Higher Education Dropout: A Literature Review

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Abstract

This research delves into the complex issue of dropout from higher education, marking a crucial first step towards understanding and addressing this problem. Dropout, in its broadest sense, can be described as incompletion, interruption of studies or the inability to complete the enrolled study programme. The ramifications of dropout in higher education are manifold, affecting not just the student but also the higher education system, the labour market, and society at large. These include incomplete education, diminished workforce competitiveness, and the loss of financial resources earmarked for higher education. The impact of dropout is felt by students, their parents, higher education institutions, the economy, and society as a whole. Hence, it is imperative to identify the reasons for dropout and implement measures to mitigate it.

Keywords: dropout, higher education, student support, interventions, retention, academic success

INTRODUCTION

Student dropout, defined as the interruption of studies or the inability to complete a degree, is a critical issue in all higher education systems. This phenomenon has many consequences beyond the direct impact on the student. First, a student's incomplete education limits their employment and career advancement opportunities that would otherwise be possible with a degree. This can harm an individual's financial and personal well-being. In addition, dropping out reduces the overall educational level of a country's workforce, which can affect its global competitiveness. Thirdly, dropping out also means a loss of financial resources invested in higher education. This includes tuition fees, scholarships and other costs from students, their families, the government, and higher education institutions.

Dropping out has a profound impact on various stakeholders—students and their families, higher education institutions, and society. The personal and financial consequences that students and their families grapple with are significant, often leading to a sense of loss and disappointment. Higher education institutions, on the other hand, can suffer from reduced funding and a tarnished reputation. Society, as a whole, bears the burden of dropout in the form of reduced competitiveness and poorer economic and social development.

This article seeks to examine student dropout through a comprehensive literature review. The literature review was conducted using the following databases: Scopus, SpringerLink and ScienceDirect. The search terms included 'student dropout' and 'higher education. We also focused on including representative research as independent country-specific studies. Publications were included if they provided empirical research on factors of student dropout particularly focusing on higher education. We carefully identify the key dropout factors and review institutional strategies to reduce student dropout rates. Our literature review provides a fundamental overview of the dropout problem, identifying relevant variables and proposing solutions, laying the groundwork for more comprehensive future research. Our review focuses on the multiple causes of student dropout and the efficacy of institutional solutions. However, the breadth of extant studies leaves the potential for further investigation and a better understanding of this complex subject. Future research should examine how developing technologies affect student engagement and retention, how psychological factors affect student persistence, and how personalised learning works. Empirical studies using advanced methods like machine learning algorithms may provide new ways to detect and avoid student dropout. These prediction algorithms could help schools identify at-risk pupils earlier and improve targeted treatments. Our paper provides a critical overview of student dropout factors and institutional interventions. Still, it also lays the groundwork for future research to explore new dimensions and innovative solutions to improve student retention and success in higher education.

LITERATURE REVIEW

Student dropout is a fairly well-researched topic, with many studies examining its factors, causes, and interventions to reduce it.

European higher education policy focuses much on the student competition rate and academic success. Academic success can be defined with (Vossensteyn et al., 2015): i) *Completion*: students successfully complete their study programme with a degree; ii) *Time-to-degree*: students complete their study programme within a reasonable time period; iii) *Retention or dropout*: encourage students to continuously enrol in their study program until they attain their degree, while minimizing the chances

of them discontinuing their studies prematurely. The HEDOCE study (Vossensteyn et al., 2015) found that academic success is vital in three-quarters of the 35 European countries participating in the survey. It is high or very high on the political agenda in almost half of the countries, including Denmark, England, Estonia, Finland, Flanders (Belgium), France, Greece, Hungary, Italy, North Macedonia, Malta, the Netherlands, Norway, Serbia, Slovenia and Sweden. Austria, Croatia, the Czech Republic, Germany, Ireland, Luxembourg, Montenegro, Poland, Portugal, Romania, Spain and Switzerland have academic success on their agenda. It is insignificant or of minor importance in Bulgaria, Cyprus, Iceland, Latvia, Lithuania and Slovakia (Vossensteyn et al., 2015). Academic achievement goals rarely target students at higher risk of dropping out. Interestingly, even successful graduation or reduction in dropout rates has no impact on higher education funding in half of European higher education systems (Crosier et al., 2015). Furthermore, the countries have yet to establish monitoring mechanisms for students who have dropped out without graduating (Crosier et al., 2015).

