



Instructional Factors Behind Teacher Training Colleges Students' Low Motivation of Learning Mathematics in Language Education Option

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Abstract: *The present study argues that instructional factors are key determinant for teacher training colleges (TTCs) students' low motivation of learning mathematics in language education option. Findings are drawn from a large study that investigated factors behind the low motivation of TTC students in learning mathematics as a subsidiary subject. The research was informed by learning theories which affirm that what is learned depends on one's prior knowledge, on the social context for learning, and on the connections between what is being learned and the real world. Through a questionnaire and classroom observation in two teacher training colleges (TTCs), qualitative data were collected from 34 participants and analyzed using thematic approach. The theme of this study was created based on literature review and findings from respondents. The results of the study revealed that teaching strategies and teaching resources take over the mathematics content to explain the low motivation of students in language education option. Therefore, the study recommends mathematics tutors in TTCs to put more effort in using teaching and learning materials to enhance learner-centered teaching approaches.*

Keywords: *Instructional, strategies, Motivation, learning, mathematics*

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1. Introduction

Mathematics is very important in all areas of life. It helps to bring the hidden into the observable to solve real-world problems (Hodaňová & Nocar, 2016). For this reason, learning mathematics should start in pre-service (Amoo & Disu, 2012). To support effective mathematics learning, all Rwandan teacher training colleges took on the role of training future primary school teachers (MINEDUC, 2007 quoted Uworwabayeho & Muhire, 2016). In 2010, the University of Rwanda College of Education (UR-CE) reviewed TTC programs and included the modern language education option (ibid, 2016). Later, language education option introduced as one of the four options

available in TTC aims to train prospective primary teachers to establish, lead and manage a primary school (REB, 2020). In addition, students from language education option may also be well-equipped to teach the creative arts.

To the extent that REB (2019) finds the level for which mathematics is required by each TTC student, the TTC curriculum has been reviewed (REB, 2020). The revision of this curriculum separated General Science and Mathematics (GSM) into Mathematics and Integrated Science. The motive for separating mathematics and integrated science in the language education option was to ensure that the mathematics curriculum met the needs of the students (REB, 2020). Currently, language education

option students study using a competence-based approach within 60 periods per week among which only 2 periods are reserved for mathematics (REB, 2020). It is expected that the covered content will equip students in language education option with skills to apply mathematics in different contexts and solve real-world challenges (ibid., 2020). However, effective mathematics learning is influenced by numerous factors including students' motivation (Agustyaningrum et al., 2020)

According to Wæge (2010), low motivation to learn mathematics can be overcome by changing the teaching strategies. Nonetheless, as mathematics tutor in one of the sixteen TTCs, it was observed that students in the language education option continue to show low motivation to learn mathematics. These have an immediate negative impact on studying other subjects, such integrated science, hence a solution is required. Therefore, the current study while trying to identify key factors behind the low motivation of students to learn mathematics in language education option, found that instructional factors are key determinant. The study attempts to achieve its objective by focusing on the following questions: What are the instructional factors behind TTC students' low motivation of learning mathematics in language education option? How do instructional factors affect TTC students' low motivation of learning mathematics in language education option? Then, recommends what mathematics tutors should do to improve student motivation when learning mathematics.

2. Literature Review

This part highlighted conceptual definitions. It also discusses the meaning of concepts found in the study, such as the meaning of instructional strategies, motivation, and learning mathematics. In addition, it tells related literature and studies related to the study topic.

2.1 Instructional strategies

Instructional strategies are techniques that teachers use to help students become independent and strategic students (Wan, 2013). These strategies become learning strategies when students independently select the appropriate ones and use them effectively to accomplish task (Wan, 2013). Thus, constructivist approaches placed instructional strategies at the heart of curriculum (Yildirim & Kasapoglu, 2015). The instructional strategies show the ways and procedures followed by teachers to achieve the basic objectives of teaching. Hence, it is very important for teachers to confirm the instructional goal to achieve high motivation to learn mathematics (Rasmussen & Marrongelle, 2006; Shenkut Belhu, 2017). Wan (2013) added that instructional strategies can motivate students and facilitate their concentration in learning.

