



# THE COMPETENCY FOCUS APPLIED TO FORMATION IN SCIENTIFIC RESEARCH

## EL ENFOQUE DE COMPETENCIAS APLICADO A LA FORMACIÓN EN INVESTIGACIÓN CIENTÍFICA

<https://doi.org/10.21555/rpp.vi37.2852>

**Yolvy Javier Quintero Cordero**

Universidad Tecnológica Israel,  
Ecuador

yquintero@uisrael.edu.ec

orcid.org/0000-0002-5773-2574

**Norma Molina Prendes**

Universidad Tecnológica Israel,  
Ecuador

nmolina@uisrael.edu.ec

orcid.org/0000-0002-9589-3723

**Mayra Alejandra Bustillos Peña**

Universidad Tecnológica Israel,  
Ecuador

mbustillos@uisrael.edu.ec

orcid.org/0000-0003-4038-4726

**Betty Pastora Alejo**

Universidad Tecnológica Israel,  
Ecuador

bpastora@uisrael.edu.ec

orcid.org/0000-0002-9837-3264

Recibido: junio 13, 2023 – Aceptado: agosto 3, 2023

### Resumen

This study aims to carry out a comprehensive analysis of the competency approach in the field of scientific research. To this end, a meticulous exploration was conducted in the Scopus database, using specific keywords to identify articles published in the period 2013-2023. After ensuring that the selected works met the previously established inclusion criteria, a peer review was carried out, resulting in a total of 28 articles. In the analysis of these documents, it was observed that most of the research training programs mentioned were aimed at teachers without formal research roles in middle-level managerial positions. In general, the reviewed literature indicated a major focus on teacher training. This study reveals that research training programs tend to focus on the “knowing” and “doing” competencies, relegating those of “being”. This pattern points to a possible gap in the holistic formation of researchers, suggesting an opportunity for improvement in future professional development programs.

*Palabras clave:* Competency Approach, Scientific Research, Education.

## Resumen

Este estudio propone un análisis exhaustivo del enfoque de competencias en el ámbito de la investigación científica. Para tal fin, se realizó una exploración minuciosa en la base de datos Scopus, utilizando palabras clave específicas para identificar artículos publicados en el periodo 2013-2023. Tras asegurar que los trabajos seleccionados cumplieran con los criterios de inclusión previamente establecidos, se procedió a una evaluación por pares, resultando en un total de 28 artículos. En el análisis de estos documentos, se observó que la mayoría de los programas de formación investigativa mencionados, estaban destinados a docentes sin funciones formales de investigación en posiciones gerenciales de nivel intermedio. En general, la literatura revisada indicó un enfoque mayoritario hacia la formación de profesores. Este estudio revela que los programas de capacitación en investigación tienden a centrarse en las competencias de «saber» y «hacer», relegando las del «ser». Este patrón señala una posible brecha en la formación integral de los investigadores, sugiriendo una oportunidad de mejora en futuros programas de desarrollo profesional.

*Palabras clave:* enfoque de competencias, investigación científica, educación.

## INTRODUCTION

Competency-based models – also known as competency-based approaches – represent a descriptive and analytical tool whose primary objective is to identify the skills and competencies required in an organization for its optimal functioning (Shet et al., 2019). These models play a fundamental role in the articulation between education, vocational training, and specific demands of the labor market, thus facilitating the mobility and adaptability of individuals, particularly those workers who find themselves in situations of job instability or precariousness (M'mboga Akala, 2021; Tran & Nyland, 2013).

Competency-based approaches emerged in the second half of the 20th century, primarily in the United States and the United Kingdom, with orientations focused respectively on the individual and the organization. Recently, these models have gained significant relevance, providing a framework for aligning the changing and increasingly specialized demands of the labor market with education and vocational training programs. Through a thorough and detailed analysis of the existing literature, four essential milestones in the development of competency-based approaches have been identified.

The first was cemented by the pioneering work of Defillippi and Arthur (1994), who proposed the competency-based model in the individual context, postulating that personal skills and competencies are decisive in individuals' performance and success in the workplace. On the other hand, Jaeger and Eagan (2007) questioned the effectiveness of conventional intelligence and ability tests, arguing that they only reliably predict academic success but do not consider a broader range of key life events and outcomes. Consequently, correlations and causalities based on these metrics are inevitably subject to a series of sociocultural biases, which can distort or limit their applicability and validity in broader and more diverse contexts.

