



Comparison the Effect of Gagne's Educational Model and Keller's Educational-Motivational Model on Academic Motivation and Achievement of Seventh Grade Students

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Purpose: One of the main goals of the education system is to improve the academic performance of students. Therefore, the aim of this study was to comparison the effect of Gagne's educational model and Keller's educational-motivational model on academic motivation and achievement of seventh grade students.

Methodology: This was a quasi-experimental study with pretest and posttest design with control group. The research population was seventh grade students of Zahedan city in 2019-20 academic years, which from them 60 people who were selected by purposive sampling method and randomly replaced in three equal groups including two experimental groups and one control group. The first experimental group was trained by Gagne's educational model method and the second experimental group was trained by Keller's educational-motivational model method for eight sessions of 45 minutes and the control group was trained by conventional method. Data were collected by academic motivation questionnaire (Harter, 1981) and research-made academic achievement test and analyzed by multivariate analysis of covariance and Bonferroni post hoc test in SPSS software.

Findings: The findings of the present research showed that both methods of Gagne's educational model and Keller's educational-motivational model in compared to the control group significantly increased academic motivation and academic achievement of students ($P < 0.05$), but there was no significant difference between the two educational methods in increasing their academic motivation and academic achievement ($P > 0.05$).

Conclusion: According to the results of this study, to increase and promote academic motivation and academic achievement of students can be used both methods of Gagne's educational model and Keller's educational-motivational model.

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1. Introduction

Study period is one of the most important periods of people's lives, which affects people's learning and future success, and the capabilities and merits acquired during this period affect the student period and other academic periods (Chon and Shin, 2019). In all educational systems, including the educational system, the effort has been to make students interested and motivated in the subjects in order to have better academic functions (Amit-Aharon, Melnikov and Warshawski, 2020). Undoubtedly, not all students have a high motivation to learn and this causes academic failure. Motivation is the force that creates, maintains and guides behavior, and academic motivation is the internal processes that stimulate and maintain activity to achieve academic goals (Jiang, Rosenzweig and Gaspard, 2018). Motivation is a set of internal and external factors that prompts a person towards an activity and goal, guides it and causes it to continue (Nishimura and Sakurai, 2017). Academic motivation as one of the main goals of education is a means to help learn lessons and general and professional skills (Ricard and Pelletier, 2016). This motivation refers to the desires, needs and factors that cause a person to be present in different educational situations and achieve academic goals (Froment and Gutierrez, 2022). Academic motivation is the basis of learning and academic progress, and if methods and ways of motivation are injected and taught to students and teachers, we can have a society with educated people and motivated and hopeful people in the direction of academic progress and work and life progress (Wasityastuti, Susani, Prabandari and Rahayu, 2018).

Academic progress is one of the important indicators for evaluating the education system, which is used to predict the future scientific status of the country (Torvik, et al, 2021). In addition, academic progress has always been important for teachers, students, parents, researchers and educational theorists (Watson, Dumuid, Maher and Olds, 2022). As a multidimensional or multifactorial variable, this construct refers to a person's learned or acquired ability in academic subjects and goals, which is evaluated through standardized and non-standardized tests (Faught, Qian, Carson, Storey, Faulkner, Veugelers and Leatherdale, 2019). Academic progress indicates the degree of achievement of acquired abilities and skills and the degree of progress of learners in education according to educational goals (Marciano and Camerini, 2021). Students with high academic achievement usually gain the approval and acceptance of parents, teachers and peers and have high self-confidence and self-efficacy, on the other hand, low academic achievement causes feelings of inferiority and ineffectiveness and doubts about abilities and sufficiency (Kulkarni and Sullivan, 2022).

Today, the teaching and learning process is one of the most basic issues of education that has attracted the attention of educational science experts, and educational technology is a branch of educational science that aims to facilitate, accelerate and deepen learning. Educational technology seeks to answer the question of how to make education more effective and productive (Barzegar and AliAbadi, 2013). Educational design is one of the main pillars of educational technology, which means prescribing or predicting the desired educational methods to achieve the desired changes and transformations in the knowledge, skills and emotions of learners (Andersen, Guinea, Reid-Searl and Levett-Jones, 2021). Educational design means preparing specific programs to achieve educational goals. In other words, whenever a series of activities and educational methods are predicted and adjusted to achieve a series of knowledge, attitudes and skills as educational goals, that means educational design has taken place (Peahl, Tarr, Has and Hampton, 2019). Educational design is based on teaching and learning theories; So that an educational designer takes his basic principles from learning theories and designs different models according to educational needs, topics and educational goals (Ziegler, Minkalis, Langdon and Vining, 2022).