2.2 Motivation

Motivation is one of the dominant elements in learning mathematics (Agustyaningrum et al., 2020). The fact that motivation increases students' willingness to learn more effectively and apply learned content to new situation (Esra Meşe, 2021). In addition, motivation relates to the process of meeting internal or external needs (Vansteenkiste et al., 2009). Thus, motivation of the students in the learning process can be seen from their learning behavior (Vansteenkiste et al., 2009). Moreover, students who are highly motivated to learn work diligently on the task, show interest in a variety of problems, prefer to work independently, and are not bored when completing a task (Deringol, 2018).

According to self-determination theory, students are motivated by internal or external reasons (Dunn & Zimmer, 2020). Researchers argue that students' motivation makes mathematics learning easier, while low motivation leads to difficulties in mathematics learning (Gafoor & Kurukkan, 2015). This low student motivation is the main cause of student difficulties in learning mathematics (Gafoor & Kurukkan, 2015). On the other hand, motivation in learning is key to all other academic learning outcomes (Esra Meşe, 2021). According to (Agustyaningrum et al., 2020), low motivation affects effective learning mathematics. So, there are several factors for low motivation to learning mathematics (Shenkut Belhu, 2017).

2.3 Learning mathematics

Learning mathematics is defined as the process of acquiring new knowledge, skills and effects that are very useful in a range of situations related to quantity, space, and structure in nature (Verschaffel et al., 2012). Thus, learning mathematics has proven to be effective due to student motivation (Abramovich et al., 2019). Hence, learning mathematics can be affected by the low motivation of students (Shenkut Belhu, 2017). It is precisely the misunderstanding of mathematical concepts that leads to a lack of interest in learning mathematics (Tahir & Bakar, 2009). Therefore, learning mathematics should base on the interest and needs of students in relation with society.

2.4 Instructional factors and learning mathematics

Some researchers have agreed that reasons for teaching drive students' motivation to learn mathematics (Amoo & Disu, 2012). It is agreed that instructional reasons are the causes of students' low motivation to learn mathematics (Shenkut Belhu, 2017; White, 2001). According to extrinsic motivation theory, interest in learning mathematics is influenced by instructional reasons for teaching (Cetin-Dindar, 2016; Ullah et al., 2013). For

example, the study conducted by Shenkut Belhu (2017) showed that low student motivation was predicted by instructional strategies, curriculum, resources, and natural abilities to facilitate learning.

Researchers agree that active learning strategies return in students' motivation to learn mathematics (Anthony & Walshaw, 2009; Farah et al., 2013). Furthermore, active teaching strategies in mathematics refer to various methods used by teachers to facilitate student learning and achieve learning objectives (Deringol, 2018). In contrast, Magen-Nagar (2016) showed that teaching strategies are the reasons for low motivation to learn mathematics depending on the quality of teachers. However, the use of active teaching strategies in mathematics education improves students' motivation and mathematics skills (Walshaw, 2003). With this, students increase their interest in learning mathematics by reducing laziness (County, 2015; George & Adu, 2018). Abramovich et al. (2019) added that instructional strategies employed by teachers are very crucial in preparing future primary school teachers.

Therefore, tutors of mathematics need to help students in controlling their own learning experiences. Some researchers George & Adu (2018 and Magen-Nagar (2016) spoke about the influence of teachers on students' motivation to learn mathematics. According to Pantziara and Philippou (2015), the quality of teachers is an important determinant of student motivation in mathematics as they have key role in changing students' motivation.

