


Review

# Self-Determination Theory and Online Learning in University: Advancements, Future Direction and Research Gaps

Mohd Shafie Rosli <sup>1,\*</sup> , Nor Shela Saleh <sup>2</sup>, Azlah Md. Ali <sup>3</sup> and Suaibah Abu Bakar <sup>3</sup>

<sup>1</sup> School of Education, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia

<sup>2</sup> Department of Social Science, Centre for General Studies and Co-Curricular, Universiti Tun Hussein Onn Malaysia, Parit Raja 86400, Malaysia

<sup>3</sup> School of Human Resource Development and Psychology, Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia

\* Correspondence: shafierosli@utm.my or drshafierosli@gmail.com

**Abstract:** Self-Determination Theory (SDT) has been studied to comprehend human motivation, particularly in education. Numerous studies have been conducted at universities regarding online learning as a technology to mitigate the effects of COVID-19. On the basis of these expansions, however, there is a knowledge gap regarding what constitutes advancement, future direction, and research gaps regarding SDT in university online learning. This new systematic literature review analyzed 49 articles using PRISMA to bridge the knowledge gap. Currently, SDT research in online learning at university does not extensively integrate other theories and models, but there is a trend toward acceptance models and cognitive theories. Future research should incorporate additional SDT factors such as intrinsic motivation, external regulation, identified regulation, and amotivation in addition to autonomy, competence, and relatedness. As most research samples students, a research gap involving lecturers and mixed groups is suggested. The future is anticipated to be dominated by quantitative research, leaving qualitative and mixed methods as points of exploration. This review sheds light on the advancements, future direction, and research gaps regarding SDT in university-level online learning. It could serve as a basis for future research in SDT within the context of online education.

**Keywords:** Self-Determination Theory; online learning; PRISMA; systematic review



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## 1. Introduction

Human life is influenced by internal factors, external factors, and the surrounding environment. Every one of these is influenced by motivation. Numerous theories and models were able to explain motivation. Self-Determination Theory (SDT) is one of them and has become one of the most popular. According to Deci, Connell, and Ryan [1], self-determination is the capacity to initiate and control one's own actions. SDT includes the basic psychological need of autonomy, competence, and relatedness [2]. Later, as SDT continued to develop, the theory grew to include intrinsic motivation, extrinsic motivation, and amotivation. Researchers such as Rosli and Saleh [3] refer to this as the full spectrum of SDT. Extrinsic motivation includes four types of regulations: external regulation, identified regulation, introjected regulation, and integrated regulation [4].

SDT is a universally recognized motivational theory. Since the COVID-19 pandemic, the theory has become more crucial for comprehending human psychology. Based on the initial search carried out by the authors, in 2020, there were 926 articles published in Scopus that utilised SDT as one of their fundamental theoretical frameworks, whereas in 2019 there were only 814 articles. The number of articles increased to 1073 and 1002 in 2021 and early August 2022, respectively. Compared to SDT-related articles published between 2014 and 2019, a significant increase is noticeable.

In addition to its applications in the transportation [5] and tourism industries [6], SDT is also widely utilised in the education sector [7–9]. The application of SDT in the educational sector takes place in primary schools [10], secondary schools [11], and universities [7,12,13]. Clearly, SDT research was conducted with greater intensity in universities. The research conducted within the context of the university included studies on online learning and its variants [14–18].

As the development of SDT in online learning has matured, it is the ideal time to present the academic community with a systematic literature review that reveals and illustrates the development, future direction, and current research and knowledge gaps on this topic. Despite the increased intensity of online learning as a result of the pandemic, such a systematic literature review has never been conducted as far as we are aware. The information synthesised by this new systematic literature review would enable future researchers to comprehend the SDT not only within the scope of online learning, but also beyond the context of educational approaches, such as the online working ecosystem, given that universities are the primary source of digitally savvy labour for the economy. To ensure a comprehensive understanding of advancement, future direction, and gaps, it is suggested to establish research paradigms [19].

Due to the increased interest in SDT, the researchers are unable to determine which other theories should be integrated into their research model. Expanding SDT with other suitable theories or frameworks is one of the long-term research gaps identified by SDT's founders, Ryan and Deci [2]. Therefore, the first objective of this new systematic literature review is to determine the current state of SDT integration with other theories. The data had the opportunity to profoundly enlighten scholars about the current state of research and potential research gaps for further exploration. This will contribute significantly not only to the understanding of the development and future direction of SDT in the context of online learning, but also to the overall understanding of SDT outside of the educational context. This would aid academics in determining which theories are compatible with SDT for future research. This would aid in our comprehension of human motivation.

As the theory of SDT evolved from a primary emphasis on internal perception based on autonomy, competence, and relatedness to its expanded version, its focus shifted from internal perception to external perception. As suggested by Rosli and Saleh [3], the term “full spectrum of SDT” emerges. The SDT had been expanded by Ryan and Deci [20] to include intrinsic motivation, extrinsic motivation (external regulation, introjection, identification, and integration), and amotivation. However, this expansion diverts SDT research, as some researchers continue to use autonomy, competence, and relatedness as representations of SDT [21–23]. For others, the version of SDT used is the combination of autonomy, competence, and relatedness with intrinsic motivation, identified regulation, external regulation, and amotivation [3,24,25]. This created a knowledge gap regarding what should actually be included in SDT-focused research. Due to the fact that SDT is comprised of five mini-theories and that basic psychological needs play a central role in SDT [26], it is essential to establish what should be included in an SDT study. Therefore, this new systematic literature review would give insight into what are actually the trends of factors included from the SDT to represent it as a theory. On the basis of the current state of research in SDT, it would eventually aid the scientific community in understanding the future direction of research and the formulation of research gaps.

For a comprehensive understanding of the advancement, future direction, and gaps of the current state of SDT in online learning at the university, crucial methodological information is required, such as the samples used, research methods, and analysis employed [19]. This would not only provide an overview of the current state of research, but it would also enable future researchers to make decisions and formulate justifications for their research.

