Journal of STEM Teacher Institutes, 2022, 2(1), 33-41

Deep (Meaningful) Learning Perception Scale: Validity and Reliability*

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Abstract

This study aimed to develop a scale to determine preservice teachers' deep (meaningful) learning. The sample consisted of 175 students from the faculty of education of Mus Alparslan University. Twenty-five participants were guidance and psychological counseling students (14.3%). Seventeen participants were preschool teaching students (9.7%). Thirty-seven participants were classroom teaching students (21.1%). Twenty-eight participants were Turkish teaching students (16%). Thirty-three participants were math teaching students (18.9%). Thirty-five participants were social studies students (20%). Validity and reliability analyses were performed. The explanatory factor analysis revealed a nine-item single-factor structure that explained 54% of the total variance. The Deep (Meaningful) Learning Perception Scale (DLPS) had a Cronbach's alpha of 0.89. The results show that the instrument is a valid and reliable scale for determining preservice teachers' deep (meaningful) learning.

Received:
16 February 2022

Accepted:
1 March 2022

Published online:
1 March 2022

Keywords
Learning,
Deep learning,
Meaningful Learning,
Scale Development,

Introduction

The Teacher-centered education systems are bound to face challenges on their way to preparing students for the 21st century. In such systems, students are passive learners who regard knowledge as discrete facts and acquire information by memorizing and mimicking without using critical thinking skills. In fact, both traditional and contemporary education systems have functional and effective dimensions. However, every age comes with its own benefits and challenges within the framework of its own conditions and paves the way for some approaches and skills to stand out. Students who receive traditional education are less likely to cooperate, share ideas, create knowledge communities, design, and adapt to digital developments and cultural changes. Contemporary education views school as life itself and has a student- and activity-centered structure. It takes individual differences into account and turns students into active participants in their own learning. In contemporary education, teachers are primarily responsible for organizing educational environments and encouraging students to work together to solve problems (Şimşek, 2004).

We need to provide students with learning settings based on contemporary educational approaches to create an information society. We must motivate students, arouse their curiosity, and help them achieve high academic performance. In this context, contemporary educational approaches allow students to go beyond factual recall and procedural regurgitation and help them develop 21st-century skills (cooperation, critical thinking, problem-solving, effective communication, self-learning, etc.). Advances in science and technology have significantly improved standards and quality of life (Yıldırım, 2021). With the advancement of information and communication technologies, societies have also changed and the emerging problems have become more complex. Therefore, societies need citizens who can

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** This study is derived from the Ph.D. thesis completed in March 2021 at Ankara University by the first author under the supervision of the second author.*

comprehend and cope with changes and complex problems. Contemporary education considers students' learning styles and turns them into citizens of the 21st century.

There are two approaches to learning: deep (meaningful) learning and surface learning. However, researchers generally avoid the critical features of deep (meaningful) learning and instead use the same instruments to determine students' deep and surface learning. Researchers cannot adequately examine whether learners have deep (meaningful) learning experiences because measurement tools are insufficient to measure them. Therefore, we need an instrument to assess learners' deep (meaningful) learning experiences from different dimensions. This study aimed to develop a valid and reliable scale to determine online and face-to-face learners' deep (meaningful) perceptions.

Literature Review

Deep (meaningful) and surface learning

We should identify students' learning approaches to ensure that they achieve permanent and high-level learning (Özkan & Sezgin Selçuk, 2014). Marton and Säljö (1976) were the first to identify deep and surface approaches to learning. They conducted a study with college students. Some students read a text and regarded it as discrete pieces of information that must be memorized to answer questions. Other students tried to make sense of the text and regarded it as a whole. The first group tried to memorize the text and had difficulty answering questions. On the other hand, the second group made sense of the information in the text and answered the questions easily. Based on these results, Marton and Saljo named the first approach "surface learning" and the second one "deep learning."

According to Biggs et al., (2001), surface learning refers to the process in which students decide on when and where to fulfill tasks and organize how long it will take them to fulfill those tasks. Surface learners take a traditional approach (Dart et al., 2000). Özgür and Tosun (2013) argue that surface learning is based on the tendency to perform the learning task in a way that causes fewer problems. According to Chan (2003), surface learners are learners with fixed skills who memorize facts without understanding and interpreting them. Ramsden (2003) also maintains that surface learners are task-oriented learners who memorize formulas without understanding their embedded mechanism. In other words, surface learners view learning as a temporary task. Önder and Beşoluk (2010) also define surface learners as learners who accept new situations and ideas uncritically and keep the information as unrelated bits of knowledge.