In Slovenia, the percentage of graduates who complete their studies within the prescribed period is a significant indicator. It is one of the variable indicators of the lump sum funding of higher education institutions (Regulation on Public Funding of Higher Education Institutions and Other Institutions, 2023, Official Gazette No. 16). The number of students who re-enrol is also not considered in the allocation of funds from the title of enrolled students. Both indicators aim to prevent dropout and encourage higher education institutions to take more responsibility for developing tools and strategies to increase student success and reduce dropout rates.

Due to dropout in higher education, the projected number of graduates entering the labour market is significantly lower than the number of students enrolled. In this way, public money needs to be optimally used. The problem of students dropping out of higher education in Slovenia is particularly worrying in the first year of study. This means that many students do not complete their studies after enrolment in the first year and do not fulfil their academic potential.

In recent decades, higher education institutions worldwide have been confronted with the problem of student dropout, as the median value for the entire European higher education area shows that almost one in three enrolled students still needs to complete their studies (Crosier et al., 2015). The dropping-out problem is particularly pronounced in Slovenia, where the dropout rate among first-cycle students is exceptionally high. According to data from Education at a Glance (OECD, 2022), 40% of first-cycle students in Slovenia do not complete their studies or are no longer in education after the official duration of studies plus three years (the OECD average is 23%), while 52% graduate in the same period (the OECD average is 65%).

Higher education institutions must recognise their needs and provide appropriate support for students to progress successfully in their studies. Experience from the UK, Germany and the Netherlands (Yorke & Longden, 2004; Thomas, 2012; Ulriksen et al., 2010; Inspectie van het Onderwijs, 2009) shows that the commitment and dedication of higher education institutions can contribute significantly to student success, for example by creating the conditions for student-centred learning and providing appropriate support for students from all staff.

Vosensteyn et al. (2015, pp. 18–22) state that a student's ability to complete their studies is manifested in three aspects: national, institutional and individual. The national aspect includes the selectivity or accessibility of higher education (higher accessibility can have an impact on non-completion as students who lack study skills enrol in higher education) (Heublein et al., 2003), the flexibility of the higher

education system (credit system that may increase the time to study (Hovdhaugen, 2012) and higher education policy (legal framework, student support and funding; students who pay for their studies may be more motivated to complete their studies (Orr et al., 2014) and socioeconomic factors that include demographics, economic status etc.). Institutional structural aspects include the diversity of the student population, financial resources mainly dedicated to student support, the organisation of studies in terms of pedagogical-didactic working conditions, technical infrastructure and other resources; individual aspects include demographics (gender, age, ethnicity, minorities), socioeconomic status, cognitive competencies, motivation and previous educational path.

The reasons for dropping out early can be divided into several groups. The research by Aina et al. (2018) identified four main groups of determinants: students' behaviour, skills and characteristics; family background and support; the characteristics of the tertiary education system and institutions; and the characteristics and functioning of the labour market. They emphasise that dropout and the reasons for not completing studies are determined by several complex individual and institutional characteristics that need to be considered in different national frameworks. Aina et al. (2018) emphasise the importance of comprehensive information when choosing higher education institutions to help students accurately perceive their abilities, motivation and the attributes required to succeed in their chosen field. It is also useful to accurately predict future labour demand and wage trends. It would be necessary to provide adequate information on the supply of studies and the available resources of higher education institutions, as dropout is also related to the deterioration in the quality of higher education due to the increased demand for it. Regardless of student characteristics and behaviour, it is clear that the quantity and quality of resources at the college level are essential. This makes pre-enrolment activities that can reduce the risk of students dropping out or delaying graduation all more important. Support is also essential, especially for first-year students, as it increases student success. This has been well researched and documented by Tinto (1993) and Bean and Metz (1985), who concluded that dissatisfaction with the study program, lack of academic preparation and personal problems are among the most critical factors for dropping out.