SDT, a globally recognised theory, was implemented in numerous locations. Therefore, it is crucial for the global research community to comprehend the current state of research from a geographical perspective. By analysing the sampled articles, it is anticipated that

this article will provide future researchers with the knowledge and inspiration to formulate research gaps based on the location of research.

Finally, to further understand the future direction and research gaps based on this new systematic literature review, studying the future work suggests by the sampled articles would be beneficial. This information could be synthesised in order to suggest research gaps to be addressed in future studies. Our new systematic literature review provides not only information about the development and future direction of SDT, but also a list of future work that could be tapped for further exploration.

The purpose of this paper is to conduct a new systematic literature review that could provide future researchers with novel information regarding the advancement, future direction, and research gaps of SDT in online learning conducted within the context of universities. Correspondingly, the following research questions have been formulated:

1. What theories are used in the studies?
2. What factors are included in the studies?
3. What types of samples are included in the studies?
4. What research approaches and analysis were employed in the studies?
5. Where were the studies conducted geographically?
6. What are the future works suggested in the studies?

## 2. Previous Reviews

SDT is a widely used motivational factor that was developed by Deci, Connell, and Ryan [1]. The theory has earned international and multidisciplinary recognition for the study of human motivation. It is being used to understand motivational aspects in higher education [3], tourism [6], and sport [27]. In the context of education, SDT has been implemented in a variety of ecosystems, including universities [7], medical schools [28], AI education [11], and teacher innovation [29]. After more than thirty years of SDT's introduction as a theory and, later, as a theory that meets the needs of education, SDT has never escaped the attention of previous studies as a research topic. The previously published reviews of SDT identified in this new systematic review are listed in Table 1.

**Table 1.** Previous literature reviews featuring the SDT in educational and non-educational contexts.

Article	Year	Focus	Studies Reviewed	Findings
[30]	2012	Exercises and Physical Activity	1993–2011	Autonomous motivation influences exercise, while intrinsic motivation predicts long-term exercise adherence. The descriptive design is prevalent in the sampled studies.
[31]	2009	Education	n/a	Intrinsic and autonomous motivation influence academic performance. For classrooms that emphasize autonomy, competence, and relatedness, intrinsic motivation and autonomous types of extrinsic motivation are visible.
[32]	2022	Physical Activity	2004–2021	SDT positively affects physical activity.
[33]	2022	School -Students	2000–2021	Student satisfaction influenced the intrinsic motivation, academic performance, and well-being of the students.
[34]	2022	MOOC	2015–2020	There is still a lack of a comprehensive understanding of the theories that influence MOOC retention regarding the influence of motivation on the retention rate of MOOCs.

The literature reviews on SDT were analyzed to better comprehend the gaps not yet addressed by these reviews. At the same time, this could help us perceive the current state of the subject under review more accurately [35].

In general, SDT reviews covered studies published from 1993 to 2011, as did those by Teixeira et al. [30] covering research about SDT in the context of exercises and physical activity. Even though it is a comprehensive review, it does not address SDT in online education, particularly in universities. Second, the reviews are restricted to articles published through 2011. A review in almost the same discipline was continued by Manninen et al. [32] with articles that were published until 2021. Both studies indicated that SDT influences physical activity.

The impact of SDT is not limited to influencing individuals' perceptions of physical activity. In education, the same effect can be observed [31,33,34]. In 2009, Niemiec et al. [31] reported that students' motivation is influenced in multiple dimensions by implicit SDT. However, the review does not focus on online learning and university. A systematic review of SDT in educational research spanning two decades of published articles was subsequently published. As per the findings, satisfaction is a crucial indicator of academic performance and intrinsic motivation [33]. This review's exclusive focus on school students leaves open the question of the role, direction, and development of SDT research in higher education and online learning.

In 2022, a review was conducted that focused on SDT in the context of MOOC research conducted between 2015 and 2020. Although this review partially addresses the aforementioned gap, it does not exclusively address online education. This leaves unanswered the question of the advancement and future direction of SDT research in the context of online learning in universities.

It is also noteworthy that this article does not discover any review of SDT in online learning, despite the article's emphasis on SDT's educational applications. This demonstrates a knowledge gap regarding a review of SDT research in online education and universities. As a result, this new systematic review is crucial to alleviate the identified research and knowledge gap.

### 3. Methodology

The purpose of this systematic literature review is to comprehend the development and future direction of SDT in online university education. This study followed the procedure and recommendations of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), a popular and widely accepted guideline for systematic reviews across multiple disciplines.

#### 3.1. Inclusion and Exclusion Criteria

This study established a number of inclusion and exclusion criteria to ensure that the sampled articles fall within its scope, based on the research questions generated based on the previously identified research gaps. Establishing the inclusion and exclusion criteria is therefore crucial. The inclusion and exclusion criteria for this study are derived from prior systematic literature reviews. Table 2 outlines the inclusion and exclusion criteria for this new systematic literature review.

**Table 2.** Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Research about SDT in online learning	Research about SDT but not within the area of online learning
Include a clear element of SDT in research	SDT element is not very visible in research
Studies conducted in university	Studies not conducted in university such as in schools and other educational institutes
Empirical research	Studies that are not empirical, such as reviews
Written in English	Studies not written in English

### 3.2. Data Sources and Search Strategies

The search for articles was conducted at the end of September 2022. This research will analyze all articles discovered in the involved databases, as the search does not restrict results based on publication year. This maneuver would enable this new systematic literature review to investigate the entire nature and structure of existing research and produce findings that are both comprehensive and in-depth. Two databases, Scopus, and Web of Science were used as data sources because these two databases cover multiple publishers and are well-known and widely used indexing bodies worldwide.

Using the logic of Boolean operators, specific and highly exclusive keywords and search terms were used to ensure that the vast majority of relevant articles were included in this systematic literature review. Both “Self-Determination Theory” and “Online Learning” are used as keywords. It resulted in the search for information (TITLE-ABS-KEY (“Self-Determination Theory”) AND TITLE-ABS-KEY (“Online Learning”)). For search in Web of Science, the same search terms “Self-Determination Theory” and “Online Learning” are used. Seventy-five articles were included in the initial version of this review after a search of Scopus. The initial data search on Web of Science yielded 103 articles based on the search terms used for this study. This study included a total of 178 articles published on SDT in online learning within a university context.