In addition, the skills and directions of mathematics teachers affect students' motivation to learn mathematics (Agustyaningrum et al., 2020). The quality of teachers' use of teaching and learning materials influences students' motivation to learn mathematics. Agustyaningrum et al. (2020) mentioned that learning materials are the main reason for student motivation in learning mathematics. However, inadequate teaching and learning materials are the main reasons for students' low motivation to learn mathematics (Agustyaningrum et al., 2020). They added that lack of sufficient learning materials is the cause of students' low motivation to learn mathematics. Alkilany (2017) added that learning activities designed by mathematics teachers should allow for active student participation. In contrast, teaching and learning materials support effective learning of mathematics. This was confirmed by the study by Agyman and Nkum (2015) on 50 College of Education students in Ghana using survey research design and showed that 78% learn mathematics effectively through teaching and learning materials. Furthermore, Agyman and Nkum (2015) argue that classroom materials motivate students to learn mathematics. Therefore, teaching strategies, resources, and how students perceive mathematical content can lead students to low motivation of learning mathematics.

3. Methodology

3.1 Research design

This study followed a case study research design to determine factors behind the low motivation of students to learn mathematics. Each selected teacher training college was considered as a case study. According to Ridder (Ridder, 2017), case studies are very effective for constructivist viewpoints. This research used a qualitative methods and thematic analysis for data analysis. However, questionnaire and classroom observation were used under the following paces.

First phase: Filling open-ended questionnaire

The main aim of this study was to determine instructional factors for the low motivation of TTC students to learn mathematics in the language education option. The questionnaire contained open-ended questions which were distributed to students to express their views on learning mathematics. In addition, both tutors and students took part in answering the open questions with their own opinions.

Second phase: Observation

After completing the open questionnaire, observation in the classroom was carried out over a period of 40 minutes. It was conducted to monitor tutors' teaching strategies and student participation in the classroom.

3.2 Population and Sampling

Since there are sixteen TTCs in Rwanda, they all fitted well into this study. Among these TTCs are the four TTCs in the Southern Province. Thus, this research was conducted in the southern province of Rwanda in TTC and was of interest to all mathematics tutors and students of these TTCs as a study population. The Southern Province was selected because no other study on the low motivation to learn mathematics in the language education option had been conducted in that province. In addition, there were more accessibility options that were appropriate for this study. In addition, purposive sampling was used to select 34 participants for the study.

3.3 Research instruments for data collection

In this research, open-ended questionnaires and observations were used to collect data. Open questionnaire was designed focusing on constructivist theory. It was designed based on the information required, the target participants, the wording of the questions, the order that made sense, and the length. Participants were asked to answer all the questions asked. Each respondent gave

his/her own opinion on instructional factors that are behind students' low motivation of learning mathematics.

In addition, an observation checklist, based on the instructional strategies, classroom structure, resources, and facilities created to collect primary data on the instructional factors behind students' low motivation to learn mathematics in language education option. This observation was made in the classroom over a period of 40 minutes. It was flexible for all participants in this study as it permitted the recording of any action observed in classroom. The information gathered through classroom observation revealed actual teaching factors through classroom structure, teaching strategies, resources, and facilities.

3.4 Data analysis method

The results from open-ended questionnaire and classroom observation were gathered and analyzed by thematic analysis. This was used to prepare and organize data collected from participants, evaluate, and collate the same ideas from participants' responses, establish a set of codes, assign codes to all data collected, and link codes together in an organized manner. To ensure anonymity, codes provided from TTCS1 to TTCS30 for students and from TTCT1 to TTCT4 for Tutors. In fact, thematic analysis is used to discover instructional factors that are behind students' low motivation to learn mathematics in language education option.

3.5 Validity and reliability

The same research tools were used for all participants under the same conditions. Thus, the description of this study showed that the research results are transferable to other contexts and situations of mathematics learning. Therefore, other experts from the literature review provided more information on data collection and analysis.