As Behr et al. (2020) stated, not completing the degree program or dropping out results from a long-term decision-making process and a complex interplay of several factors. There are three main reasons why students leave the higher education system without graduating. These are 1) the national education system, e.g. the country's funding policy; 2) the higher education institutions, e.g. the type of institution or the quality of teaching; and 3) the students themselves, with this last reason being subdivided into a) pre-study factors, such as the type of secondary schools, and b) study-related factors, such as work during studies.

Since the 1970s, Tinto (1975, 1987, 1993) has been concerned with modelling dropout rates and predicting performance, such as Tinto's model of student retention, one of the most influential models for understanding dropout. The model assumes that a series of interactions with the academic and social system of the higher education institution shape the student's decision to continue or discontinue their studies. It assumes that the student's commitment to their studies and the higher education institution influences their decision to continue or discontinue their studies. This commitment may be related to the student's academic performance, social and academic community integration, personal circumstances, and other factors.

Bean's dropout model (Bean, 1980, 1982, 1983) is also used to predict dropout. Bean's model is based on occupational mobility theory and assumes that students decide to drop out based on factors similar

to those of employees when they leave a job. Factors addressed by Bean include student satisfaction, commitment to their studies, institutional commitment, academic success and others. Pascarella's Integrated Retention Model (Pascarella & Terenzini, 1980, 1983) is another model often used to predict dropout. This model is based on Tinto's model but considers additional factors such as individual student characteristics, institutional characteristics, peer influence and the interaction between the student and the higher education institution.

Recently, many data mining approaches have been used to predict student dropout. Machine learning techniques have been used to predict possible dropouts based on demographic and academic characteristics, with classification methods applied to identify potential dropouts (Noboa et al., 2018). Machine Learning is supposed to be more effective. However, a simple Logistic Regression model can also be considered a good predictor (Segura et al., 2022). Noboa, Ortdonez and Magallanes (2018) found that 22 % of students are potential dropouts. More specifically, older students fail their courses many times while passing more than 12 courses, and providing access to library materials is a good predictor of not dropping out. Da Cruz et al. (2023) provided a new approach to analysing the student information system data with a risk score. Risk score by using machine learning technique (KNN) managed to provide an equation and accuracy of 87 % with KNN. In comparison, the random forest model is estimated to be between 73 % and 99 % accurate for predicting student dropout (Salinas-Chipana et al., 2024). Other techniques, including Support Vector Machines, Decision Trees, Artificial Neural Networks, and Logistic Regression, have also been popularly used to predict likely dropout (Segura et al., 2022).

The advent of technology and the rise of online learning have added a new dimension to the dropout discourse, with Xu and Jaggars (2014) exploring the nuanced performance gaps between online and traditional learning modalities, suggesting that the digital divide may exacerbate existing inequalities. Because online or online education is becoming mainstream and, as a result, the number of students enrolling in degree programs conducted online is constantly increasing, as stated by Muljana and Luo (2019), among others, the degree of completion in an online environment is significantly lower than in a traditional environment. According to the authors, the critical factors for degree completion are institutional support, the complexity of degree programs, fostering a sense of belonging, facilitating learning, course material design, student behavioural characteristics, and demographic and other personal variables.