Later, the researchers downloaded the Scopus and Web of Science-generated article information for further investigation. After comparing both sets of data, it was determined that 57 Web of Science articles are identical to Scopus results. The 57 duplicated articles were eliminated, reducing the number of articles from 178 to 121. The analysis is continued by searching for and downloading the complete articles of the 121 documents. Only 28 of the 121 articles could not be evaluated due to various factors. The remaining articles, a total of 93, were downloaded for further analysis.

Analysis based on the predetermined inclusion and exclusion criteria further reduced the number of articles to 49, which covered research involving diverse samples, statistical approaches, geographical regions, as well as varying perspectives on SDT integration. The number of articles as well as the diversity of the articles satisfied the authors. After screening using inclusion and exclusion criteria, 44 articles were excluded for a variety of reasons, including the use of samples from outside the university ecosystem, such as school-based research. Another reason for exclusion is the absence of a clear framework or element of SDT in the conducted study. Figure 1 depicts the research flow based on the guidelines and procedures of PRISMA.

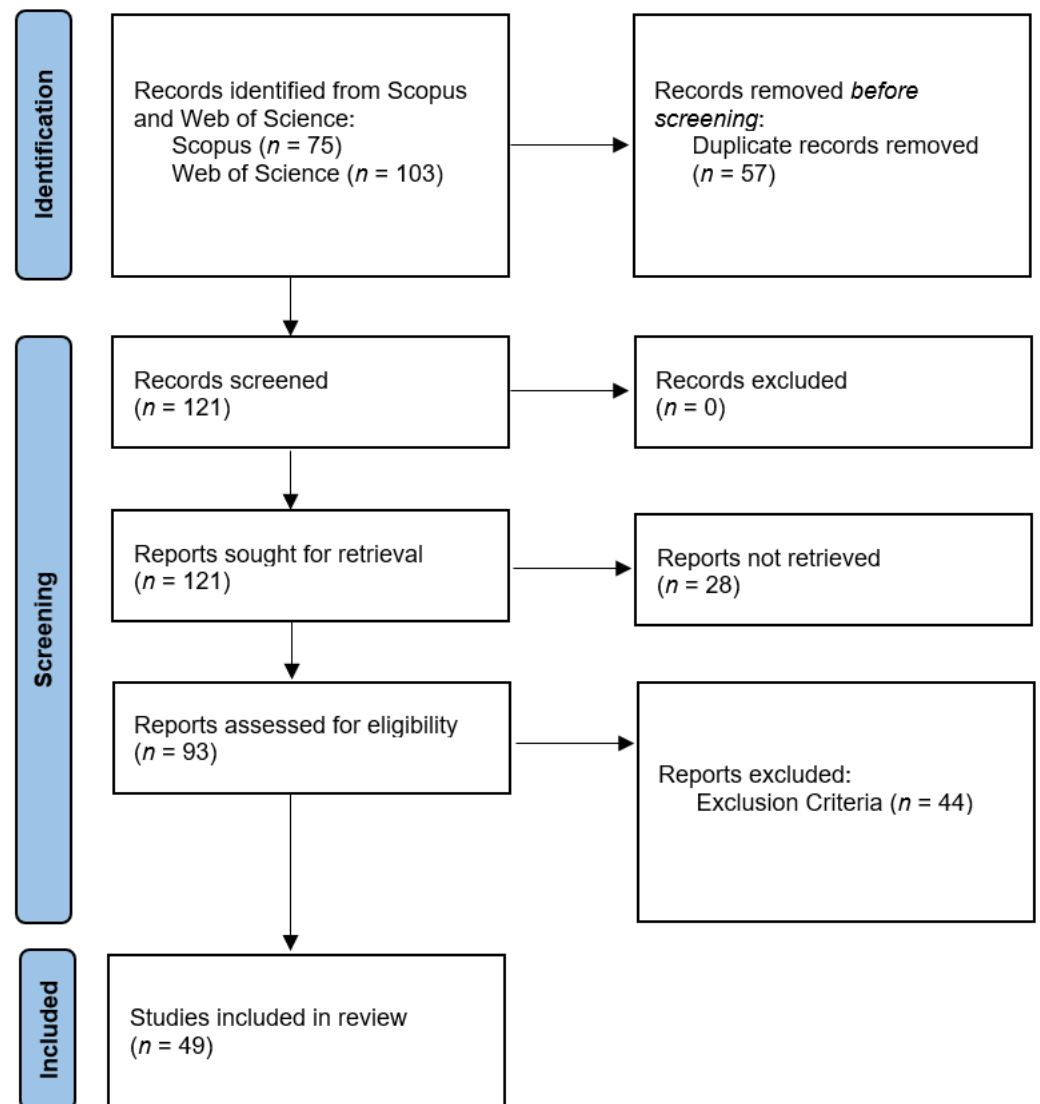


Figure 1. The PRISMA procedures and guidelines for this systematic literature review.

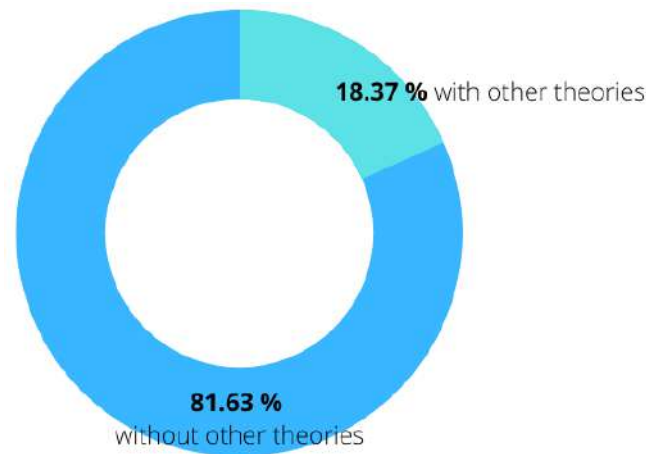
#### 4. Results

To answer the formulated research questions, the 49 articles that had undergone the identification, screening, and inclusion processes as recommended by PRISMA [36] were subsequently analyzed critically and analytically for the trends and direction of SDT in online learning research. Appendix A contains the articles being reviewed and included in this systematic review.

