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Enhancing Students' Skills in Multi-Domains Using Specialized Learning Platforms: A Systematic Literature Review of Empirical Research

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Abstract

Recently, specialized learning platforms were created with intended functionality and material for online education to enhance learning outcomes. Recent empirical studies that present specialized learning platforms try to demonstrate the effects of specialized learning platforms in enhancing varied learning skills. This study aimed to analyze the impacts of specialized learning platforms on improving skills-based learning for students in various domains. A systematic literature review method was used in this study. The papers screened were retrieved from multiple databases in this review, published between 2014 and 2024. The study included and analyzed 14 empirical studies. The findings of the reviews indicate that the most common specialized learning platforms in education positively impact the improvement of skills, especially related to technical skills across various domains, such as enhancing students' computational thinking skills, problem-solving skills, practical radiological skills, English writing skills, scientific writing skills, traffic skills (such as riding skills), surgical practical skills, radiology imaging interpretation skills, and nursing skills. Therefore, one of the proposals is to use specialized learning platforms in an academic setting to assist target students in developing multi-domain skills in schools and universities.

Keywords: Specialized Learning Platforms, Skills-Based Learning, Enhancing Students' Skills, Systematic Literature Review, Instructional Technology.

1. Introduction

Generally, the use of online educational platforms in schools and universities has increased recently due to their effective role in improving students' learning outcomes. These platforms employ a variety of technologies, such as gamification, virtual reality, cloud computing, 3D modeling, and artificial intelligence. As a result, it offers several benefits to students' learning processes, such as increased levels of information understanding, self-learning and evaluation, ongoing learning, and flexible scheduling and location.

Skill-based learning is a key requirement for preparing and qualifying students for the labor market, especially in higher education. Skill-based learning here means the acquisition of knowledge through practice and application (Williams, 2024). Skill-based learning is of great importance in education in terms of supporting the learner's positive participation in the learning process and engagement, promoting critical thinking and problem-solving abilities, focusing on equipping the learner with skills that are directly applicable in the workplace, and increasing the learner's confidence (Rusconi, 2025).

This study exemplifies the potential of specialized learning platforms in revolutionizing education through enhanced learning skills. In this research, specialized learning platforms mean web-based learning systems that offer specialized functionalities and learning material relating to one or a set of similar fields for normal students or a particular learner type, such as gifted students,

visually impaired students, or hearing-impaired students. Compared to conventional e-learning platforms now in use, including Moodle, Blackboard, Schoology, etc., the specialized learning platforms that have been built offer unique capabilities appropriate for students in a certain domain or a group of students in matching domains. The general design of existing e-learning platforms did not include specialized tools related to specific domains because they were made for students in all domains, not just one or a group of students in similar domains. In contrast, specialized learning platforms have new features and functional tools that are targeted at particular domains and student categories, such as deaf students, talented students, and visually impaired students, to facilitate learning.

Recent studies focused on testing the impact of specialized learning platforms on improving skills across multiple domains for specific target students. Examples include the virtual microscopy system as an assisted teaching platform in histology related to promoting active learning and problem-solving skills of medical undergraduate students (Tian et al., 2014); the reading practice platform (Readvise) for undergraduate students who study English as a second language in developing self-regulated reading skills (Akopyan & Saks, 2022); the virtual lab platform for programming skills of undergraduate students (Maulana et al., 2024); and a web-based telehealth training platform to improve second-year undergraduate medical students' clinical communication skills (Liu et al., 2016). However, there is a lack of literature reviews that focus on investigating the impact of interventions in different areas of specialized

learning platforms on promoting skills in an all-encompassing and methodical way.

This study aimed to analyze and identify the impact of specialized learning platforms on improving skills for students in various fields and educational levels. The study adopted systematic literature review methods to evaluate the effectiveness of implementing specialized learning platforms in enhancing skills for students. Therefore, this study focused on two research questions, as follows: RQ1: What domains of specialized learning platforms were the previous studies conducted in? RQ2: What is the impact of the use of specialized learning platforms on enhancing skills for students in various domains in literature?