Reasons for dropping out of higher education

Dropping out of higher education is a complex problem caused by several factors. These factors include students' personal circumstances, such as financial difficulties, health problems or family commitments (Staiculescu & Richiteanu, 2018), as well as institutional factors, such as the quality of teaching, student support and study conditions (Aina et al., 2015). The study by Kehm, Larsen, and Sommersel (2019) found that the following are the most common reasons for dropout: i) study conditions at the university, ii) academic integration into the higher education institution, iii) social integration into the higher education institution, iv) personal effort and motivation for studying, v) information and requirements for admission and enrollment, vi) previous academic success in school, vii) personal characteristics of the student, viii) the student's sociodemographic background, and ix) external factors.

Building upon the insights from the literature and reasons for dropout listed in the previous chapter, the main aspects and challenges related to this problem are summarised in the nine following factors:

1. Lack of information about study opportunities: Some students need more information about available study programs, career opportunities, and required skills, which can lead to a wrong choice of study program or a feeling of disorientation, increasing the likelihood of dropping out.

2. Poor academic performance: Some students need help to meet their academic obligations. This may result from inadequate preparation for higher education, difficulty adjusting and adapting to the complexity of the enrolled program, or lack of motivation to study due to inappropriate program choices. Failure in the exam can lead to a decline in student confidence and, consequently, dropout.

3. Lack of support: Some students need more support than they could receive through tutoring or mentoring during their studies. Lack of personal contact with professors and teaching assistants, unclear expectations, and poor communication can diminish student success and lead to dropout.

4. Lack of adapted programs for specific groups of students: Certain groups of students, such as students with special status or special needs, students from ethnic minority backgrounds, students from migrant backgrounds or simply international students, face particular challenges and need additional support.

5. Quality of study programs: Poor quality study programs, outdated course materials and content, and a lack of connection between theory and practice can affect student motivation. If students do not see the relevance and usefulness of their study content, they may drop out.

6. Lack of employment opportunities: A sufficient connection between programs of study and employment opportunities can help students' motivation and prevent them from dropping out. If students do not see a clear goal or benefit of their studies for the future, they may drop out.

7. Social and personal factors: Students often struggle with personal issues such as lack of motivation, low self-esteem, difficulty adapting to a new environment or stress. Social factors such as lack of social support, feeling lonely, not being accepted or not belonging can also contribute to dropping out.

8. Financial obstacles: Higher education can financially burden students and their families. Students face a growing financial strain and the escalating costs of higher education. Some face high tuition (enrolment fees), and others face the cost of living away from home and need more financial support through a scholarship or from their parents. This can lead to problems with financing their studies and dropping out of college.

9. Student work: Many people take on the status of a student to do student work without the intention of actually studying, either for financial reasons or due to labour market conditions.

Understanding and addressing these challenges requires a comprehensive approach that includes improving financial aid, enhancing student mentoring and support from higher education institutions, updating and adapting study programs to emerging socioeconomic conditions, and improving communication between higher education institutions and the labour market. Tables and figures must be placed within the text of the paper. Generally, graphics should be in Times New Roman 10 pt with table column headings underscored (as seen in Table 1).

Various viewpoints on dropout

Based on a comprehensive literature review, it has become evident that many factors contribute to student dropout rates. This extensive research, encompassing the findings and analyses from sources

such as Aina et al. (2018, 2022), the European Commission (2022), de la Cruz-Campos et al. (2023), Crosier et al. (n.d.), Vossensteyn et al. (2015), Makovec (2018), and Nunes et al. (2022), has led to the identification of several groups of interrelated factors affecting student dropout. The significance of these findings lies in their utility; with a deeper understanding of the causes (factors) of dropout, higher education institutions are better equipped to implement strategies to reduce student dropout rates. Most existing research focuses on pinpointing these causative factors, which, when understood and addressed, pave the way for institutions to take actionable steps towards mitigating the dropout phenomenon. This underscores the importance of acknowledging and analysing the factors contributing to formulating effective retention strategies.