##### 4.1. Theory Integration

The majority of articles neither expand nor integrate SDT with other theories. Only nine of the fifty-nine articles, or 18.37 percent of the total, incorporate other theories into the SDT. Attention-Relevance-Confidence-Satisfaction (ARCS), McClelland's needs, Engagement Theory, Control-Value Theory of Emotion, Social Cognitive Theory, Constructivism learning theory, Cognitive Evaluation Theory, Task-Technology Fit model, Social Motivation Theory, Cognitive Coping Theory, and Unified Theory of Acceptance and Use of Technology were the theories that were incorporated into SDT (UTAUT). The limited number of theories incorporated into SDT may be a result of its high explanatory power. As a result, it led to the integration of SDT with other theories and models in order to enhance the explanatory power of those theories and models. This is not a novel stance or strategy, as it has been used previously [3]. However, this should not be considered an endpoint, as

it is highly suitable for further SDT investigation. SDT was proposed and suggested for incorporation by its introducers, Ryan and Deci [37]. As a result, we propose the incorporation of other theories into SDT within the context of online learning as a research gap and future direction for SDT. Based on our sampled articles, Figure 2 illustrates the percentage of other theories that have integrated and implemented the original SDT.



**Figure 2.** The distribution of other theories integration into SDT.

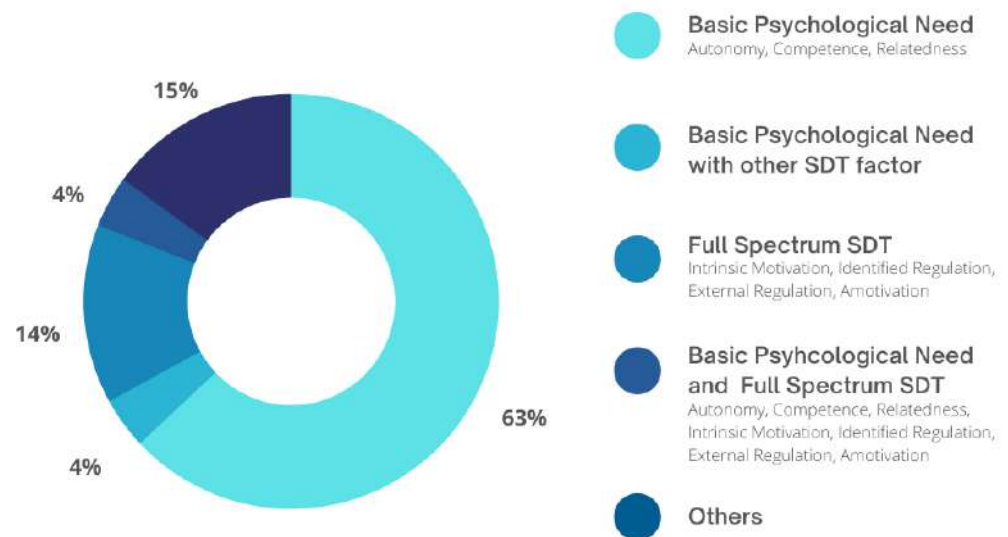
#### 4.2. SDT Factors

Deci, Connell, and Ryan [1] introduced SDT in 1989 to comprehend the nature of human motivation in the workplace. It was initially intended to implement motivation toward organization. At this early stage, the theory focuses on the implementation of autonomy as a means of increasing employee motivation. Deci et al. [4] introduced motivational elements based on SDT into education in 1991, with an emphasis on intrinsic and extrinsic motivation based on the concepts of internalization, external regulation, introjected regulation, identified regulation, and integrated regulation. The article by Deci et al. [4] proposes autonomy, competence, and relatedness as the future direction of student motivation in educational perspectives. In 2022, it was determined that intrinsic motivation and amotivation from the SDT dimension significantly influence university students' acceptance of technology-enhanced learning [3]. In addition, autonomy, competence, and relatedness are significant factors in university students' acceptance of technology-enhanced learning when viewed as a single construct [3]. This resulted in the SDT being divided into several components based on how researchers interpreted the continuum of SDT.

Most of the research in online learning at universities based on SDT integrates autonomy, competence, and relatedness as SDT components. Only 26.53% ( $n = 13$ ) of the articles sampled do not include autonomy, competence, and relatedness in their framework. Autonomy, competence, and relatedness were the most prevalent SDT elements in the sampled articles, with 35 articles (or 71.43 percent) employing these notions. For the full spectrum of SDT as posited by Rosli and Saleh [3], nine articles (18.37 percent) were published from this perspective. Typically, intrinsic motivation, identified regulation, external regulation, and amotivation were integrated as the SDT paradigm for the full spectrum of SDT [24,25,38–45].

Separated into distinct entities, 31 articles (63%) operated autonomy, competence, and relatedness (basic psychological need) without any extended SDT factors. Two articles (4%) employed autonomy, competence, and relatedness (basic psychological need) in conjunction with other SDT factors, including amotivation [46] and intrinsic motivation [47]. Incorporating intrinsic motivation, identified regulation, external regulation, and amotivation, a notion suggested as full spectrum SDT [3] into the research framework is another method of employing SDT. In this study, seven articles, or 14%, adopt this methodology. Integrating the basic psychological need with the full spectrum of SDT reveals the appearance

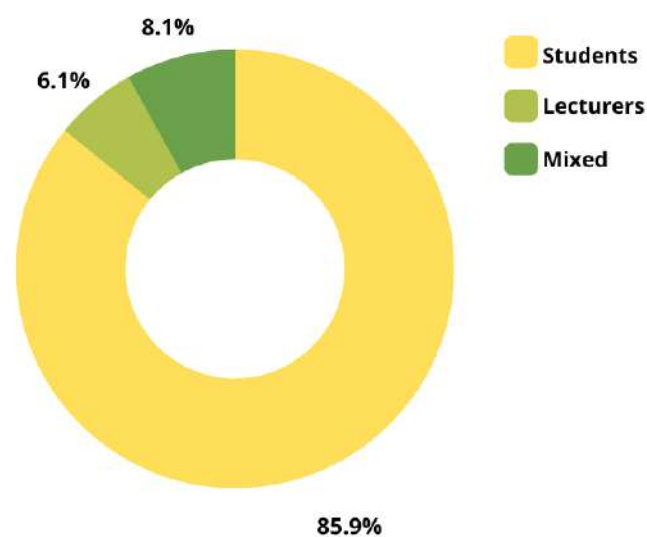
of autonomy, competence, relatedness, intrinsic motivation, identified regulation, external regulation, and amotivation, among other patterns. This pattern appears to be used in two articles (4%). Figure 3 depicts the inclusion of SDT factors in research.