2. The significance of a study

Numerous educational and research aspects would benefit from this study. Educational institutions may use the findings of this study to their advantage and offer alternatives and solutions, such as the use of specialized learning platforms, to overcome the weak learning outcomes of practical skills. Also, drawing the attention of educational designers towards developing and using specialized learning platforms to improve various academic skills in any field. Additionally, to stimulate the interest of researchers in conducting further research related to the design, development, and use of new specialized learning platforms to improve students' skills related to various domains and skills related to teachers' professional development. Moreover, conduct further research on evaluating the effectiveness of using specialized learning platforms in developing various skills among

postgraduate students and instructors. Lastly, directing attention to conducting more applied research on the effectiveness of using specialized learning platforms in developing various skills among student groups with disabilities, such as students with hearing, visual, and mental disabilities.

3. Skills-Based Learning and Specialized Learning Platforms

3.1 Classification of Specialized Learning Platforms

As follows are the two categories into which particular learning platforms were divided: specialized learning platforms based on a particular field: One topic or a collection of related domains, like the medical domain (Aqib et al., 2024), the programming domain (Poolsawas & Niranatlamphong, 2017), and the English language domain (Jehma & Akaraphattanawong, 2023), were covered by the specialized learning platform's features and content. Another kind is specialized learning platforms based on specific characteristics of target students: This category included features and content tailored to the characteristics of particular learners, including deaf students (Ahmed & Hasegawa, 2022), visually impaired students (Maćkowski et al., 2020), and regular learners in certain fields (Lee et al., 2019).

3.2 Pros of Using Specialized Learning Platforms to Promote Skills-Based Learning

Considering the current study, several advantages of specialized learning platforms were concluded:

1. Overcoming constraints of practicality in terms of a lack of hardware, equipment, and software, which contributes to raising the efficiency of learning the required skills in schools and universities.
2. Supporting lifelong learning by providing students with continuous training in the required skills through platforms after graduation, helping them become more qualified for the job market.
3. Contributing to mastering the required learning skills by providing students with repetition at no economic cost to educational institutions and achieving educational goals with high quality.
4. Contributing to supporting the learning of skills for students with special needs, such as students with hearing, visual, or mental disabilities.
5. Providing support for technical education by developing specialized simulation platforms for the skills required in the fields of industry and agriculture.
6. Provides students with precision in implementing the required skills by displaying all visible and hidden details, which contributes to increasing students' understanding.

4. Method

In this study, the primary goal is to examine and evaluate the impact of specialized learning platforms on improving students' skills in multiple domains in recent literature. A systematic literature review (SLR) approach was employed in this

study to address certain research questions. RQ1: What domains of specialized learning platforms were the previous studies conducted in? RQ2: What is the impact of the use of specialized learning platforms on enhancing skills for students in various domains in literature? A systematic literature review is an identification, evaluation, and interpretation of all available research relevant to a particular research question, topic area, or phenomenon of interest (Kitchenham & Charters, 2007). The primary eligibility criterion used to choose the papers for the review was how well they addressed the stated research questions. The selection standards are displayed in Table 1. As a result, the review study selection method was divided into many stages based on the PRISMA flow article identification, screening, checking for eligibility, and final rigorous full text analysis (refer to Figure 1). Also, a deductive thematic analysis approach was used to analyze the results of selected studies. The coding of the analysis of each study's results included three categories (positive impact, neutral impact, and negative impact).