The subsequent paragraphs provide an elaborate analysis of the different perspectives on dropout rates in higher education derived from the literature review.

1. The first important factor of student dropout is a global scale one: the impact of external crises, such as the global COVID-19 pandemic. The pandemic has significantly impacted traditional ways of learning, resulting in increased psychological stress among students and a drop in academic performance, leading to student dropouts. The transition to e-learning has emphasised the importance of flexibility and resilience in facing unforeseen challenges.
2. At the same time, national and European goals and strategies also play a vital role in forming higher education. The European Union's commitment to reducing school dropout rates and increasing the share of highly educated youth reflects a broader vision of a knowledge-based society. However, the effectiveness of these goals varies between countries, contributing to differences in access to higher education and school dropout rates.
3. Definitions of key terms such as academic failure and the role of higher education institutions also add to the complexity of the problem. A dynamic approach to understanding academic failure includes social, emotional, and environmental factors, recognising that success in higher education is a multifaceted concept.
4. Regional and national differences make it more challenging to define the dropout problem. Differences in socioeconomic conditions, educational policies, and culturally conditioned attitudes toward education have different dropout rates between countries and regions. Addressing the dropout problem requires a tailored approach to understanding these contextual factors to develop targeted interventions.
5. The structure and financing of national higher education systems also significantly impact students' educational paths. Public funding, institutional selectivity, and student support mechanisms affect the overall cost and accessibility of higher education. In addition, alignment between educational programs and labour market requirements is vital, as students often make decisions based on their expected income and employment prospects in the future.
6. Individual characteristics of students, such as gender, age, self-awareness, academic self-efficacy, conscientiousness and motivational approaches, also contribute to academic success and persistence. Adapting support systems to address diverse student populations' unique needs and challenges is critical to promoting social inclusion and reducing dropout rates.
7. Economic conditions and the availability of support programs also play a crucial role. Programs designed to promote the employment of young individuals not engaged in education or employment can act as a bridge. However, re-engagement in formal education is a complex challenge.

8. Financial support for students, whether through scholarships, grants or loans, is critical in addressing dropout rates. The availability and adequacy of financial aid programs affect students' ability to meet the financial challenges associated with higher education.
9. Finally, establishing a supportive and inclusive educational environment and targeted interventions that address identified factors is critical. A holistic and collaborative approach involving educational institutions, decision-makers and the wider community is key to fostering a culture of study persistence and academic success.

DISCUSSION AND CONCLUSION

Summarising the findings of our study, it is clear that comprehending and addressing the factors contributing to student dropout poses a substantial challenge for higher education institutions and the wider educational system. The literature review, which includes important research by Aina et al. (2018), Vossensteyn et al. (2015), Aina, Baici, & Casalone (2011), Tinto (1975, 1993), Crosier et al. (2015), and Bean & Metzner (1985), emphasises that student dropout is a complex problem. The phenomenon results from an intricate interaction between national, institutional, and individual elements. These include academic achievement, social assimilation, financial means, and personal difficulties.

The results emphasise the importance of implementing interventions at the institutional level. These interventions should include strategies such as improving the availability of programme information, enhancing the process of matching students with appropriate programmes, introducing selection mechanisms, monitoring student attendance and progress, promoting social integration, addressing the needs of a diverse student population, and implementing teaching and learning initiatives (Vossensteyn et al., 2015). Implementing comprehensive strategies is crucial for supporting students, particularly first-year students, to ensure they receive the necessary support in developing their academic and teaching skills. This approach is vital in fostering their academic growth and abilities, student success and retention.

It is possible for higher education institutions to act and reduce student dropout and improve competition rates if they have a better understanding of the factors that influence dropout, including the definition, the reasons, and the consequences. This is a significant challenge not only for higher education institutions but also for the higher education system. The ongoing dialogue in the literature suggests that understanding and addressing dropouts requires a multifaceted strategy that is sensitive to the diverse needs and challenges of the student population.