Looking at a broader context, Atkins et al. (2020) suggested looking at successful and less successful workers to identify differences between the two groups. In this way, it was recog-

nized that traditional intelligence and ability tests cannot predict a person's level of success and/or efficiency throughout their career. Success, according to this approach, should be measured in a broader context by directly comparing successful workers with less successful ones.

The second milestone of transcendental importance in the evolution of competency-based approaches emerged approximately a decade later, when an empirical investigation was undertaken to examine and validate the theoretical propositions postulated by Norman et al. (2014). This scientific study constituted a collaborative effort to decipher and unravel the intrinsic qualities that lead to the success of managers in diverse organizations and corporate strata.

Within the framework of this research, a broad spectrum of managers was evaluated, covering different hierarchical levels and organizations of varied characteristics, to identify those attributes or skills that potentially determine their success in the corporate world (Berssaneti & Carvalho, 2015). This scientific study constituted a collaborative effort to decipher and unravel the intrinsic qualities that lead to the success of managers in various organizations and corporate strata.

The fundamental assumption of this research was that the individual characteristics and skills of managers—in terms of their competence and ability to lead—significantly and decisively influence the performance and overall success of the organization they lead. In this sense, the study sought not only to identify these competencies but also to quantify and qualify their impact on organizational outcomes, thus contributing a valuable body of empirical knowledge to the growing field of competency-based approaches.

The third important milestone lies in the recognition of the relevance of competencies from an organizational perspective. It is evident that both Jacobs (2019) and Osagie et al. (2016) focused their analysis on the individual and their competencies. However, Bogers et al. (2017) shifted the focus to the organizational level. They introduced key competencies, including the ability to coordinate diverse production skills and integrate multiple streams of technologies across organizational boundaries.

Based on the above, according to Ljungquist (2013), an organization's core competencies must a) provide potential access to a wide variety of markets; b) add value to the customer; and c) be difficult for competitors to imitate. His study parallels that of Baruch (2006), who compared successful and less successful individuals; however, this time, the object of analysis was two similar organizations that took different paths. Holtzman's (2014) results indicate that organizations that invest little in core competencies limit innovation, while those that structure their businesses around a set of core competencies tend to be more successful.

The latest milestone in the development of competency-based approaches arises from the integration of individual and organizational contexts under a single perspective. Wongnaa and Boachie (2018) present a contemporary competency-based model, in which they differentiate four determinants of successful job performance: potential competence, skills, context, and outcome.

Potential competence includes the individual characteristics necessary to achieve certain results, encompassing both the dispositional potential (traits, motives, values) as well as other achievements (knowledge, skills, qualifications, and experience). Skills refer to a set of desired behaviors, defined by the outcomes that are intended to be achieved with those behaviors.

The distinction between these two concepts stems from a third element, context, which refers to the organizational characteristics and social relationships within organizations that deter-

mine desired behaviors and outcomes. Finally, a final set of variables focuses on the desired outcomes toward which individual behavior is oriented.

An illustrative example of this holistic, competency-based modeling approach is the work of Hecklau et al. (2016), who focus on the role of contemporary human resource management. Their approach consists of three essential stages: identification of emerging challenges (categorized into political, economic, social, technical, environmental, and legal factors); deduction of the competencies needed to address these challenges (grouped into technical, methodological, social, and personal); and, finally, visualization of the levels of development of the required competencies.

On the other hand, since 2000, competency-based human resource management has been widely integrated into selection, retention, and compensation processes. According to Gunawan et al. (2019), several factors explain the growing adoption of this approach. These include the transition from a traditional, supply-oriented approach to a more demand-driven approach in the education system; the increase in adaptive training; non-formal learning and work-based learning; and a greater inclination toward learning outcomes, as opposed to results based on time spent in education (Škrinjarić, 2022). This last aspect provides “stepping stones” for those who have had limited educational opportunities but have developed the required competencies.

These considerations underlie the objective of this article, which is to conduct a systematic review of the competency-based approach applied to training in scientific research. To this end, articles from the past ten years were examined in the Scopus database.