According to Entwistle (1994), surface learners are imitators with certain characteristics:

- Intension to cope with content and tasks set
- Studying without reflecting on either purpose or strategy
- Treating course content as unrelated bits of knowledge
- Having difficulty making sense of new ideas
- Memorizing facts and procedures routinely
- Feeling undue pressure and worry about work

Deep learning aims to help students develop the skills necessary to achieve high performance academically and socially in the 21st century. Those skills are concerned with how students make sense of academic information and relate it to daily life. Therefore, deep learning adopts a constructivist approach.

According to Chan (2003), deep learners make sense of new pieces of information and relate them to one another, transfer new knowledge instead of memorizing, and reconstruct information by associating it with prior knowledge. Weinstein and Mayer (1986) state that deep learners question the authenticity of new knowledge and associate it with previous knowledge and experience. According to Trigweel and Prosser (1991), surface learners achieve low-level learning outcomes, while deep learners achieve high-level learning outcomes. Byrne, Flood, and Willis (2002) also argue that deep learners have high academic performance, whereas surface learners have low academic performance.

According to Entwistle (1994), deep learners tend to reconstruct information into a

new form. Deep learners have common characteristics:

- Intention to understand material
- Being actively interested in course content
- Relating ideas to previous knowledge and experience
- Looking for patterns and underlying principles
- Checking evidence and relating it to conclusions
- Examining logic and argument cautiously and critically

Mayer (2010) evaluates surface and deep learning outcomes regarding retention and transfer performance. According to him, surface learners have high retention but low transfer performance. However, deep learners have high retention and high transfer performance.
Mayer (2011a) argues that deep learning involves a network consisting of five kinds of knowledge:

- Facts: Factual knowledge about the world
- Concepts: Categories, schemas, models, or principles
- Procedures: A step-by-step process
- Strategies: A general method
- Beliefs: Thoughts about learning

Mayer (2010) maintains that learners who can organize those five kinds of knowledge can achieve deep learning. To him, deep learning involves coordinating those five kinds of knowledge. Learners with those five kinds of knowledge acquire a network of facts, develop procedures, schemas, mental models, and cognitive and metacognitive strategies, and have productive beliefs about learning. They develop not only the facts and procedures that support retention but also transferable knowledge.

Although many researchers focus on deep and surface learning, they cannot agree on a common framework. However, we can summarize the general characteristics of deep and surface learning approaches:

Surface learning

- Intention to cope with content and tasks
- Accepting information and ideas for what they are
- Working without reflecting on goals or strategies
- Focusing on knowledge only for exams
- Exam-oriented approach to course content
- Not recognizing that new information is built on previous information
- Imitating rather than modifying, editing, and transferring information
- Not associating ideas and experiences with previous ones
- Treating a course as discrete content
- Having difficulty understanding new ideas
- Memorizing information and applying procedures routinely
- Not reflecting on content, tasks, and strategies
- Feeling under pressure and worrying about work
- Not focusing on solving problems
- Taking shortcuts to solve problems

Deep learning

- Associating ideas and experiences with previous ones
- Focusing on the main idea or concepts
- Willingness to understand course material on one's own
- Relating course content with real life
- Deriving principles from ideas and applying them
- Engaging with course content actively
- Checking evidence and linking it to results
- Mobilizing cognitive processes
- Discovering the principles that unite ideas and using them
- Examining ideas and arguments carefully and critically
- Tending to understand topics
- Searching for patterns and basic principles
- Taking an active role in associating course content with real life

Method

This section addressed the research model, the study group, the scale development process, and the techniques used for data analysis.

Research model

This study adopted the general survey model to develop a scale to assess preservice teachers' perceptions of deep (meaningful) learning. Researchers use the general survey model to measure variables' frequency, distribution, or relationship in their natural environment (Wiersma, 1995).

Study group

The sample consisted of 175 first-year students (75 men and 100 women) from the faculty of education of Mus Alparslan University in the 2020-2021 academic year. Table 1 shows all participants' descriptive characteristics:

Table 1.
Descriptive characteristics

Major	*N*	*%*
Guidance and psychological counseling	25	14.3
Preschool teaching	17	9.7
Classroom teaching	37	21.1
Turkish teaching	28	16.0
Math teaching	33	18.9
Social studies teaching	35	20.0
Total	175	100

Scale development

First, a literature review was conducted on deep and surface learning. Then, the "Perceived Learning Scale" developed by Rovai et al. (2009) and adapted to Turkish by Albayrak et al. (2014) was examined. Moreover, the Revised Two Factor Study Process Questionnaire developed by Biggs, Kember, and Leung (2001) and adapted to Turkish by Önder and Beşoluk (2010) was analyzed. Other scales were also checked.

A pool of items was developed regarding the basic characteristics of deep (meaningful). Then a draft scale was created. It consisted of 11 items rated on a five-point Likert-type scale (1-Strongly disagree, 2-Disagree, 3-Undecided, 4-Agree, 5- Strongly agree). Afterward, analyses were performed for content and construct validity.