Nevertheless, the research on students dropping out of higher education has certain drawbacks. The examined research generally concentrates on institutional and systemic issues, possibly neglecting the intricacies of individual student experiences. Furthermore, the effectiveness of the suggested interventions may fluctuate depending on the specific circumstances and groups of students, highlighting the necessity for additional research.

Future research should investigate the effects of these treatments in various educational environments, including the shifting demographics of student populations and the growing higher education landscape. There is a need to investigate the long-term effects of these strategies on student retention and completion rates. By addressing these gaps, future research can contribute to more effective and tailored strategies to combat student dropout, thereby enhancing student success and educational outcomes. Furthermore, it is crucial to integrate empirical research that employs machine learning techniques.

Advanced analytical tools can provide more profound insights into forecasting student dropout rates by examining extensive datasets to detect trends and factors that may not be readily apparent. This method can significantly improve the accuracy of interventions by allowing institutions to customise their support mechanisms based on each student's specific needs and risk profiles. By incorporating machine learning into investigations on student retention tactics, forthcoming research can lead to developing more efficient and personalised strategies to address student attrition, therefore augmenting student achievement and educational results.

REFERENCES

Aina, C., Baici, E., Casalone, G., in Pastore, F. (2018). The Economics of University Dropouts and Delayed Graduation: A Survey. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3153385

Aina, C., Baici, E., Casalone, G., in Pastore, F. (2022). The determinants of university dropout: A review of the socioeconomic literature. Socioeconomic Planning Sciences, 79, 101102. https://doi.org/10.1016/j.seps.2021.101102

Bean, J. P., in Metzner, B. S. (1985). A Conceptual Model of Nontraditional Undergraduate Student Attrition. Review of Educational Research, 55(4), 485

Behr, A., Giese, M., Kamdjou, H.D.T, & Theune, K. (2020). Dropping out of university: a literature review. BERA Review of Education, Volume 8, Issue 2, Pages 614-652.

Crosier, D., Horvath, A., Kerpanova, V., Kocanova, D., & Riihelainen, J. (2015). Prelet politik. Posodabljanje visokega šolstva v Evropi. Dostop, uspešnost pri študiju in zaposljivost. EACEA, Eurydice, Publications Office. https://data.europa.eu/doi/10.2797/652077

da Cruz, R. C., Juliano, R. C., Souza, F. C. M., & Correa Souza, A. C. (2023). A Score approach to identify the risk of students dropout: An experiment with Information Systems Course. 120–127. Scopus. https://doi.org/10.1145/3592813.3592896

de la Cruz-Campos, J.-C., Victoria-Maldonado, J.-J., Martínez-Domingo, J.-A., & Campos-Soto, M.-N. (2023). Causes of academic dropout in higher education in Andalusia and proposals for its prevention at university: A systematic review. Frontiers in Education, 8. https://www.frontiersin.org/articles/10.3389/feduc.2023.1130952

European Commission. (2015). Celosten pristop do izobraževanja k zmanjševanju osipa Sporočila politike. Generalni direktorat za izobraževanje in kulturo. https://education.ec.europa.eu/sites/default/files/document-library-docs/policy_rec_slovenian_final.pdf

European Commission. (2022). Directorate General for Education, Youth, Sport and Culture. Education and training monitor 2022: country analysis. Publications Office. https://data.europa.eu/doi/10.2766/54808

Heublein, U., Spangenberg, H., & Sommer, D. (2003): Ursachen des Studienabbruchs. Analyse 2002, Hannover: HIS, Hochschul-Informations-System.

Hovdhaugen, E. (2012). Leaving early: Individual, institutional, and system perspectives on why Norwegian students leave their higher education institutions before degree completion. Ph.D. dissertation, Sociology, Faculty of Social Science, University of Oslo. Oslo: University of Oslo.