## METHODOLOGY

### a) Literature search

A systematic and thorough search was conducted for relevant studies, written in Spanish and English, published between 2013 and February 2023, using the electronic database Scopus as the primary information resource. Initially, articles were identified through keyword searches in the text, using terms such as “competency approach” and “research training.”

Subsequently, a comprehensive search strategy was designed and applied, incorporating a series of terms closely related to the competency-based approach in research. These terms included competencies, skills, and competency models; combined with research or research practice and, in turn, linked to training, capacity building, and updating. This search methodology resulted in 596 unique and relevant articles.

In addition, four additional articles were identified through other complementary sources of information, making up a total corpus of 600 academic and scientific articles. This set of studies provides a solid and extensive basis for the analysis and synthesis of current knowledge surrounding the competency approach in the fields of research and training, thus facilitating a deeper and more nuanced understanding of the trends, challenges, and opportunities emerging in this constantly evolving field.

## b) Eligibility criteria

For inclusion, all peer-reviewed articles were considered that:

- 1) detail a course, program, or curriculum designed to provide training in scientific research, under the competency approach;
- 2) describe the pedagogical strategies used to achieve this objective, in the context of higher education, or
- 3) present the results of the evaluation corresponding to the aforementioned course, program, or curriculum.

## c) Article review process

The research team conducted an independent review of all available titles and abstracts. Of the total of 600 articles, 527 were discarded due to their lack of relevance, including works focused exclusively on primary education or those describing programs aimed at developing competencies other than research, such as quality improvement (when necessary, the full text of the article was consulted). Seventy-three articles were found that described research training courses or programs, of which the full texts of 71 were obtained. The researchers reviewed these articles to determine their eligibility; 43 that did not report the evaluation results were excluded, resulting in a final sample of 28 studies.

The article selection process was followed by independent data extraction from the 28 selected articles, using a structured data collection form with categories for setting/target group, teaching/learning method employed, educational content, assessment design, method, and outcome. Discrepancies in categorization—during the article selection and data extraction stages—were resolved through negotiated consensus.

## d) Data analysis

Curriculum descriptors were collected using the data entry form, recording whether the training was a single activity or an extended program, as well as the extent to which didactic lectures/seminars, project work, group work, simulations, and multi-source or 360-degree feedback tools were used. Research-based training may focus on personal growth, or conceptual or technical knowledge. Likewise, the aspects addressed by each program were documented. Research training programs can be evaluated using various outcome measures, which may include those achieved by individuals, groups, teams, networks, and societies.

To classify the programs, we used Kirkpatrick's four-level evaluation model. This model establishes four levels of evaluation: response (level 1), learning (level 2), performance (level 3), and outcomes (level 4). Following previous reviews of research training in the general literature, a distinction was made between subjective and objective evaluation of outcomes. Seven categories were used to classify evaluation outcomes: reaction (level 1); subjective knowledge (level 2A); objective knowledge (level 2B); subjective behavior/skill (level 3A); objective behavior/skill (level 3B); subjective system outcomes/performance (level 4A); and objective system outcomes/performance (level 4B).

## RESULTS AND DISCUSSION

### a) Environment and target group

Enhance, paraphrase, and expand with scientific writing. The studies presented a diverse range of characteristics. Of the 28 studies that met the eligibility criteria, the majority (n = 18) addressed competency-oriented research training programs, while a minority (n = 10) described multidisciplinary programs. These findings are in line with studies by Dörnyei and Muir (2019), who emphasized the importance of promoting a learning environment that encourages exploration and participation without being threatening, justifying their specific focus on teachers. The pursuit of interdisciplinary learning and improved communication and collaboration were recurring reasons for opting for a multidisciplinary competency approach.

International cooperation in research training programs has been widely recognized in the scientific literature. Hairstans and Smith (2018) emphasized the importance of establishing international collaborations as an effective strategy to foster the exchange of knowledge and experiences in research training. These authors argue that international collaboration offers opportunities to address complex challenges and promote diversity of perspectives in educational research. By working together with researchers and experts from different countries, new approaches and methodologies can be derived, and research training can be enriched.