3.6 Ethical considerations

The participants were requested to sign voluntary informed consent forms. This declaration of consent prompted the participants to actively fill out the open questionnaire. The completed questionnaires were kept in a secure place for confidentiality. In addition, codes were used for confidentiality reasons.

4. Results and Discussion

Findings

This section presents results and the corresponding discussions in relation to results from other researchers. Respondents at selected TTCs participated in highlighting the instructional factors behind students' low motivation to learn mathematics. Below is a summary of participants' responses to the observations and open-ended questions:

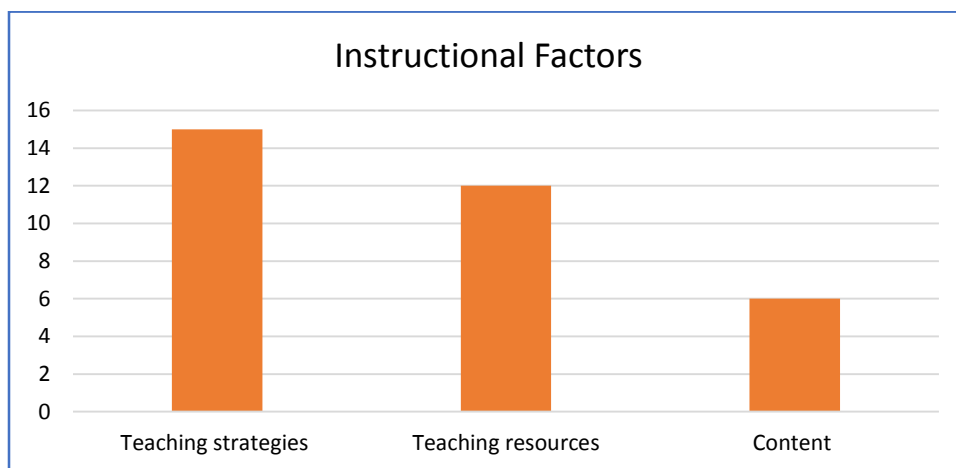


Figure1: Instructional factors

From the figure above, participants' responses were based on instructional strategies, instructional resources, and content. Below are the views of the respondents:

The respondent with code TTCS6 reported that he feels bad and bored when the tutor uses teacher-centered methods and does not use teaching aids. This causes this respondent to dislike mathematics. Other respondent TTCS14 said that teachers don't motivate them through storytelling, don't use materials, don't spend enough time on research, and don't have enough materials.

The respondent TTCS2 said that strategies used by the tutors did not encourage them, these strategies resulted in low motivation to learn mathematics. The respondent TTCS5 said that the tutors' methods put him to sleep, and the resources used by the tutors are not communicative. However, the respondent TTCS2 said that when the teacher came to class with materials, it helped slow learners learn effectively. Respondents TTCS5 and TTCS4 said that during mathematics class they sleep, and tutor did not motivate them. Other respondent TTCS1 said that strategies used by their tutors are boring strategies as

he uses simple examples in class and then asks complex questions in the exam. This causes him to reduce his motivation to learn math. In addition, he does not use any teaching aids in mathematics lessons.

The respondent TTCS13 said that most of tutors teaching mathematics in a teacher-centered manner and that there are no teaching aids in mathematics classes. This reduces my interest in learning mathematics. Another respondent TTCS2 said that poor teaching materials and beliefs reduce motivation to learn mathematics. Other respondent TTCS14 said that many materials in mathematics class are not concreted and not even used in mathematics class, and you can't show the meaning of some symbols like x and y . Other respondent TTCS1 said that poor teaching strategies and resources are not appropriate. Another respondent TTCS4 added that mathematics tutors do not use enough teaching materials, which makes him uninterested in mathematics teaching. The respondent TTCS5 said that because of the strategies used by the mathematics tutors, he always sleeps, he is passive and bored in the classroom. While another respondent TTCT2 added that best teaching strategies can help them to be engaged in their learning of mathematics.