**Figure 3.** The distribution of SDT factors inclusion.

#### 4.3. Type of Sample

To better comprehend the direction and trends of SDT research in the context of online learning in universities, it is essential to understand the type of sample in order to justify the selection of samples for future research and comprehend the current knowledge gap. SDT research is always centered on humans, as it describes human motivation from the perspective of self-determination. The analysis of samples employed in the sampled articles revealed that the majority of samples for SDT research on online learning were largely made up of students. Students made up 86.71 percent of the collected samples. Only 6.12% ( $n = 3$ ) of the studies employed lecturer samples. In addition, 8.16% of the studies ( $n = 4$ ) surveyed both students and lecturers. The move to combine students and instructors as samples may be an attempt to better understand the motivations of the entire online learning ecosystem from both the information recipient's and the instructor's perspectives. Figure 4 depicts the sample distribution derived from our analysis.



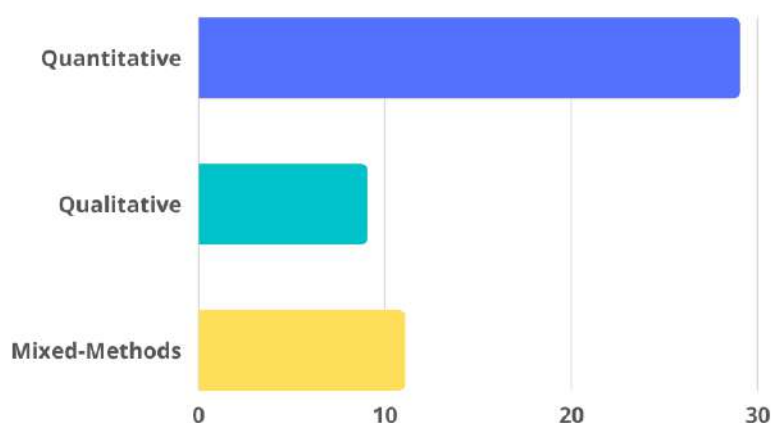
**Figure 4.** Sample types.



#### 4.4. Research Approaches and Statistical Analysis

Early on in the evolution of SDT, quantitative research methods were used to understand the underlying relationships between internal motivation and organizational factors [1]. Years later, when SDT was implemented in education, quantitative approaches utilizing questionnaires such as the Academic Self-Regulation Questionnaire (ASRQ) were implemented [48] and the Academic Motivation Scale (AMS) [49] remained the preferred method and the one that was recommended [4]. Therefore, 29 articles, or 59.18 percent of the total, incorporated quantitative research methods. Quantitative methods are still implemented and relevant for SDT and the online learning ongoing effort [50,51].

However, qualitative approaches have gained popularity as well. Griffin's [52] research, for instance, had begun to implement qualitative methods such as interviews in studying SDT. In this systematic literature review, only nine articles were published using qualitative approaches such as essay [15], interview [16,47,53–56], self-reflection journal [16,23,47,53,57], observation [16], and focus group session [55,57]. The most common qualitative methods include interviews and journals of self-reflection. Mixed-methods approaches are significantly more prevalent than qualitative approaches, accounting for 22.45% of sample research. Figure 5 illustrates the research methodologies employed by the sampled articles.



**Figure 5.** Research approaches.

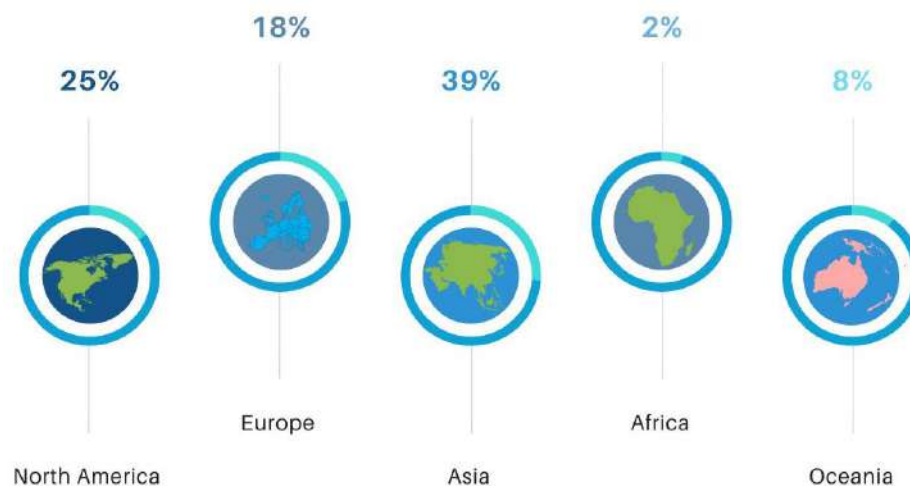
In the sampled articles, quantitative analysis predominates the overall analysis technique. Structural Equation Model leading the analysis technique either using the Covariance-Based Structural Equation Model (CB-SEM) [25,43,50,58–63] or the Partial-Least Square Structural Equation Model (PLS-SEM) [14,21,42,64,65]. Other quantitative analysis such as regression [66,67], correlation [39,44,68], and ANOVA [17,18,69,70] were also implemented in the sampled research. The qualitative analysis involved popular analysis techniques such as thematic [15,23,47,56].