Regarding the target audience of research training programs, the scientific literature supports the aforementioned findings. Schildkamp (2019) extensively argues for the importance of making these programs accessible to a wide range of professionals, including those who do not hold a formal research role. In her study, she highlights that research training should not be limited solely to those in formal research positions, such as academic researchers or scientists. Rather, she points out that all education professionals, regardless of their specific role, can benefit from acquiring skills and knowledge in educational research. This includes teachers, school leaders, educational consultants, and other education-related professionals.

In line with research training programs for teachers, several studies support their justification and relevance in the educational field. Evans et al. (2017) argue forcefully for the fundamental role that more experienced teachers play in promoting educational research and knowledge transfer. Collaboration between teachers with formal research roles can also generate joint research projects and the creation of strong professional networks. By working as a team, teachers can share resources, ideas, and methodological approaches, positively impacting the quality and relevance of educational research.

Regarding the length of research training programs, there is variability supported by previous studies. Teal et al. (2015) observed that short programs, such as workshops and conferences, play an important role in introducing basic concepts and developing specific skills related to educational research. These programs can provide participants with an overview of research fundamentals and in acquiring practical skills in a relatively short time.

On the other hand, extended training courses, lasting approximately 12 months, stand out for their ability to provide deeper and more sustained learning. According to Teal et al. (2015), these programs allow participants to engage in a more comprehensive training process, where they have the opportunity to acquire advanced knowledge, explore research methods in greater depth, and apply them in real-life contexts. The longer duration of these courses also facilitates the transfer of knowledge into practice, as there is more time for reflection, application, and feedback.

It is important to note that the optimal length of a research training program varies depending on several factors, such as the specific objectives of the program, the experience level of the participants, and the available resources. In some cases, programs can be designed to accommodate different lengths of time, providing flexible options that fit the needs and availability of participants.

## **b) Educational objectives and content**

The findings of the reviewed studies reveal a diversity in the areas of focus of research training programs. According to Sun and Chen (2016), more than half of the studies reviewed focused on skill development, including activities for providing feedback, team building, conducting formal research, and communicating and writing scientific research reports. This highlights the importance of strengthening the skills needed to conduct rigorous research and communicate its results effectively.

In addition, nine programs were found to have explicit objectives such as growth in research and research collaboration. These findings are consistent with the importance of promoting a culture of research and collaboration in research training programs, as highlighted by previous research (Quimbo & Sulabo, 2014).

Regarding the educational content of the programs, a wide range of topics was found, reflecting the diversity in scientific processes and research management. Archibald (2016) points out that this can lead to inconsistencies in the approaches and practices used in research training. On the other hand, Cao (2018) identified the most commonly included competencies in the curricula, such as methods management, knowledge of paradigms, data analysis, scientific writing, approach to scientific inquiry, research coherence, research communication, and instrument development. These skills are essential for conducting quality research and contributing to the advancement of scientific knowledge.

However, the variety and inconsistency in educational content highlight the need for greater coherence and standardization in competency-based training programs for scientific research. Programs must provide a solid and standardized foundation of research knowledge and skills, enabling more effective training and better preparing participants to address the challenges of scientific research in their respective areas of study.

## **b) Teaching/learning methods**

The findings of the studies reveal a variety of teaching methods used in research training programs. In 26 of the 28 articles analyzed, the teaching methods employed were specified, highlighting the importance of providing detailed information on this aspect. Of the programs that provided details on teaching methods, the majority (23 of 26) incorporated didactic lectures and interactive plenary seminars as part of their methodology. These approaches provide participants with an opportunity to acquire fundamental theoretical knowledge and engage in interactive discussions that encourage reflection and the exchange of ideas (Kaufman, 2018).

Group work was implemented in 15 programs, and this included discussions based on scientific cases, exercises, and group reflections. This approach encourages collaboration, critical discussion, and the application of theoretical concepts to practical situations, helping participants develop teamwork and problem-solving skills (Živković, 2016).

It is important to note that most programs employed two or more teaching and learning methods in their curriculum, suggesting a multifaceted approach to competency-based training. This variety of methods addresses different learning styles and provides a more comprehensive and enriching training experience.

#### **d) Design and results of the evaluation**

Approximately half of the studies analyzed relied on pre- and post-intervention designs to assess competency outcomes (baseline). This methodology is widely used in the evaluation of research training programs, as it compares competency levels before and after the intervention, providing information on the impact of such programs. Most post-intervention evaluations were conducted immediately after the program concluded, providing an immediate view of the results achieved.