One of these models that can play an effective role in improving academic performance is Gagne's educational model (Sarawathi & Stanly, 2019), which is derived from the cognitive approach and includes nine stages of attracting attention, informing about educational goals, recalling past learning, presenting materials Teaching is providing learning guides, performance testing, providing feedback related to performance accuracy, performance evaluation and persuasion and facilitating recall and transfer of learning (Merrotsy, 2017). Based on this model, the learning outcomes are divided into five categories of mental skills, cognitive strategies, verbal information, motor skills and attitudes, which require a series of nine educational events, including

attracting attention, informing learners of educational goals, reminding of previous learning, Providing learning stimulating materials, providing conditions for guidance, testing performance, providing feedback, evaluating performance and increasing retention and transfer of knowledge and skills (Woo, 2016). Gagne believes that if education is to become effective learning, it must be formed in such a way that it is based on the internal processes of learning, and he defined educational design as the design of a set of intentional events that are designed to support the internal processes of learning (Berger-Estilita and Greif, 2020).

Another effective model for improving academic performance is the educational-motivational model of Keller (Goksu & Bolat, 2021), which is derived from the expectation-value approach and its purpose is to motivate learners to learn more, which should also be used in the preparation and production of programs. lesson and its implementation should be considered (Wu, 2018). In his educational-motivational design, Keller combines theories and motivational strategies with educational design and forms a practical approach that causes learners to try harder to achieve educational goals and to create motivation in learning the four factors or strategies of attention, communication, trust and It raises satisfaction (Li and Keller, 2018). In his educational design, motivational design as a process of arranging resources and instructions to change people's motivation, as well as strategies, principles and processes that are used to make education attractive for learners, does not happen in isolation from other factors that affect learning, but is a process that It makes sense in combination with systematic educational design (Simsek, 2014). In describing these four factors, it can be said that the attention strategy to arouse and maintain the sense of curiosity and attention, the communication strategy that is related to the needs, interests and motivations of the learners, the self-confidence strategy that helps students to develop positive expectations and successful progress, and the satisfaction strategy that It provides external and internal reinforcements for effort and activity (Daugherty, 2019). In the educational-motivational model, the students' motivation is first analyzed and their motivational problem is identified. Then, about the design of educational strategies, brainstorming takes place and motivational strategies are recorded and the most suitable strategy is selected (Luo, Liu and Li, 2022).

In the following, the results of the most important researches about the effect of Gagne's educational model and Keller's educational-motivational model on academic motivation and academic progress are reported. The results of Jaiswal's research (2019) showed that the learner-centered educational approach based on Gagne increased the retention and transfer of knowledge, motivation and acceptance of successful language learning. Khazaie & Moradi (2017) concluded that e-learning based on the Gagne model increased the motivation and academic progress of medical students. In another study, Abdoli, Aliabadi, Moradi & Mehrvarz (2016) reported that there was no significant difference between Bybee and Gagne teaching methods in increasing students' motivation, and both increased it, but Gagne's teaching method compared to Bybee's teaching method increased Their learning became meaningful. The results of Maleki's (2014) research showed that both Gagne and Bybee's five-stage educational models increased the motivation of students' academic progress, and the effect of Bybee's five-stage educational model was greater than that of Gagne's educational model. Barzegar & AliAbadi (2013) concluded that the Gagne and Briggs educational model significantly increased students' learning and memorization compared to the control group, but there was no significant difference in terms of motivation for academic progress. In another study, Neo & Neo (2010) reported that teaching based on Gagne's approach in a multimedia-oriented learning environment increased students' motivation. Also, Hosseinzade, Shahamat Dehsorkh and Vaghari Zamharir (2020) concluded that Keller's motivational design model increased the motivation of elementary school students. The results of Dincer's research (2020) indicated the effect of Keller's educational model based on four parts of interest, communication, confidence and satisfaction on increasing motivation. Ghasemi Samani, Falahi & Komasi (2020) concluded that Keller's motivational teaching model increased learning and motivated students' academic progress. In another study, Saravani, Mirzahosseini & Zargham Hajebe (2019) reported that Keller's educational-motivational design increased the motivation of medical students. Zandi, Hatami, Fardanesh & Talae (2017) conducted a research on the combination of motivational factors and volitional control through the combination of Merrill and Keller's educational models and concluded that this integrated teaching method

increased students' learning and motivation. In another study, Kurt & Kecik (2017) reported that Keller's four-part motivational model of interest, connection, confidence, and satisfaction increased students' motivation.