Results

This section focused on results on validity, reliability, and item analyses.

Validity

Six experts (three in computer and instructional technologies, one in guidance and psychological counseling, one in measurement and evaluation in education, and one in education programs and teaching) were consulted to determine the content validity of the scale. Moreover, an expert in Turkish education was consulted to assess the intelligibility and relevance of the items of the draft scale. A pilot study was conducted with three first-year students from the guidance and psychological counseling department. The draft scale was revised and finalized based on the expert feedback and the pilot study results.

A factor analysis was performed for construct validity. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used to determine whether the data were suitable for factor analysis. The KMO is about sampling adequacy. A KMO value greater than 0.60 indicates adequate sampling (Field, 2000; Tabachnick & Fidell, 2013). Bartlett's test of sphericity is based on partial correlations between scale items (Büyüköztürk, 2018). The KMO was 0.88, for which Bartlett's test of sphericity was significant ($\chi 2=753.022$, $p= .006$, $p<0.05$), indicating that the data set was suitable for factor analysis.

The factor analysis revealed a two-factor structure. Nine items (1, 2, 3, 4, 7, 8, 9, 10, and 11) were grouped under one factor, while two items (5 and 6) were grouped under the other. Items 5 and 6 were removed from the scale, and then, factor analysis was performed again. The factor analysis revealed a one-factor structure with nine items. Figure 1 shows the Scree Plot, while Table 2 shows the analysis results.

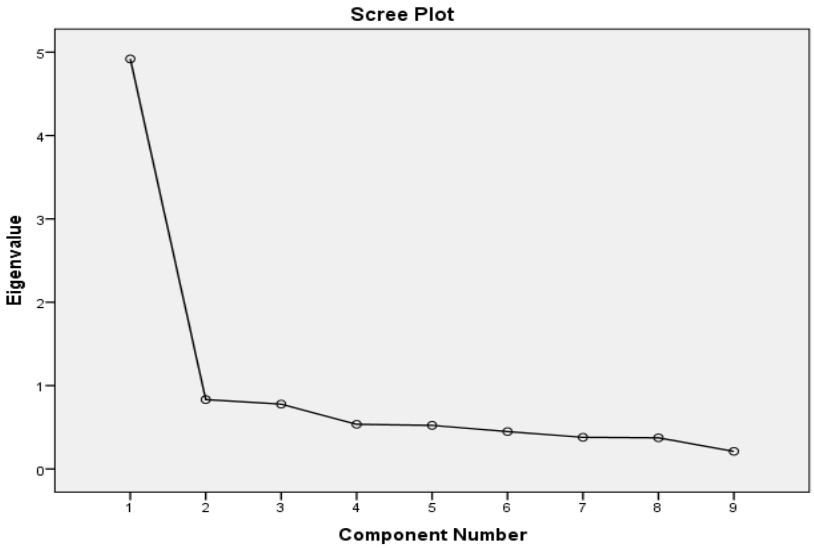

Figure 1. Scatter graph

Table 2.
Factor analysis

	Initial eigenvalues			Total variance explained Loadings		
Component	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)
1	4.91	54.65	54.65	4.91	54.65	54.65
2	.83	9.25	63.90			
3	.77	8.63	72.54			

The scale explained 54.65% of the total variance. Table 4 shows the factor loadings of the nine-item Deep (Meaningful) Learning Perception Scale (DLPS)

Table 3.
Factor loadings

Items	Factor loadings	Common factor variance
1	.69	.482
2	.72	.521
3	.75	.570
4	.75	.571
5	.58	.337
6	.77	.598
7	.76	.589
8	.78	.621
9	.79	.630

The items had factor loadings of 0.58 to 0.79 and common factor variance values of 482 to 630.

Reliability

A rule of thumb for scale development is determining reliability. There are various methods to determine the reliability of a scale (Pallant, 2016). One of those methods is calculating the internal consistency coefficient (Devellis, 2014), which refers to the relationship between items (Pallant, 2016). Cronbach's Alpha (α) internal consistency coefficient was calculated to determine the reliability of the DLPS.

A Cronbach's alpha (α) ranges from 0 to 1, with higher values indicating greater internal consistency (and ultimately reliability). The DLPS had a Cronbach's alpha of 0.89, indicating high internal consistency, and thus, high reliability.

Item factor correlations

Table 4.
Item factor correlations

Factor 1: (nine items)	
Items	Item-Total Correlation
1	.600
2	.641
3	.673
4	.680
5	.497
6	.696
7	.677
8	.711
9	.721

The scale had item-total correlations of 497 to 721, indicating that each item can be used (Büyüköztürk, 2006; Field, 2009).