The respondent TTCT2 indicated that teaching strategies strongly influence students' interest and motivation in learning mathematics. Other respondent TTCT1 added that when the strategy is teacher-centered, students lose interest in learning mathematics and become passive. He added that a lack of practical skills, if the materials are insufficient, students lose interest. Other respondents TTCT1 and TTCT3 said that students lose interest and develop negative attitudes in mathematics classes due to the lack of teaching materials. The respondent TTCT1 said that scarcity of materials in mathematics classes is causing students to lose interest in mathematics.

Observation conducted in the classroom showed that tutors used teacher centered as more activities were conducted by the tutor and he spoke more than students. In addition, the materials used were not sufficient. This disrupts students during teaching and learning mathematics. In addition, the students did not follow the tutor well, since the tutor did not move around the class during the lesson, even when he asked them to form discussion groups. As the teaching strategy was teacher-centered, students did not ask further questions during the lesson.

Discussion

The discussion is based on teaching strategies and resources for mathematics as created theme. Learning mathematics could be effective when tutors use a learner-centered approach that has a significant impact on students' interest, motivation, and self-direction in learning mathematics. This theme included participants' opinions on instructional factors behind students' low

motivation to learn mathematics in language education option.

As a results, most respondents indicated that well-planned and implemented classroom strategies encouraged students to learn mathematics effectively. When teaching and learning materials become limited, students become bored and lose interest. This was agreed by White (2001) and (Shenkut Belhu, 2017) that instructional strategies are at the root of students' low motivation in learning mathematics.

It is the teacher's job to choose strategies that encourage students to like mathematics. Due to that the lack of teaching and learning materials, students develop a negative attitude towards mathematics lessons. If materials are missing in class, the mathematics content will not be clear. In addition, when materials are not available, students lack practical skills and lose interest. If the tutors do not use any materials, the students hate mathematics and their motivation decreases. Therefore, due to the lack of materials, students consider mathematics as a difficult subject, and they do not enjoy mathematics because it becomes abstract and then difficult to understand. This was confirmed by Agustyaningrum et al. (2020) that inadequate teaching and learning materials are the main reasons for students' low motivation to learn mathematics.

Most of respondents also agreed that lack of teaching aids, use of teacher-centered, and poor use of teaching strategies in mathematics lesson negatively affects students' motivation. This was observed by Agustyaningrum et al. (2020) who argue that lack of enough learning materials is among the cause of students' low motivation of learning mathematics. As a result, the challenge in mathematics is to deliver a lesson with adequate learning and teaching resources (Botes & Mji, 2010).

5. Conclusion and Recommendations

This section presents the conclusion and recommendations yielded from the study. These are highlighted for each proposed research question. This study was done to determine instructional factors behind students' low motivation of learning mathematics in language education option. A sample of 34 participants was selected, all of whom are highly placed to elicit responses of instructional factors behind students' low motivation of learning mathematics among these students of language education option.

5.1 Conclusion

Based on results of the first research question, the results of this study provided the basis for research to conclude that factors such as teaching strategies, content, and

teaching materials cause low motivation to learn mathematics effectively. All mathematics tutors, students and TTCs are strongly encouraged to put more effort in the use of improvisation to create materials for effective learning of the mathematics in language education option.

The results of the second research question showed that students lose their interest and motivation when mathematics tutors use teacher-centered methods. In addition, students lose interest and motivation when since tutors do not use enough materials in mathematics class.

5.2 Recommendations

Based on the conclusion, the following suggestions are possible actions to solve the current problem related to the instructional factors behind the low motivation of students to learn mathematics. TTC should create an enabling environment and support students from language education option in learning mathematics. In addition, the availability of sufficient materials in mathematics and equipment should be present.

Therefore, concerned TTCs should provide enough materials and facilities to enable effective mathematics learning. Students in the language education option should be encouraged to learn mathematics by showing them the use of mathematics in real life. In addition, mathematics tutors should choose appropriate teaching strategies that motivate all students for each topic in mathematics to increase their motivation.