Table 1. Inclusion and exclusion selection criteria

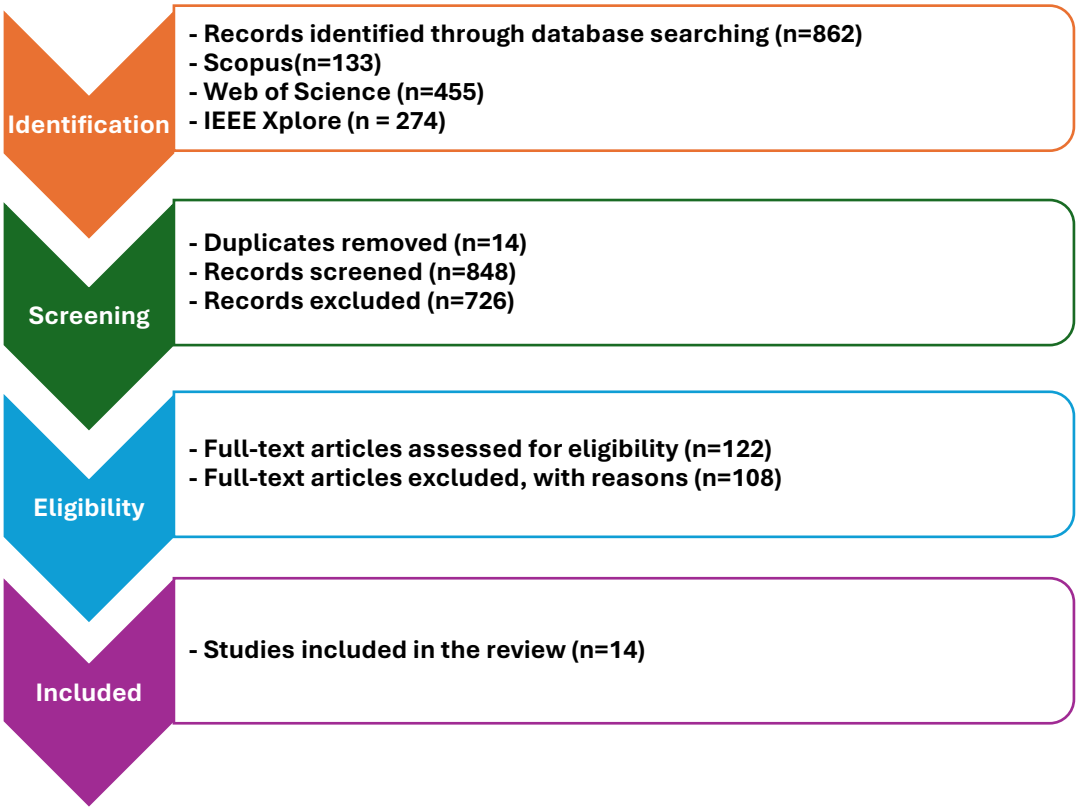
Inclusion Criteria	**Exclusion Criteria**
Empirical Studies published in the English language.	Studies that do not focus on developing skills in students or learners.
Empirical studies containing terms related to the topic in the title.	Studies not published in English Papers.
	Studies for which the full paper is not available.
Empirical studies were published between 2014 and 2024.	Studies that are not relevant to test the impact of the development/use of a specialized learning platform.

Empirical studies that focus on testing the impact of using a specialized learning platform for enhancing specific skills for students across fields.	Theoretical studies on the development/uses of a customized platform.
	Theoretical studies that address systematic literature review studies, meta-analysis, cross-sectional studies, and surveys.
Empirical studies that are published in reputable peer-reviewed journals.	Studies published outside of 2014–2024.
Empirical studies included the implementation of practical experiments of specialized learning platforms on promoting skills for students in the academic context.	Duplicate articles were excluded.
	Studies that addressed or used conventional e-learning platforms such as Blackboard, Moodle, Google Classroom, Schoology, Edmodo, and MS Teams.

Figure 1. Prisma analysis stages flow

Identification

To conduct the literature search, research papers were chosen from the following electronic databases and libraries: IEEE Xplore, Web of Science, and Scopus. The included studies were defined using the following standards: With an emphasis on specialized learning platforms used in learning and educational environments, journal articles solely



address the effects of specialized learning platforms on improving skills across a range of students and disciplines. The literature was chosen

using the database and keywords listed in Table 2.