#### 4.5. Geographical Location

There is no precise focus on locations, as the research on SDT in online learning within the context of universities is geographically diverse. Nonetheless, significant research frequencies in the United States of America are visible. Twelve articles (24.49%) were conducted and published in the United States [17,45–47,55,57,62,63,65,66,69,71]. Only nine studies have been conducted in Europe, including four in Germany [18,44,68,70], three in Belgium [22,24,54], one in Russia [15], and another in Austria [72].

In the meantime, nineteen articles comprising 38.78 percent of the sampled articles were published in Asia. Most of the articles in Asia come from China ( $n = 4$ ), Malaysia ( $n = 3$ ) and Pakistan ( $n = 3$ ). Other Asian nations include Indonesia ( $n = 2$ ), Singapore ( $n = 1$ ), Taiwan ( $n = 1$ ), Hong Kong ( $n = 1$ ), South Korea ( $n = 1$ ), Jordan ( $n = 1$ ), and Sri Lanka ( $n = 1$ ) are also contributing toward the scope of our review.

Africa represents an appropriate research gap, as only one study was conducted there, in Ghana [73]. Therefore, little is known about the SDT in online learning at African universities. In the future, we would like to recommend conducting additional research that includes Africa as a component of the studies. The distribution of geographical location is as in Figure 6.



**Figure 6.** Geographical distribution.

#### 4.6. Future Work

The majority of the sample articles recommended further research into SDT in online learning at universities. Among the recommendations are some related to the methodological practice such as the use of larger samples [14,44,46,59,71,74], longitudinal research designs [16,21,42,59,60], time-series research designs [50], and experimental designs [67]. Other suggestions include conducting research in a different geographical and cultural location to further understand the observed phenomena [15,25,43,60,73].

## 5. Discussion

SDT is a common psychological theory. In addition to industrial ecosystems, it was also utilized in educational contexts. Due to its popularity, SDT has been utilized in universities to comprehend online learning. There exists a knowledge gap in the current body of knowledge regarding the direction, advancement, and research gaps of SDT in online learning applications at universities. Therefore, the purpose of this new systematic literature review is to comprehend how the SDT has advanced for understanding online learning in universities. Scholars in the field would be able to forecast the direction of SDT and gain insight into research gaps that could serve as the basis for future new research predicated on this review.

### 5.1. Theory Integration

This comprehensive review of the literature revealed a number of intriguing and significant facts. According to the sampled articles, the majority of studies implement SDT without incorporating other theories. Nonetheless, there is a discernible trend toward integrating theories and models from the cognitive dimension. The integration of cognitive into SDT is spearheaded by the pioneers of the SDT, Deci and Ryan [75], who had integrated Cognitive Evaluation Theory (CET) into SDT. The CEF emphasized two types of motivation, namely intrinsic and extrinsic motivation [76]. The theory was also proposed by Deci, one of the SDT pioneers. The incorporation of CET into SDT is also evident in the articles sampled for this systematic review of the literature [25]. We infer that the preference for cognitive integration within SDT is due to the inclusion of cognitive dimensions such as CET within the mini theories that comprise SDT. Five mini theories comprise SDT:

Cognitive Evaluation Theory (CEF), organismic integration theory, causality orientations theory, basic psychological need theory, and goal content theory [77].

There is also some indication of the integration of SDT with the acceptance model. The sampled articles, for instance, incorporated the Unified Theory of Acceptance and Use of Technology [70] and Task-Technology Fit [42] into SDT. For this reason, we infer that this behavior is caused by the nature of acceptance models such as the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology, which encourage the addition of external variables to the models. Future research in SDT, either in online learning or outside of the educational context, is anticipated to focus more on the integration of SDT with other theories and models, such as cognitive and acceptance-oriented theories and models. Integration with learning theories such as constructivism [61] and inquiry-based learning [78] is also possible.

### *5.2. SDT Factors to Be Included in Research*

SDT is a theory composed of five miniature theories. The central aspect of the theory is suggested to be the psychological need for autonomy, competence, and relatedness [26]. The theory of basic psychological need identifies psychological nutrients that are essential for human psychology [77]. Intrinsic motivation, which originated from CET, is another element of SDT [37,77]. However, intrinsic motivation is rarely implemented without any SDT-related factors, such as extrinsic motivation. Originating from the Organismic Integration Theory, extrinsic motivation describes activities that are not intrinsically pleasurable [77,79]. Then, the SDT expanded further to external regulation, introjection, identification, and integration [20].

This resulted in various implementations of SDT in global research. Some studies identify autonomy, competence, and relatedness as fundamental SDT components [18,60,62,69,71]. In addition to basic psychological need, research also appears to include amotivation [46]. For a substantial portion of the studies, SDT is implemented through the use of intrinsic motivation, identified regulation, external regulation, and amotivation [38,39,41,43]. We suggest, based on the sampled article, that a research gap exists, namely, less emphasis is placed on understanding human motivation using SDT by integrating all of its components into a single package. Integration of autonomy, competence, relatedness, intrinsic motivation, extrinsic motivation, and amotivation is believed to be necessary.

### *5.3. Type of Sample*

Almost all SDT-related research uses human samples as the theory is about human motivation. The majority of the sampled articles employed students as their research sample. Therefore, the discussion should be incorporated into the research using the similar context of online learning. The results of this study are supported by findings from prior studies [19,80]. The opinions and feedback of students are essential for universities [81]. As no previous review was identified about SDT in online learning, thus there were no clear conclusions about the direction of research using lecturers as samples. Nonetheless, future research could use this information void as an impetus for exploration and research gap formulations. In addition to the lack of attention paid to the use of lecturers as samples, a trend is emerging to use mixed samples of lecturers and students [14,18,55,61]. Due to a lack of research into this group of diverse samples, little is known about the less uni-dimensional oriented motivation of the online learning ecosystem [82].

