive relationship with these skills ($\beta = 0.35$, $p < 0.001$) [12, pp. 44–56].

The eighth foundation is direct contact with the world of work. UNESCO recommends involving industry and community representatives in education so that students become familiar with occupations and workplace realities; it also emphasizes the integration of work-based learning into technical and vocational education [4, pp. 49–52].

At the secondary-school level, this can be achieved through visits to enterprises, meetings with professionals, demonstrations by skilled workers, workplace simulations, short observational activities, school workshops, career projects, and cooperation with local organizations.

The ninth foundation is evidence-based career information. OECD research indicates that students require information about occupations, education pathways, qualifications, and labor-market conditions. Career guidance is more effective when information is accessible, understandable, objective, and connected with decision-making [2, pp. 83–92].

Current evidence also illustrates the scale of students' reliance on digital sources. According to OECD PISA 2022 data, 76% of students across OECD countries reported using the internet to explore possible careers, while 66% used it to research post-secondary programmes. By contrast, only 45% had visited a workplace or undertaken job shadowing, and 35% had attended a job fair or completed an internship by age 15 [5].

This difference is pedagogically important. Students increasingly obtain occupational information online, but technology lessons can provide a complementary form of learning: direct practical experience. The combination of digital information and practical experience can provide a stronger basis for occupational self-assessment than either source alone.

Analysis and Discussion

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IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

The evidence indicates that labor education and career education should be understood as interconnected components of technological education rather than as separate educational tasks.

Traditional labor education often emphasized discipline, practical skills, responsibility, and respect for productive work. Contemporary technology education must retain these functions while incorporating technological literacy, creativity, project management, digital competencies, problem-solving, and career awareness. The Uzbek state standard already establishes this connection by combining practical technological competencies with preparation for conscious occupational choice [1, §18].

The pedagogical value of technology lessons lies partly in their ability to provide immediate feedback. In academic subjects, students may sometimes have difficulty seeing how knowledge relates to future professional tasks. In technology lessons, however, the result of an activity can often be observed directly. A poorly designed construction may fail; an inaccurately measured component may not fit; an inefficient technological sequence may increase production time; an improperly selected material may reduce product quality. These situations provide natural contexts for learning responsibility and quality control.

Such learning also supports self-efficacy. Social Cognitive Career Theory proposes that self-efficacy and expected outcomes influence career interests and choices [7, pp. 79–122]. Practical success can therefore contribute to students' perceptions of their own competence. Conversely, unsuccessful tasks can become educationally valuable when teachers use them for diagnosis, reflection, revision, and improvement rather than treating failure simply as a negative outcome.

The role of the teacher is therefore critical. The teacher should design activities in which students have opportunities to make decisions rather than merely reproduce predetermined actions. A task such as "make this object according to the teacher's model" provides fewer opportunities for career-related exploration than a task such as "design and produce a functional object for a specified user." The second task requires students to identify needs, generate alternatives, select materials, plan operations, test the product, and defend their decisions.

Project-based learning can strengthen this process. Recent research on vocational education reports positive associations between project-based learning and employability-related outcomes [11]. However, project-based learning should not be treated as effective merely because it is called a "project." Its educational value depends on the authenticity of the task, student participation in decision-making, teacher guidance, assessment criteria, reflection, and connection with meaningful competencies.

The same principle applies to STEAM education. Interdisciplinary integration becomes pedagogically meaningful when students must use knowledge from several fields to solve a concrete problem. Technology lessons can provide a practical platform for such integration because technological production inherently combines scientific, mathematical, engineering, design, and social considerations. Recent Uzbek research also identifies project-based collaboration and STEAM as promising approaches for career awareness and professional self-determination [10, pp. 58–66].

Another important issue is the relationship between school education and labor-market needs. OECD research on vocational education stresses that educational provision should respond to labor-market demand while also taking students' informed preferences into account [3, pp. 16–18, 56–62].

This principle should not be interpreted as requiring schools to train students narrowly for specific current vacancies. Labor markets change, and occupation-specific skills can become obsolete. OECD evidence emphasizes the importance of transferable skills such as

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communication, teamwork, flexibility, literacy, numeracy, and the capacity to learn new skills [3, pp. 60–62].

Therefore, labor education in technology lessons should combine specific technical skills with transferable competencies. Students should learn not only how to use a particular tool but also how to select an appropriate tool, analyze a task, work safely, communicate with others, organize time, evaluate quality, and adapt to a new technological requirement.