This methodological approach is consistent with recommendations from previous literature, which highlights the importance of evaluating the immediate effects of research training programs on participants' competencies (Carroll & Doherty, 2003). However, it should be noted that some studies carried out evaluations over a longer period, examining long-term skills retention. These long-term evaluations are valuable because they inform the sustained effectiveness of programs and the transfer of acquired skills to practical settings.

Taken together, these findings underscore the importance of evaluating competency outcomes in research training programs. The use of pre- and post-intervention designs captures changes in participants' competencies, providing evidence of the programs' impact. Furthermore, conducting long-term evaluations provides a more complete picture of the programs' sustained impact and long-term transfer of competencies.

In terms of the data collection methods used in the studies analyzed, the use of quantitative data, such as surveys, tests, and standardized observations, was predominant. This is consistent with the findings of Crowley-Koch and Van Houten (2013), who argue that these methods provide objective and quantifiable data that accurately measure the skills acquired by participants in training programs.

However, it is worth noting that one study adopted an exclusively qualitative approach to data collection. Luna-Reyes and Andersen (2003) used qualitative methods – free text comments, oral assessment, and semi-structured interviews – to capture richer and more contextual perspectives on the research training process. This approach obtained detailed and in-depth information about participants' experiences and perceptions, thus complementing the quantitative data.

Taken together, these findings highlight the importance of considering both quantitative and qualitative approaches in the evaluation of research training programs. Quantitative data provide an objective and quantifiable view of the skills acquired, while qualitative data provide a deeper and more contextualized understanding of the training process. Combining quantitative and qualitative methods in mixed-method studies provides a richer and more comprehensive perspective on the outcomes and participants' experiences.

Regarding the assessment measures used, most studies reported on competency-based participant response scores, using four- or five-point Likert scales. These scales allow participants to rate their level of competency in different areas. In addition, some studies reported on self-assessed knowledge, while others used objective knowledge tests to measure the level

of knowledge acquired. This combination of measures provides a more comprehensive and reliable assessment of competency outcomes.

Some studies included in the analysis reported system-level outcomes reflecting the impact of research training programs on participants' scientific performance and their progress in their academic careers. These findings are consistent with research by Vlasenko et al. (2021), who argue that research training programs have a positive impact on the development of participants' scientific skills and competencies, resulting in improved quality of their scientific output and their advancement to higher scientific roles.

In addition to outcomes related to scientific performance, the studies also reported on indicators of research quality and satisfaction with scientific production and communication. These indicators are essential for evaluating the effectiveness of research training programs in generating high-quality research and promoting the effective dissemination and communication of scientific results.

One study even measured the number of publications produced as a result of the intervention, highlighting the tangible contribution of research training programs to scientific production. This result is significant, as it demonstrates the direct impact of the programs on the generation of new knowledge and its dissemination through scientific publications.

## CONCLUSIONS

In the era of globalization, employers are increasingly influenced by their perception of the skills professionals require to perform effectively in their jobs. This phenomenon suggests that the accumulation of knowledge must be constantly updated, taking into account scientific and technological advances related to their professional field. Hence, there is an imperative need for university professors to possess and develop solid research skills.

The contemporary environment promotes the generation of knowledge through research, a process enhanced by Information and Communication Technologies (ICT). ICTs have fostered a knowledge boom, generating exponential growth in information, increasing the number of devices for accessing it, and fostering innovative education methods.

Higher Education Institutions (HEIs) should focus on training in these areas, incorporating methodologies into their curricula that promote the development of research competencies in their students. This approach will allow for a smoother transition for students to the workforce, as they will be equipped with the skills required to perform in their professional roles. Furthermore, it can contribute to the development of critical thinking, collaborative work, creative thinking, and problem-solving skills. All of this will only be possible with a scientifically competent teaching staff.

Internationally, research competitions are promoted to foster teamwork and the search for truth, with a multidisciplinary approach in academia. HEIs are encouraging collaborative work in various areas of action. In many countries, research competencies among students are being strengthened through a "Learning by Doing" approach, creating an environment that values interdisciplinary collaboration, teamwork, communication, respect for others' opinions, honesty, self-control, and ethics.