Inspectie van het Onderwijs (2009): Werken aan een beter rendement. Casestudies naar uitval en rendement in het hoger onderwijs.

Kehm M.B., Larsen, M.R., and Sommersel, H.B. (2019). Student dropout from universities in Europe: A review of empirical literature. HERJ Hungarian Educational Research Journal, Vol 9, No 2, pp. 147–164.

Makovec, D. (2018). Mednarodna primerjava dejavnikov vpliva na zgodnje opuščanje izobraževanja. Andragoška spoznanja, 24(4), 109–125. https://doi.org/10.4312/as.24.4.109-125

Muljana, P., & Luo, T. (2019). Factors Contributing to Student Retention in Online Learning and Recommended Strategies for Improvement: A Systematic Literature Review. Journal of Information Technology Education: Research, Volume 18, 19-57

Noboa, C., Ordóñez, M., & Magallanes, J. (2018). Statistical learning to detect potential dropouts in higher education:Aa public university case study. 2231. Scopus.

Nunes, C., Oliveira, T., Santini, F. de O., Castelli, M., & Cruz-Jesus, F. (2022). A Weight and Meta-Analysis on the Academic Achievement of High School Students. Education Sciences, 12(5), 287. https://doi.org/10.3390/educsci12050287

OECD (2023). Education at a Glance 2023. Pridobljeno s https://www.oecd-ilibrary.org/docserver/e13bef63-en.pdf?expires=1697626158&id=id&accname=guest&checksum=EBCA44EE08A711CFB9EC1A3EC A21B5EC

Orr, D., Wespel, J., & Usher, A. (2014). Do changes in cost-sharing have an impact on the behaviour of students and higher education institutions? Evidence from nine case studies, Volume I: Comparative report, Brussels: European Commission, DG-EAC.

Pascarella, E.T., &Terenzini, P.T. (1980). Predicting Freshman Persistence and Voluntary Dropout Decisions from a Theoretical Model. The Journal of Higher Education, 51(1), 60-75.

Salinas-Chipana, J., Obregon-Palomino, L., Iparraguirre-Villanueva, O., & Cabanillas-Carbonell, M. (2024). Machine Learning Models for Predicting Student Dropout—A Review. 695 LNNS, 1003–1014. Scopus. https://doi.org/10.1007/978-981-99-3043-2_83

Segura, M., Mello, J., & Hernández, A. (2022). Machine Learning Prediction of University Student Dropout: Does Preference Play a Key Role? Mathematics, 10(18). Scopus. https://doi.org/10.3390/math10183359

Staiculescu, C., & Richiteanu, N.E.R. (2018). University dropout. Causes and Solutions. Mental Health Global Challenges XXI Century, 1, 71–75.

Tinto, V. (1975). Dropout from Higher Education: A Theoretical Synthesis of Recent Research. Review of Educational Research. 45:89–125.

Tinto, V. (1993). Leaving college: Rethinking the causes and cures of student attrition (2nd ed). Chicago: University of Chicago Press.

Tinto, V. (2006). Research and Practice of Student Retention: What Next? Journal of College Student Retention: Research, Theory and Practice 8 (1): 1–19.

Ulriksen, L., Madsen, L. M., Holmegaard, H. T. (2010). What do we know about explanations for dropout/opt out among young people from STEM higher education programmes? Studies in Science Education 46 (2): 209–244.

Vossensteyn, J. J., Kottmann, A., Jongbloed, B. W. A., Kaiser, F., Cremonini, L., Stensaker, B., Hovdhaugen, E., $ Wollscheid, S. (2015). Dropout and completion in higher education in Europe: main report. European Union. https://doi.org/10.2766/826962

Xu, D., & Jaggars, S. S. (2014). Performance Gaps between Online and Face-to-Face Courses: Differences across Types of Students and Academic Subject Areas. The Journal of Higher Education, 85(5), 633–659. https://doi.org/10.1080/00221546.2014.11777343