### *5.4. Methodological and Statistical Approaches*

Quantitative methods predominate among the research methods employed in the sampled articles. This is totally in line with the previous reviews [30,33]. What is novel about our new systematic review of the literature is the emergence of qualitative and mixed-methods research in the sampled studies, which was not evident in the prior literature. This novel finding demonstrates that the direction of future research is shifting from quantitative to qualitative analysis integration. From a statistical analysis standpoint, the

result is comparable to previous studies. The application of the Structural Equation Model technique constitutes a significant portion of quantitative analysis [14,43,58–62,73,83,84]. Thus, we anticipate that the prevalence of the Structural Equation Model will persist for at least another decade. Other less complex statistical analyses, such as factor analysis [46], regression analysis [66,67], correlation analysis [39,44,68], MANOVA [22], MANCOVA [72], and nonparametric analyses such as the Mann-Whitney test [38,41], are also appropriate for future research.

The quantitative dominance may be due to the availability of questionnaire-based instruments such as ASRQ and AMS. These closed-ended questionnaires have a strong correlation with quantitative analysis [49,85,86]. However, qualitative analysis, such as thematic analysis [15,56] and content analysis [44,53,57], remains on the radar. As qualitative analysis has not been sufficiently explored, we propose qualitative and mixed methods as the future research direction and knowledge gap.

### 5.5. Research Locations

The majority of analyzed articles were conducted within the context of the developed western economy. We infer that the infrastructure in these countries supported online education in universities. Consequently, they were less concerned with other aspects of online learning, such as acceptance and accessibility. Thus, the motivational perspectives of the users are prioritized. Africa receives less exploration than other regions such as North America, Europe, and Asia, which should be highlighted as a research gap based on the sampled articles. As Asia is home to emerging economies that have studied SDT in online learning, such as Malaysia [74], Indonesia [14,23], and Pakistan [25,42], it is anticipated that research will continue to flourish on this continent. This proportion is bolstered by the discovering of research conducted in Asia's advanced economies, such as China [59,60,83], South Korea [84], and Singapore [87].

### 5.6. Future Works

According to our knowledge, future works have received less consideration in past reviews. The methodological recommendations, such as larger samples, and quantitative research designs, such as longitudinal, time-series, and experimental designs, indicate that the future focus of SDT research on online learning in universities will be on quantitative investigation. Consequently, this supports our assertion that quantitative analysis, such as the Structural Equation Model, will dominate future research. Indicative of the same magnitude is the suggestion that future work should concentrate on different geographical and cultural settings.

## 6. Future Direction and Research Gaps

This novel systematic literature review focuses on six aspects of SDT, including theory integration, sample type, methodological and statistical component, location, and future work. On the basis of a thorough and rigorous analysis of 49 articles using PRISMA, the authors developed the following future directions and research gaps. Table 3 outlines the suggestions.

**Table 3.** Formulated future research directions and research gaps.

Dimension	Future Direction	Research Gap
Theory Integration	Integration of SDT with extended theories, such as the acceptance model and cognitive-related theories.	Insufficient research investigating the integration of SDT with other theories.
SDT Factors	Incorporate additional SDT factors, such as amotivation, intrinsic motivation, identified regulation, and external regulation, in addition to autonomy, competence, and relatedness.	Insufficient focus on the full spectrum of SDT and inclusion of all SDT mini theories in a single study.
Sample Type	Include diverse samples of lecturers and students.	Lack of attention toward lecturers as sample.

Table 3. Cont.

Dimension	Future Direction	Research Gap
Methodology and Statistics	Future analysis techniques will be dominated by either CB-SEM or PLS-SEM, both of which are Structural Equation Models.	Qualitative and mixed methods constitute a methodological gap.
Location	Asia continues to emerge as a major research location.	Africa and South America require additional study.
Future Work	Quantitative analysis as the main choice of research approach.	Methodological improvement using larger sample, longitudinal research design, and time-series research design.

## 7. Limitations

At the end of September 2022, the Scopus and Web of Science data search was conducted. There is a possibility that some 2022 articles were not included because they were indexed after the data search was complete. Articles that are not indexed by Scopus or Web of Science are also exempted from this review. There is a small possibility that articles were removed inadvertently due to human error, but steps have been taken to ensure that a sufficient number of relevant articles were analyzed for this review.

## 8. Conclusions

SDT is a central motivational theory that has received considerable attention in education. As the significance of online learning increased, the knowledge gap regarding advancements, future directions, and research gaps in this field of study became more important. This new systematic review of the literature examined the identified studies in terms of theory integration, sample type, methodological and statistical component, location, and future work. It is suggested that SDT should integrate with other theories and models in the future, as well as include lecturers or a mixed sample of lecturers and students in future research. As qualitative and mixed-methods research have yet to be exhaustively explored, quantitative analyses such as the Structural Equation Model are anticipated to remain a popular option. With research in other continents, such as Africa and South America, the scientific community may be able to comprehend the SDT in university-level online education in a more comprehensive and profound manner. Using a larger sample size and a more complex research design, such as longitudinal, time-series, and experimental studies, are two methods for bridging the research gap for future studies.

This new systematic review synthesized the future direction that SDT should be integrated with other theories, with the integration of acceptance models such as TAM and UTAUT as well as cognitive theories serving as a bridgehead. It is anticipated that SDT research will include a greater number of SDT factors, such as amotivation, intrinsic motivation, identified regulation, and external regulation, using mixed samples of lecturers and students. Quantitative approaches and Asia will continue to be relevant with an emphasis on the Structural Equation Model analysis technique.

Lack of research on the integration of SDT with other appropriate theories, full-spectrum SDT, and the inclusion of all SDT mini-theories in a single study were identified as research gaps. In addition to methodological gaps such as a lack of qualitative research, the need for a larger sample size, and the improvement of research design through the implementation of longitudinal and time series design, there is a gap in the sample of lecturers. It is anticipated that future research in South America and Africa will contribute to the global understanding of SDT, particularly in university-level online education.