Table 2. Database and search criteria

Database	Search Keywords	Publication Year	Publication Type
Scopus	"Specialized learning platform" OR "development platform" OR "virtual learning platform" OR "learning platform" OR "web-based platform" OR "virtual lab platform" OR "platform" AND "skills" AND "Students" OR "students" AND "empirical study" OR "Quasi-experimental"	2014-2024	Journal articles
Web Of Science	"Specialized learning platform" OR "Learning platform" OR "Web-based platform" "Virtual lab platform" AND "Skills" AND "Students" AND "Empirical study"		
IEEE Xplore			

In the identification stage, 862 initial articles were found using the previously given search criteria. Figure 1: PRISMA flow diagram-based illustration of the article selection procedure.

Screening

This stage involved eliminating 14 duplicate articles. Next, the titles and abstracts were screened for

848 studies to see if they satisfied the review criteria listed in Table 1. The criteria for exclusion selection were used. 726 studies were also eliminated using exclusion criteria, leaving 122 articles.

Eligibility

In this stage, the eligibility of journal articles was evaluated. We checked the titles, abstracts, full contents, and conclusions to make sure they satisfied Table 1's inclusion requirements. In this phase, 108 journal articles were eliminated based on the exclusion criteria.

Inclusion

Finally, a total of 14 journal articles were selected. In this review, we focused on the analysis of three main topics: specialized learning platform domain, target learning skills acquired, and study results analysis according to coding categories (positive impact, neutral impact, negative impact) as a deductive thematic analysis.

5. Results and Discussion

The results of several pertinent publications that were recovered using the PRISMA process, one of the data analysis techniques for articles that were successfully retrieved from scientific publication databases, including IEEE Xplore, Web of Science, and Scopus. Only 14 journal articles were found to meet the targeted search criteria out of the total number of papers reviewed. The analysis of each article is presented in Table 3.

Table 3. Data analysis of selected articles

No	Author, Title	Specialized Learning Platform Domain	Target Learning Skills Acquired	Target Students	Study Results Analysis (Positive, Neutral, Negative)
1	Ahmed and Hasegawa (2019), The effects of a new virtual learning platform on improving student skills in designing and producing online virtual laboratories	Instructional Technology	Skills in designing and producing online virtual laboratories	Fourth-grade undergraduate students majoring in instructional technology	Positive
2	Ahmed and Hasegawa (2024), The Impact of a New Specialized Learning Platform on Enhancing Students' Skills in Designing and Producing Online Educational Talking Books	Instructional Technology	Skills of Designing and Producing Online Educational Talking Books	Third-grade undergraduate students majoring in instructional technology	Positive

3	Cheng et al. (2023), Enhancing student's computational thinking skills with student-generated questions strategy in a game-based learning platform.	Programming	Computational thinking skills	Primary school students	Positive
4	Chuang et al. (2015), Development of a situated spectrum analyzer learning platform for enhancing student technical skills.	Spectrum Analyzer	Problem-solving skills	University sophomore students	Positive
5	Henkel and Belfi (2024) Utilizing Learning Analytics in Radiology: A Pilot Study of an e-Learning Platform in	Medical (Radiology education)	Practical radiological skills	Second-year undergraduate medical students	Positive

	Medical Student Education.				
6	Jha et al. (2024), Investigating the effect of multiple try-feedback on students computational thinking skills through online inquiry-based learning platform.	Computational Thinking	Computational thinking skills	High school students	Positive
7	Peungcharoenkun and Waluyo (2023), Implementing process-genre approach, feedback, and technology in L2 writing in higher education.	English language	Writing skills	Freshmen undergraduate students from the veterinary college	Positive
8	Lin et al. (2022), Explorations of two approaches to learning CT in a game environment for elementary school students.	Programming	Computational thinking (CT) skills	Elementary school students	Positive