However, in many other areas, collaborative scientific production is still a pending task. This panorama underscores the importance of implementing strategies that facilitate the integration of research into the teaching-learning process, as a methodology for creating spaces that foster skill development and improve competencies. In this way, the adoption of research values is manifested in students' interpretation of the real world based on the results they obtain from their research.

## REFERENCES

- Archibald, M. M. (2016). Investigator Triangulation. *Journal of Mixed Methods Research*, 10(3), 228-250. <https://doi.org/10.1177/1558689815570092>
- Atkins, K., Dougan, B. M., Dromgold-Sermen, M. S., Potter, H., Sathy, V., & Panter, A. T. (2020). «Looking at Myself in the Future»: how mentoring shapes scientific identity for STEM students from underrepresented groups. *International Journal of STEM Education*, 7(1), 42. <https://doi.org/10.1186/s40594-020-00242-3>
- Baruch, Y. (2006). Career development in organizations and beyond: Balancing traditional and contemporary viewpoints. *Human Resource Management Review*, 16(2), 125-138. <https://doi.org/10.1016/j.hrmr.2006.03.002>
- Berssaneti, F. T., & Carvalho, M. M. (2015). Identification of variables that impact project success in Brazilian companies. *International Journal of Project Management*, 33(3), 638-649. <https://doi.org/10.1016/j.ijproman.2014.07.002>
- Bogers, M., Zobel, A.-K., Afuah, A., Almirall, E., Brunswicker, S., Dahlander, L., Frederiksen, L., Gawer, A., Gruber, M., Haefliger, S., Hagedoorn, J., Hilgers, D., Laursen, K., Magnusson, M. G., Majchrzak, A., McCarthy, I. P., Moeslein, K. M., Nambisan, S., Piller, F. T., ... Ter Wal, A. L. J. (2017). The open innovation research landscape: established perspectives and emerging themes across different levels of analysis. *Industry and Innovation*, 24(1), 8-40. <https://doi.org/10.1080/13662716.2016.1240068>
- Cao, L. (2018). Data Science. *ACM Computing Surveys*, 50(3), 1-42. <https://doi.org/10.1145/3076253>
- Carroll, J. S., & Doherty, W. J. (2003). Evaluating the Effectiveness of Premarital Prevention Programs: A Meta-Analytic Review of Outcome Research. *Family Relations*, 52(2), 105-118. <https://doi.org/10.1111/j.1741-3729.2003.00105.x>
- Crowley-Koch, B. J., & Van Houten, R. (2013). Automated measurement in applied behavior analysis: A Review. *Behavioral Interventions*, 28(3), 225-240. <https://doi.org/10.1002/bin.1366>
- Defillippi, R. J., & Arthur, M. B. (1994). The boundaryless career: A competency-based perspective. *Journal of Organizational Behavior*, 15(4), 307-324. <https://doi.org/10.1002/job.4030150403>
- Dörnyei, Z., & Muir, C. (2019). *Creating a Motivating Classroom Environment* (pp. 719-736). [https://doi.org/10.1007/978-3-030-02899-2\\_36](https://doi.org/10.1007/978-3-030-02899-2_36)
- Evans, C., Waring, M., & Christodoulou, A. (2017). Building teachers' research literacy: integrating practice and research. *Research Papers in Education*, 32(4), 403-423. <https://doi.org/10.1080/02671522.2017.1322357>