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## Appendix A

**Table A1.** List of Sampled Articles.

Label	Article	Theories	SDT Factors	Sample	Research Approaches	Analysis	Research Location	Future Work
A1	[46]	SDT	Autonomy, Competence, Relatedness, Amotivation	Students	Mixed-Methods	Factor Analysis <i>t</i> -Test	USA	Larger sample
A2	[14]	SDT, ARCS, McClelland's needs	Autonomy, Competence, Relatedness	Lecturers and students	Mixed-Methods	PLS-SEM	Indonesia	Larger sample
A3	[15]	SDT	Autonomy, Competence, Relatedness	Students	Qualitative	Thematic	Russia	Sample beyond Russia
A4	[16]	SDT, Engagement Theory	Autonomy, Competence, Relatedness	Students	Qualitative	Qualitative	Hong Kong	Longitudinal design
A5	[66]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	Regression	USA	Structural Equation Model
A6	[58]	SDT, Control Value Theory of Emotion	Autonomy, Competence, Relatedness	Students	Quantitative	CB-SEM	unknown	Gender differences
A7	[53]	SDT	Autonomy, Competence, Relatedness	Students	Qualitative	Content Analysis	unknown	n/a
A8	[39]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	Correlation	Iran	Control group
A9	[83]	SDT, Cognitive Theory	Relatedness	Students	Quantitative	SEM	China	More attention given to online learning about relatedness

Table A1. Cont.

Label	Article	Theories	SDT Factors	Sample	Research Approaches	Analysis	Research Location	Future Work
A10	[17]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	ANOVA, qualitative analysis	USA	n/a
A11	[59]	SDT	-	Students	Quantitative	CB-SEM	China	Larger sample, Longitudinal design
A12	[38]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	Mann-Whitney	New Zealand	n/a
A13	[74]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	Descriptive	Malaysia	Larger sample
A14	[40]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Mixed Methods	-	New Zealand	n/a
A15	[84]	SDT	Intrinsic Motivation	Students	Quantitative	SEM	South Korea	Model confirmation
A16	[68]	SDT	Autonomy, Competence, Relatedness	Lecturers	Quantitative	Correlation	Germany	Constructivism design effect toward SDT
A17	[41]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	Mann-Whitney	Jordan	n/a
A18	[60]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	CB-SEM	China	Sample beyond China, experimental and longitudinal design
A19	[18]	SDT	Autonomy, Competence, Relatedness	Lecturers and students	Quantitative	ANOVA	Germany	Data triangulation, beyond online learning
A20	[71]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	t-Test, qualitative analysis	USA	Larger sample, beyond online learning
A21	[56]	SDT	Autonomy, Competence, Relatedness	Students	Qualitative	Thematic	New Zealand	n/a

Table A1. Cont.

Label	Article	Theories	SDT Factors	Sample	Research Approaches	Analysis	Research Location	Future Work
A22	[87]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	Descriptive, qualitative	Singapore	n/a
A23	[61]	SDT, Constructivism Theory	Relatedness	Lecturers and students	Quantitative	CB-SEM	Pakistan	n/a
A24	[54]	SDT	Autonomy, Competence, Relatedness	Lecturers	Qualitative	Qualitative analysis	Belgium	Longitudinal design, extended with other theories
A25	[88]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	Bayesian Network Analysis	Cross-nations	Qualitative and longitudinal design
A26	[73]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	SEM	Ghana	Beyond Ghana
A27	[43]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	CB-SEM	Taiwan	Beyond Taiwan, experimental design
A28	[62]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	CB-SEM	USA	Longitudinal design
A29	[24]	SDT	Autonomy, Competence, Relatedness, Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	Linear Mixed Model	Belgium	n/a
A30	[44]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Mixed Methods	Correlation, content analysis	Germany	Larger sample
A31	[25]	SDT, CEF	Autonomy, Competence, Relatedness, Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	CB-SEM	Pakistan	Beyond Pakistan



Table A1. Cont.

Label	Article	Theories	SDT Factors	Sample	Research Approaches	Analysis	Research Location	Future Work
A32	[42]	SDT, TTF, Social Motivation	Autonomy, Competence, Relatedness	Students	Quantitative	PLS-SEM	Pakistan	Beyond Pakistan, longitudinal design
A33	[69]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	ANOVA	USA	Qualitative
A34	[63]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	CB-SEM	USA	Include intrinsic motivation, identified regulation, external regulation, amotivation
A35	[23]	SDT	Autonomy, Competence, Relatedness	Students	Qualitative	Thematic	Indonesia	n/a
A36	[45]	SDT	Intrinsic Motivation, Identified Regulation, External Regulation, Amotivation	Students	Quantitative	Chi-Square	USA	Person centered approach
A37	[57]	SDT	Autonomy, Competence, Relatedness	Lecturers	Qualitative	Content Analysis	USA	n/a
A38	[64]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	PLS-SEM	China	n/a
A39	[22]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	MANOVA	Belgium	Larger sample
A40	[50]	SDT	Intrinsic Motivation, Extrinsic Motivation, Amotivation	Students	Quantitative	CB-SEM	Australia	Longitudinal and time series design
A41	[89]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	Descriptive	Sri Lanka	n/a
A42	[90]	SDT	Autonomy, Competence, Relatedness	Students	Mixed Methods	Descriptive	Malaysia	Sustainable online gamification activities
A43	[72]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	MANCOVA	Austria	Beyond Austria

Table A1. Cont.

Label	Article	Theories	SDT Factors	Sample	Research Approaches	Analysis	Research Location	Future Work
A44	[65]	SDT	Autonomy, Competence, Relatedness	Students	Quantitative	PLS-SEM	USA	Add TTF to balance tech demand and cognitive processing
A45	[70]	SDT, UTAUT	Motivation, Amotivation	Students	Quantitative	ANOVA	Germany	n/a
A46	[47]	SDT	Autonomy, Competence, Relatedness, Intrinsic Motivation	Students	Qualitative	Thematic analysis	USA	n/a
A47	[55]	SDT	Autonomy, Competence, Relatedness	Lecturers and students	Qualitative	Systematic	USA	n/a
A48	[21]	SDT, Cognitive Coping Theory	Autonomy, Competence, Relatedness	Students	Quantitative	PLS-SEM	Malaysia	Comparative method, interview, focus group, longitudinal
A49	[67]	SDT	Intrinsic Motivation	Students	Quantitative	Regression	Canada	Experimental design

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