9	Núñez-Pacheco et al. (2023), Use of a Gamified Platform to Improve Scientific Writing in Engineering Students.	Writing and Communication	Scientific writing skills	Second-year undergraduate students at the Professional School of Civil Engineering	Positive
10	Ebner et al. (2018), Tutoring writing spelling skills within a web-based platform for children.	German Language	Spelling skills by writing and publishing texts in a blog	Grade 3, 4, 5, and 6 primary school pupils	Positive
11	Le et al. (2024), Investigating the immediate and mid-term effect of a gamified e-learning platform for the enhancement of traffic knowledge and skills among Vietnamese adolescents operating	Traffic Safety	Traffic skills, such (riding skills)	Grade 10, 11, and 12 high school students	Positive

	powered two-wheelers.				
12	Zhang et al. (2024), Investigating the impact of virtual simulation experiment and massive open online course (MOOC) on medical students' wound debridement training: a quasi-experimental study.	Medical	Surgical practical skills	Third-year undergraduate clinical medicine students	Positive
13	Pierre et al. (2024), Enhancing radiology education with a case-based intro to radiology on the UF WIDI e-learning platform.	Medical	Radiology imaging interpretation skills	Undergraduate medical students, undergraduate physician assistant students, and postgraduate PhD students	Positive
14	Zaragoza-García et al. (2021), Virtual simulation for	Nursing	Nursing Skills	Final year undergraduate nursing students	Positive

last-year nursing graduate students in times of Covid-19: a quasi-experimental study.	

5.1. What domains of specialized learning platforms were previous studies conducted in? (RQ1)

As indicated in Table 3, the domains of the studies that were part of the review were examined to answer this research question. Table 4 shows that the domains of specialized learning platforms analyzed in the 14 chosen studies were spread throughout 10 domains at various educational levels. Despite this, three of the fourteen examined publications offered specialized learning platforms associated with medical fields, including radiology, clinical, and surgery. Additionally, specialized learning platforms that were centered on the instructional technology domain were offered in two of the fourteen examined studies. Additionally, two of the fourteen evaluated publications presented specialized learning platforms with a programming focus. The seven remaining examined publications presented specialized learning platforms in various fields, such as nursing, traffic safety, spectrum analyzer, computational thinking, writing and communication, English language, and German language. This diversity of specialized learning platform domains indicates that the specialized learning platforms are considered an acceptable instructional technology solution for

promoting practical skills to students in multiple domains across educational levels of the learning process.

Table 4. Classification of the number of reviewed papers based on specialized learning platform domains.

Domain name	Instructional Technology	Medical	Programming	Writing and Communication	Computational Thinking	Nursing	Spectrum Analyzer	Traffic Safety	English Language	German Language
Number of papers	2	3	2	1	1	1	1	1	1	1

5.2. What is the impact of the use of specialized learning platforms on enhancing skills for students in various domains in literature? (RQ2)

To respond to this research question, the results of the included studies in the review were organized and categorized based on a deductive thematic analysis approach (positive impact, negative impact, neutral impact). As shown in Table 3, all the selected studies confirmed that the specialized learning platforms had a favorable influence on enhancing students' skills, especially related to technical skills in various domains. The skills that were improved by specialized learning platforms varied, including skills of designing and producing online virtual laboratories and online educational talking books, computational thinking skills, problem-solving skills, practical radiological skills, English writing skills, scientific writing skills, German spelling skills by writing and publishing texts in a blog, traffic skills (such as riding skills),

surgical practical skills, radiology imaging interpretation skills, and nursing skills.

The review results illustrated that the specialized learning platforms, as a digital learning tool, have the potential to promote the required skills of students in educational institutions. Because of its many characteristics, including specialized features connected to direct skills, this potential has given rise to inventive tools for practicing the design and production of online virtual labs (Ahmed and Hasegawa, 2019). And presented an intelligent dictionary tool for German writing spelling skills was presented by Ebner et al. (2018). Additionally, several investigations (Zaragoza-García et al., 2021; Zhang et al., 2024) provided virtual simulations associated with skills. Additionally, gamification was associated with skills like (Cheng et al., 2023; Núñez-Pacheco et al., 2023; Le et al., 2024; Lin et al., 2022). Furthermore, specialized learning platforms also provide a wide range of very helpful learning opportunities.