References

Abramovich, S., Grinshpan, A. Z., & Milligan, D. L. (2019). Teaching Mathematics through Concept Motivation and Action Learning. *Education Research International*, 2019. <https://doi.org/10.1155/2019/3745406>

Agustyaningrum, N., Sari, R. N., Abadi, A. M., & Mahmudi, A. (2020). Dominant Factors that Cause Students' Difficulties in Learning Abstract Algebra: A Case Study at a University in Indonesia. *International Journal of Instruction*, 14(1), 847–866. <https://doi.org/10.29333/IJI.2021.14151A>

Agyman, O. K., & Nkum, D. (2015). *Factors Influencing Students' Mathematics Performance in Some Selected Colleges of Education in Ghana*. 3(3), 68–74.

Alkilany, A. (2017). The Impact of the Use of Active Learning Strategies in the Development of Mathematical Thinking among Students and the Trend Towards Mathematics. *Journal of Education and Practice*, 8(36), 12–18.

Amoo, S. A., & Disu, A. B. (2012). School environmental factors and mathematics teaching effectiveness: Implication for e-learning. *Library Philosophy and Practice*, 2012(1).

Anthony, G., & Walshaw, M. (2009). Characteristics of effective teaching of mathematics: A view from the West. ... *of Mathematics ...*, 2(2), 147–164. [http://knowledgeportal.pakteachers.org/sites/knowledgeportal.pakteachers.org/files/resources/Characteristics of Effective Teaching of Mathematics.pdf](http://knowledgeportal.pakteachers.org/sites/knowledgeportal.pakteachers.org/files/resources/Characteristics%20of%20Effective%20Teaching%20of%20Mathematics.pdf)

Botes, H., & Mji, A. (2010). Language diversity in the mathematics classroom: Does a learner companion make a difference? *South African Journal of Education*, 30(1), 123–138. <https://doi.org/10.15700/saje.v30n1a318>

Cetin-Dindar, A. (2016). Student motivation in constructivist learning environment. *Eurasia Journal of Mathematics, Science and Technology Education*, 12(2), 233–247. <https://doi.org/10.12973/eurasia.2016.1399a>

Deringol, Y. (2018). Primary school students' mathematics motivation and anxieties. *Cypriot Journal of Educational Sciences*, 13(4), 537–548. <https://doi.org/10.18844/cjes.v13i4.3462>

Dunn, J. C., & Zimmer, C. (2020). Self-determination theory. *Routledge Handbook of Adapted Physical Education*, 55(1), 296–312. <https://doi.org/10.4324/9780429052675-23>

Esra Meşe, Ç. S. (2021). Factors influencing EFL students' motivation in online learning: A qualitative case study. *Journal of Educational Technology & Online Learning*, 4(1), 11–22. <http://dergipark.org.tr/jetolDoi:http://doi.org/10.31681/jetol.817680>

Farah, S., Kanafiah, H. M., & Jumadi, A. (2013). Students' perception towards mathematics : Attitudes, interest and lecturers' teaching. *International Symposium on Mathematical Sciences and Computing Research*, 2013(December), 6–7.

Gafoor, K. A., & Kurukkan, A. (2015). Why high school students feel mathematics difficult? An exploration of affective beliefs. *UGC Sponsored National Seminar on Pedagogy of Teacher Education Trends and Challenges*, August, 1–6. <https://files.eric.ed.gov/fulltext/ED560266.pdf>

George, A., & Adu, E. O. (2018). Motivation and attitude of grade nine learners towards mathematics in King Williams Town Education District, South Africa. *Ghana Journal of Development Studies*, 15(1), 135. <https://doi.org/10.4314/gjds.v15i1.7>