- Gunawan, J., Aunguroch, Y., & Fisher, M. L. (2019). Competence-based human resource management in nursing: A literature review. *Nursing Forum*, 54(1), 91-101. <https://doi.org/10.1111/nuf.12302>
- Hairstans, R., & Smith, R. E. (2018). Offsite HUB (Scotland): establishing a collaborative regional framework for knowledge exchange in the UK. *Architectural Engineering and Design Management*, 14(1-2), 60-77. <https://doi.org/10.1080/17452007.2017.1314858>
- Hecklau, F., Galeitzke, M., Flachs, S., & Kohl, H. (2016). Holistic Approach for Human Resource Management in Industry 4.0. *Procedia CIRP*, 54, 1-6. <https://doi.org/10.1016/j.procir.2016.05.102>
- Holtzman, Y. (2014). A strategy of innovation through the development of a portfolio of innovation capabilities. *Journal of Management Development*, 33(1), 24-31. <https://doi.org/10.1108/JMD-11-2013-0138>
- Jacobs, R. L. (2019). Individual Competencies. In *Work Analysis in the Knowledge Economy* (pp. 165-178). Springer International Publishing. [https://doi.org/10.1007/978-3319-94448-7\\_11](https://doi.org/10.1007/978-3319-94448-7_11)
- Jaeger, A. J., & Eagan, M. K. (2007). Exploring the Value of Emotional Intelligence: A Means to Improve Academic Performance. *NASPA Journal*, 44(3), 512-537. <https://doi.org/10.2202/1949-6605.1834>
- Kaufman, D. M. (2018). Teaching and Learning in Medical Education. In *Understanding Medical Education* (pp. 37-69). John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781119373780.ch4>
- Ljungquist, U. (2013). Adding dynamics to core competence concept applications. *European Business Review*, 25(5), 453-465. <https://doi.org/10.1108/EBR-09-2012-0052>
- Luna-Reyes, L. F., & Andersen, D. L. (2003). Collecting and analyzing qualitative data for system dynamics: methods and models. *System Dynamics Review*, 19(4), 271-296. <https://doi.org/10.1002/sdr.280>
- M'mboga Akala, D. B. (2021). Revisiting education reform in Kenya: A case of Competency Based Curriculum (CBC). *Social Sciences & Humanities Open*, 3(1), 100107. <https://doi.org/10.1016/j.ssaho.2021.100107>
- Norman, G., Norcini, J., & Bordage, G. (2014). Competency-Based Education: Milestones or Millstones? *Journal of Graduate Medical Education*, 6(1), 1-6. <https://doi.org/10.4300/JGME-D-13-00445.1>
- Osagie, E. R., Wesselink, R., Blok, V., Lans, T., & Mulder, M. (2016). Individual Competencies for Corporate Social Responsibility: A Literature and Practice Perspective. *Journal of Business Ethics*, 135(2), 233-252. <https://doi.org/10.1007/s10551-014-2469-0>
- Quimbo, M. A. T., & Sulabo, E. C. (2014). Research productivity and its policy implications in higher education institutions. *Studies in Higher Education*, 39(10), 1955-1971. <https://doi.org/10.1080/03075079.2013.818639>
- Shet, S. V., Patil, S. V., & Chandawarkar, M. R. (2019). Competency based superior performance and organizational effectiveness. *International Journal of Productivity and Performance Management*, 68(4), 753-773. <https://doi.org/10.1108/IJPPM-03-2018-0128>
- Škrinjarčić, B. (2022). Competence-based approaches in organizational and individual context. *Humanities and Social Sciences Communications*, 9(1), 28. <https://doi.org/10.1057/s41599-022-01047-1>

- Sun, A., & Chen, X. (2016). Online Education and Its Effective Practice: A Research Review. *Journal of Information Technology Education: Research*, 15, 157-190. <https://doi.org/10.28945/3502>
- Teal, T. K., Cranston, K. A., Lapp, H., White, E., Wilson, G., Ram, K., & Pawlik, A. (2015). Data Carpentry: Workshops to Increase Data Literacy for Researchers. *International Journal of Digital Curation*, 10(1), 135-143. <https://doi.org/10.2218/ijdc.v10i1.351>
- Tran, L. T., & Nyland, C. (2013). Competency-based training, global skills mobility and the teaching of international students in vocational education and training. *Journal of Vocational Education & Training*, 65(1), 143-157. <https://doi.org/10.1080/13636820.2012.755215>
- Vlasenko, K. V, Rovenska, O. G., Chumak, O. O., Lovianova, I. V, & Achkan, V. V. (2021). A Comprehensive Program of activities to develop sustainable core skills in novice scientists. *Journal of Physics: Conference Series*, 1946(1), 012017. <https://doi.org/10.1088/1742-6596/1946/1/012017>
- Wongnaa, C. A., & Boachie, W. K. (2018). Perception and adoption of competency-based training by academics in Ghana. *International Journal of STEM Education*, 5(1), 52. <https://doi.org/10.1186/s40594-018-0148-x>
- Živković, S. (2016). A Model of Critical Thinking as an Important Attribute for Success in the 21st Century. *Procedia-Social and Behavioral Sciences*, 232, 102-108. <https://doi.org/10.1016/j.sbspro.2016.10.034>