5.3. Implications for Educational Practice and Future Research

For educational practice implications, the favorable results of the studies included in this review demonstrate the value of specialized learning platforms as a practical tool for enhancing students' skills, especially technical skills in varied domains. Thus, it can offer some recommendations for educational practice. First, they suggest that educators in schools and universities consider integrating the specialized learning platforms into their teaching practice, especially for promoting diverse technical skills. Second, the

findings from this review offer significant practical insights for instructional designers and developers to inspire and construct new specialized learning platforms for improving other technical skills in diverse domains for learners. Last, integrating how to design and develop specialized learning platforms into academic programs of the instructional technology departments should be considered to ensure the quality qualification of graduates for future education.

For future research implications, further research is needed to explore the effects of specialized learning platform interventions on enhancing the skills of students with disorders and disabilities such as dyslexia, autism, mental retardation, and deafness. This will allow researchers to conduct a meta-analysis to further examine the impact of specialized learning platform interventions on multiple other groups of students. Exploring the impact of teaching methods such as blended learning and eLearning, with specialized learning platform interventions on enhancing students' skills, would be beneficial for instructors and educational practitioners in selecting the best educational context for using specialized learning platforms to enhance target skills. Similarly, exploring the time framework of specialized learning platform interventions on enhancing students' skills can be investigated to determine the optimal period for mastering the target skills.

5.4. Systematic Review Limitations

There are some limitations of this systematic review as follows:

1. The Web of Science, IEEE Xplore, and Scopus databases are the only ones included in the

current review. Other databases could include relevant data. This might influence the review findings. Thus, due to the existing number of review papers, there may be a limited generalization of the study's findings.

2. The current review is limited to English-language systematic reviews; it might not contain papers that have not been published in English. The quality of the review findings may be impacted by this exclusion.
3. Since some of the evaluated studies lack sufficient empirical evidence, it might be difficult to determine the actual effects of certain specialized learning platforms on enhancing skill-based learning.
4. The search strategy keywords that were used may have missed some articles involving specialized learning platforms or skills.

6. Conclusion

In this review, we examined recently published research on the impact that specialized learning platforms may have on helping students improve their skills across a range of domains. A total of 14 empirical research studies were selected and analyzed. According to the results of this research, many studies have shown that the implementation of specialized learning platforms has a predominantly positive impact on promoting student skills, especially related to technical skills, including skills of designing and producing online virtual laboratories and online educational talking books, computational thinking skills, problem-solving skills, practical radiological

skills, English writing skills, scientific writing skills, German spelling skills by writing and publishing texts in a blog, traffic skills (such as riding skills), surgical practical skills, radiology imaging interpretation skills, and nursing skills. In addition, specialized learning platforms covered multiple domains of science across educational levels.

The results of this study will provide valuable practical insights for educators to integrate specialized learning platforms into their teaching process, particularly for enhancing diverse technical skills across multiple fields. Thus, it offers a solution to address the weak practical skills outcomes of students in educational institutions. This study also inspires educational designers and developers to create new specialized learning platforms to help learners improve other technical skills across diverse fields. In the future, explore development and use specialized learning platforms in varied educational settings and contexts, such as testing the impact of the specialized learning platform on enhancing learning skills in new and different areas, such as engineering, biology, and botany. Besides, exploring its impact on improving skills in different disability students, such as mentally retarded, visually impaired, and deaf students. Additionally, examine how specialized learning platforms might improve long-term skill retention across a diverse range of students and disciplines. As a result, it could offer an optimal vision of using specialized learning platforms in educational institutions to master the required skills among students.

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