The role of career guidance must also be reconsidered. OECD research found that school career guidance is most useful when it is regular, connected with the curriculum, supported by trained professionals, and linked with authentic contact with employers and the world of work [5, pp. 69–70, 100–102].

This suggests a model in which the technology teacher, school psychologist, career specialist, parents, and external professionals cooperate. The technology teacher provides practical and technological contexts; the career specialist provides occupational and educational information; professionals introduce students to authentic occupational experiences; and parents support informed decisions.

A particularly important pedagogical principle is equality of opportunity. OECD evidence shows that access to career-related activities is not always equally distributed among students and can be influenced by social background [5, pp. 100–102]. Therefore, schools have an important compensatory function. Technology lessons can provide a relatively accessible environment in which students from different backgrounds encounter practical tasks, tools, technologies, and occupational information.

The findings of recent vocational education research reinforce the importance of teacher competence. Sudarsono and colleagues found that teacher competence contributed to career interest primarily through students' development of 21st-century skills rather than through a simple direct relationship [12, pp. 44–56]. This finding is particularly relevant for technology teachers because professional preparation should include not only technical subject knowledge but also technology-integrated pedagogy, project design, assessment, career guidance principles, and communication with professional communities.

The pedagogical model emerging from the analysis can therefore be represented as a sequence:

practical task → technological knowledge → independent activity → reflection → occupational awareness → self-assessment → career decision-making.

The sequence should remain flexible rather than mechanical. Not every technology lesson must produce a career decision. The purpose is to create a cumulative educational environment in which repeated practical experiences gradually contribute to students' understanding of work, occupations, competencies, and personal capabilities.

Recent research in Uzbekistan specifically emphasizes the role of technology lessons in introducing primary-school students to the world of work and strengthening connections between schools and surrounding industries and agriculture [9, pp. 68–71]. This is consistent with the broader international principle that career development should begin before students reach the point of making immediate occupational decisions.

Thus, labor education should be viewed as a long-term developmental process. At younger ages, the emphasis may be on curiosity, respect for work, basic practical skills, and exploration of different forms of activity. At later stages, students can increasingly analyze occupations, qualifications, technological processes, labor-market information, and personal career preferences.

Conclusion

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IF: 14.91 | 2026 http://waerasia.org/index.php/ijtar

The analysis demonstrates that technology lessons possess substantial pedagogical potential for integrating labor education and career education in general secondary schools. This potential is supported by the Uzbek state educational standard, UNESCO recommendations, OECD research, career-development theories, and recent empirical studies.

The principal pedagogical foundations include the integration of theory and practice, systematic career orientation, authentic practical tasks, project-based learning, STEAM integration, reflection, teacher competence, contact with the world of work, reliable career information, and equal access to career-development opportunities.

The Uzbek educational standard already provides a normative basis for this integration by connecting technology education with independent practical activity, technological competence, creative thinking, product evaluation, and conscious occupational choice [1, §18]. International evidence strengthens this approach by demonstrating the importance of curriculum-embedded career education and meaningful exposure to workplaces and professionals [2; 4; 5].

The available statistical evidence also indicates a substantial difference between students' use of digital career information and their participation in direct workplace-related activities. While 76% of OECD students reported using the internet to explore careers in PISA 2022, only 45% had visited a workplace or job-shadowed and 35% had completed an internship by age 15 [5]. This suggests that schools should not rely exclusively on digital career information. Technology education can provide an important practical complement.

Project-based and work-oriented approaches are particularly promising because they allow students to experience elements of professional activity while remaining within an educational environment. Empirical findings among vocational students demonstrate positive relationships between project-based learning, field-work readiness, employability, self-confidence, and career adaptability [11]. At the same time, research on teacher competence indicates that the development of transferable 21st-century skills can serve as an important pathway connecting teaching quality with students' career interests [12].

Consequently, the effectiveness of labor and career education in technology lessons depends not simply on increasing the number of practical exercises but on their pedagogical design. Activities should enable students to plan, create, solve problems, evaluate results, communicate, reflect, and relate their experiences to possible professional pathways.

A technology lesson should therefore be understood not merely as a lesson about making things, but as an educational environment in which students learn how work is organized, how technological problems are solved, how quality is evaluated, how professional responsibility is exercised, and how personal abilities can be connected with future occupations.

The systematic implementation of these principles can strengthen students' technological competence, positive attitude toward labor, professional awareness, self-efficacy, career adaptability, and readiness for further education and future employment.

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