- Hodaňová, J., & Nocar, D. (2016). Mathematics Importance in Our Life. *INTED2016 Proceedings*, 1(March), 3086–3092. <https://doi.org/10.21125/inted.2016.0172>
- Magen-Nagar, N. (2016). The effects of learning strategies on mathematical literacy: A comparison between lower and higher achieving countries. *International Journal of Research in Education and Science*, 2(2), 306–321. <https://doi.org/10.21890/ijres.77083>
- Pantziara, M., & Philippou, G. N. (2015). Students' Motivation in the Mathematics Classroom. Revealing Causes and Consequences. *International Journal of Science and Mathematics Education*, 13(January), 385–411. <https://doi.org/10.1007/s10763-013-9502-0>
- Rasmussen, C., & Marrongelle, K. (2006). Pedagogical content tools: Integrating student reasoning and mathematics in instruction. *Journal for Research in Mathematics Education*, 37(5), 388–420.
- REB. (2020). *Competence-Based Curriculum Summary of Curriculum Framework for Teacher Training Colleges*. 1–70.
- Ridder, H. G. (2017). The theory contribution of case study research designs. *Business Research*, 10(2), 281–305. <https://doi.org/10.1007/s40685-017-0045-z>
- Shenkut Belhu, H. (2017). Factors Affecting Learning Mathematics in the Case Assosa University Collage of Natural Science. *International Journal of Education, Culture and Society*, 2(1), 6. <https://doi.org/10.11648/j.ijecs.20170201.12>
- Tahir, I. M., & Bakar, N. M. A. (2009). Influence of Demographic Factors on Students' Beliefs in Learning Mathematics. *International Education Studies*, 2(3), 120–126. <https://doi.org/10.5539/ies.v2n3p120>
- Ullah, M. I., Sagheer, A., Sattar, T., & Khan, S. (2013). Factors Influencing Students Motivation to Learn in Bahauddin Zakariya University, Multan (Pakistan). *International Journal of Human Resource Studies*, 3(2), 90. <https://doi.org/10.5296/ijhrs.v3i2.4135>
- Uworwabayeho, A., & Muhire, I. (2016). Statistical Analysis of TTC Students' performance in the examinations for the Award of a Primary Teacher Education Certificate. *Rwandan Journal of Education*, 3(2), 51–62.
- Vansteenkiste, M., Sierens, E., Soenens, B., Luyckx, K., & Lens, W. (2009). Motivational Profiles From a Self-Determination Perspective: The Quality of Motivation Matters. *Journal of Educational Psychology*, 101(3), 671–688. <https://doi.org/10.1037/a0015083>
- Verschaffel, L., Dooren, W. Van, & Smedt, B. De. (2012). Encyclopedia of the Sciences of Learning. *Encyclopedia of the Sciences of Learning*, 2107–2110. <https://doi.org/10.1007/978-1-4419-1428-6>
- Wæge, K. (2010). of, Motivation for Learning Mathematics in Terms Goals, Needs and. *Inrp*, 86.
- Walshaw, M. (2003). Pre-service Mathematics Teaching in the Context of Schools: An Exploration into the Constitution of Identity. *Journal of Mathematics Teacher Education*, 7(1), 63–86. <https://doi.org/10.1023/b:jimte.0000009972.30248.9c>
- Wan, M. (2013). Instructional Strategies. *Incidental Trainer*, 35–46. <https://doi.org/10.1201/b16069-7>
- White, J. N. (2001). Socioeconomic, Demographic, Attitudinal, and Involvement Factors Associated with Math Achievement in Elementary School. *Electronic Theses and Dissertations, Paper 77*, 110. <http://dc.etsu.edu/etd/77>
- Yildirim, A., & Kasapoglu, K. (2015). Teachers' perceptions of constructivist curriculum change as a predictor of their perceptions of the implementation of constructivist teaching–learning activities. *Asia Pacific Education Review*, 16(4), 565–577. <https://doi.org/10.1007/s12564-015-9394-5>