Today, it has been proven that educational models play an important role in improving academic performance, and based on this, educational science experts are very interested in educational design and presenting different models in this field. Among the common educational models in this field, we can mention Gagne's educational model and Keller's educational-motivational model. Gagne's educational model is derived from the cognitive approach and Keller's educational-motivational model is derived from the expectation-value approach. There have been researches about the effect of each on academic motivation and academic progress, but no research has been found comparing their effect. Using the results of this study, it is possible to provide a more effective educational model to improve and promote the academic motivation and academic progress of students. Therefore, the aim of this study was to compare the effect of Gagne's educational model and Keller's educational-motivational model on the motivation and academic progress of seventh grade students.

2. Methodology

This study was practical in terms of purpose and semi-experimental in terms of execution method with a pre-test and post-test design with a control group. The research population was the 7th grade students of Zahedan city in the academic year of 2019-20, 60 of them were selected by purposeful sampling method and randomly divided into three equal groups including two experimental groups and one control group. In the purposeful sampling method, the researcher selects a number of samples according to the criteria he has already determined. For example, among these criteria, we can mention gender, lack of failure in previous grades, willingness to participate in research, having a mobile phone, tablet or computer to receive virtual education during the Corona era, living with parents, etc.

To conduct this research, sampling was done after coordinating with the officials of Zahedan Education Department and when the samples reached 60 people, the sampling ended and they were randomly replaced in three equal groups. The first experimental group was trained with the Gagne educational model method and the second experimental group was trained with the Keller educational-motivational model method for eight sessions of 45 minutes, and the control group was trained with the conventional method. The selected content for designing with Gagne's educational model and Keller's educational-motivational model included the eighth chapter of their science book entitled Energy and its transformations. The desired content with the help of three top teachers of science courses and three educational psychology specialists in the form of the Gagne educational model with regard to nine educational events including attracting attention, informing learners of educational goals, reminding students of previous learning, providing stimulating learning materials, Providing conditions for guidance, testing performance, providing feedback, evaluating performance and increasing maintenance and transfer of knowledge and skills in the form of Keller's educational-motivational model according to the four parts of interest, communication, confidence and satisfaction designed and through WhatsApp during eight sessions for They were sent. In addition to the demographic information form, all three groups responded to Harter's academic motivation questionnaire (1981) and the researcher-made test of academic progress in the science course in the pre-test and post-test stages.

Academic motivation questionnaire: The said questionnaire was designed by Harter in 1981 with 33 items. The items are graded using a five-point Likert scale, including strongly disagree (score 1), disagree (score 2), have no opinion (score 3), agree (score 4) and completely agree (score 5) and some items are scored inversely. The score of the tool is calculated with the total score of the items and the minimum score is 33 and the maximum score is 165, and a higher score indicates a higher academic motivation. The construct validity of the instrument was confirmed by the factor analysis method and its reliability was estimated at 0.74 by the 6-week retest method (Lepper, Corpus & Iyengar, 2005). In Iran, Najafi, Nosrati Heshi, Hatami & Motaghi

(2015) obtained a reliability value of 0.82 using Cronbach's alpha method. In the present study, the reliability value was calculated using Cronbach's alpha method of 0.85. Researcher-made academic achievement test: This test was designed by researchers with 20 questions. The questions were designed based on the content of the textbook by a number of prominent researchers (5 people) in the course of experimental sciences in the form of four options. The face validity of the test was confirmed by the teachers of the experimental science course and its reliability was calculated using the Kuder-Richardson method of 0.89.

After collecting the data with the academic motivation questionnaire and the researcher-made test of the academic progress of the science course, the data were analyzed with the method of multivariate covariance analysis and the Bonferroni post hoc test in the SPSS software at a significance level of 0.05.

3. Findings

There was no dropout in any of the test and control groups, and analyzes were performed for three groups of 20 people, and the results of frequency and percentage of demographic information of the samples (gender and education of parents) can be seen in Table 1.

Table 1. Results of frequency and frequency percentage of demographic information of the samples

Variable	Levels	Gagne Educational Model Group frequency (%)	Keller's educational- motivational model group frequency (%)	control group frequency (%)
gender	Girl	(60%) 12	(50%) 10	(45%) 9
	Boy	(40%) 8	(50%) 10	(55%) 11
Father's education	High school	(25%) 5	(30%) 6	(20%) 4
	diploma	(20%) 4	(15%) 3	(25%) 5
	Bachelor's degree	(35%) 7	(40%) 8	(30%) 6
	Above bachelor's degree	(20%) 4	(15%) 3	(25%) 5
mother's education	High school	(30%) 6	(25%) 5	(20%) 4
	diploma	(30%) 6	(25%) 5	(35%) 7
	Bachelor's degree	(25%) 5	(30%) 6	(30%) 6
	Above bachelor's degree	(15%) 3	(20%) 4	(15%) 3

The average results and standard deviation of students' academic motivation and academic progress can be seen in Table 2, separated by pre-test and post-test stages.

Table 2. Mean and standard deviation results of the pre-test and post-test of academic motivation and academic progress of the samples

Variable	Levels	Gagne Educational Model Group	Keller's educational- motivational model group mean (standard deviation)	control group mean (standard deviation)
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		mean (standard deviation)		
educational motivation	pre- exam	(5/11) 64/35	(6/45) 63/40	(8/71) 63/80
	post- test	(4/82) 77/95	(6/02) 74/95	(8/88) 63/70
Achievement	pre- exam	(1/75) 15/35	(1/10) 15/55	(1/44) 15/05
	post- test	(1/01) 18/90	(1/05) 18/80	(1/63) 15/15

Examining the assumptions of multivariate covariance analysis showed that the assumption of normality of the variables of academic motivation and academic progress based on the values of the Kolmogorov-Smirnov test for the groups in the pre-test and post-test stages, the assumption of homogeneity of variances of the variables based on the values of Levin's test, the assumption of homogeneity of covariance's based on the values of the M test box and the assumption of homogeneity of the slope of the regression lines of the variables was confirmed based on the interaction between the group and the pre-test ($P < 0.05$). The results of multivariate tests to determine the effect of Gagne's educational model and Keller's educational-motivational model on the motivation and academic progress of the samples can be seen in Table 3.

Table 3. The results of multivariate tests to determine the impact of Gagne's educational model and Keller's educational-motivational model on the motivation and academic progress of the samples

exams	Value	F statistic	P-Value	Eta squared	Statistical power
Pillai effect	0/73	37/46	0/001<	0/95	1/00
Wilks Lambda	0/21	37/46	0/001<	0/95	1/00
Hotling's work	4/25	37/46	0/001<	0/95	1/00
The largest zinc root	4/25	37/46	0/001<	0/95	1/00

As can be seen in Table 3, the intervention methods, namely Gagne's educational model and Keller's educational-motivational model, at least caused a significant change in one of the variables of students' academic motivation and academic progress, and 95% of the changes in the variables were the result of the intervention methods ($P < 0.001$). The results of multivariate covariance analysis to determine the effect of Gagne's educational model and Keller's educational-motivational model on each of the variables of motivation and academic progress of the samples can be seen in Table 4.

Table 4. The results of multivariate covariance analysis to determine the effect of Gagne's educational model and Keller's educational-motivational model on each of the variables of motivation and academic progress of the samples.

Variable	Source	mean square	F statistic	P-Value	Eta squared	Statistical power
educational motivation	group	421/68	42/55	0/001<	0/96	1/00
Achievement	group	35/97	34/70	0/001<	0/93	1/00

As can be seen in Table 4, the intervention methods, i.e., Gagne's educational model and Keller's educational-motivational model, caused a significant change in both variables of academic motivation and academic progress of students, with 96% change in academic motivation and 93% change in academic achievement as a result of the intervention methods. was ($P < 0.001$). The results of Bonferroni's post hoc test to compare

the effect of Gagne's educational model and Keller's educational-motivational model on the variables of motivation and academic progress of the samples can be seen in Table 5.

Table 5. Bonferroni's post hoc test results to compare the effect of Gagne's educational model and Keller's educational-motivational model on the variables of motivation and academic progress of the samples

Variable	Groups		mean difference		P-Value
educational motivation	Gagne's model	educational Control	14/20		0/001<
	Keller's model	educational Control	11/20		0/001<
	Gagne's model	educational Keller's model	3/00	educational	0/504
Achievement	Gagne's model	educational Control	3/45		0/001<
	Keller's model	educational Control	3/15		0/001<
	Gagne's model	educational Keller's model	0/30	educational	0/472

As can be seen in Table 5, both Gagne's educational model and Keller's educational-motivational model significantly increased academic motivation and academic progress of students compared to the control group ($P < 0.05$), but between the two educational methods in increasing motivation There was no significant difference in their education and academic progress ($P > 0.05$).

4. Conclusion

Considering the importance of educational design, the aim of this study was to compare the effect of Gagne's educational model and Keller's educational-motivational model on the motivation and academic progress of seventh grade students.

The findings of this study showed that the Gagne educational model compared to the control group caused a significant increase in students' academic motivation and academic progress, which is consistent with the findings of Jaiswal (2019), Khazaie & Moradi (2017), Abdoli et al (2016), Maleki (2014), Barzegar & AliAbadi (2013), Neo & Neo (2010) were aligned. In explaining these findings, it can be said that the nine educational events of Gagne's educational model include attracting attention, informing learners of educational goals, recalling previous learning, providing learning stimulating materials, providing conditions for guidance, testing performance, providing feedback, evaluating performance and increasing retention. Transfer of knowledge and skills mentioned. Therefore, one of the positive points of the Gagne educational model is the educational event that attracts attention, and the skill of attracting attention along with the wise knowledge of the student involved in education is part of the teacher's art and can be effective in motivating students to continue learning. The event of stating the educational objectives makes the learners understand the purpose of the education and do not have an expectation that usually continues throughout the time that learning occurs. As a result, one of the strengths of Gagne's educational model is the expression of educational goals and students' familiarity with the goals. In general, it is better not to assume that students know the purpose of the lesson. In the prior knowledge retrieval strategy, previously learned organized knowledge is retrieved to become part of a larger meaningful context for the new information, and this improves learning. In the event of learning guidance, with sufficient learning guidance, students are brought to a point where they actually make the internal combined learning event happen, and the effects of learning enjoyment can be seen on their faces. They understood how to do the work and by arranging new varied tasks for the learner to

ensure that the learning was transferred in the best way. As a result, the nine educational events through improving learning can provide the basis for increasing academic motivation and academic progress in students.

Other findings of this study showed that Keller's educational-motivational model compared to the control group caused a significant increase in students' academic motivation and academic progress, which is in line with the findings of Hosseinzade, et al (2022), Dincer (2020), Ghasemi Samani, et al (2020), Saravani, et al (2019), Zandi, et al (2017) and Kurt & Kecik (2017) were aligned. In explaining these findings, it can be said that teaching and learning are among the methods that increase motivation. Therefore, improving learners' motivation can be learned with proper training. On the other hand, Keller's educational-motivational model by teaching motivational strategies and improving motivation leads to the success of learners in the teaching and learning process, and in this model, special attention has been paid to the process of theoretical and practical participation. For example, one of Keller's strategies for increasing attention is teaching the students to use the problem-solving strategy that was taught in this study. Problem solving involves taking appropriate action to remove obstacles and move towards goals, and people who learned problem solving were able to assess the situation, examine multiple solutions, and obtain correct information, and in addition, from support systems. Provide the usage and support systems you need. Another important point is that the learners under training with Keller's educational-motivational model by teaching motivational strategies were able to improve their motivation through changing learning strategies. After learning motivational strategies, these people considered the problems in the way of learning as a challenge instead of a threat and actively improved their ability to solve problems and analytical thinking and expected more success. In other words, by teaching motivational strategies, learners learned that a problem is something they have to challenge and overcome. As a result, these factors cause Keller's educational-motivational model to increase academic motivation and academic progress of students through increasing self-efficacy and academic self-esteem.

Other findings of this study showed that there was no significant difference between Gagne's educational model and Keller's educational-motivational model on students' academic motivation and academic progress. No research was found in this field, but in explaining these findings, it can be said that the efficient and practical features of each of the two methods can be mentioned. In Gagne's educational model, the nine educational events are attracting attention, informing learners of educational goals, recalling previous learning, providing stimulating learning materials, preparing conditions for guidance, testing performance, providing feedback, evaluating performance, and increasing the retention and transfer of knowledge and skills. Keller's educational-motivational model uses the four factors of interest, connection, confidence and satisfaction that both Gagne's nine educational events and Keller's four factors complement each other in particular and with their help can play an important role in increasing students' self-confidence and academic motivation. and therefore there will be no significant difference between them in increasing academic motivation.

Every research has its limitations, and the limitations of this study include the use of purposeful sampling method, lack of long-term follow-up of the results, limitation of the research community to seventh grade students of Zahedan city, and lack of examination of the results by gender. Therefore, if it is possible to use random sampling methods, to follow up the results in the long term, it is suggested to conduct the current research on students of other grades and even other cities and examine the results by gender. Another suggestion is to compare the effectiveness of Gagne's training model and Keller's training-motivational model with other training models, including Miller's training model, etc. The results of the present research have practical implications for specialists and educational planners in educational systems, including the educational system. Considering the effect of both methods of intervention, it is possible to use both Gagne's educational model and Keller's educational-motivational model to improve and improve students' academic motivation and academic progress. Therefore, they can organize in-service training courses for teachers and education teachers with emphasis on Gagne and Keller models and comparing different models with each other. Another practical suggestion to lesson planners is to include the mentioned educational models and other models in

an operational way in the book of teaching methods and models for student teachers, and for each of the models, various educational videos for different concepts should be designed and available to student teachers and even teachers and those interested in the activities put training.

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