Conclusion and Discussion

Although many researchers focus on deep learning, they cannot agree on a common framework regarding the concept. Different approaches address the concept of deep (meaningful) learning from various angles and highlight some of its aspects. In general, deep learners are learners who link ideas and experiences with previous ones, focus on the main idea or concepts, make a connection between course content and real life, derive principles from ideas and use them, take an active role in associating course content with real life, examine ideas and arguments carefully and critically, and mobilize cognitive processes.

This study aimed to develop a valid and reliable scale to determine preservice teachers' deep (meaningful) learning perceptions. Researchers generally ignore the important features of deep learning (Albayrak et al, 2014; Biggs et al., 2001; Önder & Beşoluk, 2010; Özgür & Tosun, 2013). In other words, they generally use the same instruments to assess both deep and surface learning approaches. They cannot adequately examine whether learners have deep (meaningful) learning experiences because measurement tools are insufficient to measure them. Therefore, we need an instrument to assess learners' deep (meaningful) learning experiences from different dimensions. In this context, this study developed a five-point Likert-type scale named the Deep (Meaningful) Learning Perception Scale (DLPS).

We think that the DLPS will make a significant contribution to the literature. First, we developed a draft scale and consulted experts for intelligibility and relevance. We sorted out the items and finalized the 11-item draft scale for application based on expert feedback. We administered the scale to 175 first-year undergraduate students. The factor analysis revealed a one-factor structure with nine items. The scale has a Cronbach's alpha of 0.89. No items are reverse-scored. The higher the score, the more likely the respondent is a

deep learner. The lower the score, the more likely the respondent is a surface learner.

In conclusion, we developed a valid and reliable scale to assess online and face-to-face learners' perceptions of deep (meaningful) learning. We think that the scale will be useful for researchers interested in assessing learners' perceptions of deep (meaningful) learning.

Suggestions for Future Studies

1. Researchers should use the DLPS to assess how students from different schools and grade levels perceive deep (meaningful) learning.
2. Researchers should use the DLPS to test learners' perceptions of deep (meaningful) learning based on different variables.
3. Researchers should use the DLPS to unveil the factors affecting learners' deep (meaningful) learning.
4. Researchers should develop measurement tools to assess learners' perceptions of deep (meaningful) learning in the eyes of teachers.

Limitations

1. The sample consisted only of 175 first-year students from the faculty of education of Mus Alparslan University in the fall semester of the 2020-2021 academic year.
2. The data were collected online due to the COVID-19 pandemic.

References

Albayrak, E., Güngören, Ö. C., & Horzum, M. B. (2014). Adaptation of perceived learning scale to turkish. *Ondokuz Mayis University Journal of Education Faculty, 33*(1), 1-14. https://doi.org/10.7822/egt252

Biggs, J. B., Kember, D., & Leung, D. Y. P. (2001). The revised two factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology, 71*, 133-149. Doi: https://doi.org/10.1348/000709901158433

Büyüköztürk, Ş. (2006). Sosyal bilimler için veri analizi el kitabı: İstatistik, araştırma deseni SPSS uygulamaları ve yorum [Data analysis handbook for social sciences statistics: Research design SPSS practices and interpretation] (6th ed.). Pegem.

Büyüköztürk, Ş. (2018). *Sosyal bilimler için veri analizi* [Data analysis for social sciences] (24th ed.). Pegem.

Byrne, M., Flood, B., & Willis, P. (2002). The relationship between learning approaches and learning outcomes: A study of Irish accounting students. *Accounting Education*, *11*(1), 27-42. https://doi.org/10.1080/09639280210153254

Chan, K. (2003). Hong Kong teacher education students' epistemological beliefs and approaches to learning. *Research in Education, 69*, 36-50. https://doi.org/10.7227/RIE.69.4

Dart, B. C., Burnett, P. C., & Purdie, N. M. (2000). Student's conceptions of learning, the classroom environment, and approaches to learning. *The Journal of Educational Research*, *93*(4), 262-270. https://doi.org/10.1080/00220670009598715

Devellis, F. (2014). *Scale development: Theory and practice (T. Totan, trans.).* Nobel.

Entwistle, N. J. (1994). Experiences of understanding and strategic studying. [Conference presentation]. AERA 1994 New Orleans.

Field, A. (2000). *Discovering statistics using spss for windows.* SAGE.

Field, A. (2009). *Discovering statistics using SPSS (3nd ed.).* SAGE.

Marton, F., & Saljo, R. (1976). On qualitative differences in learning: Outcome and process. *British Journal of Educational Psychology*, *46*(1), 4-11. https://doi.org/10.1111/j.2044-8279.1976.tb02980.x

Mayer, R. E. (2010). *Applying the science of learning*. Pearson.

Önder, İ., & Beşoluk, S. (2010). Adaptation of revised two factor study process questionnaire study (R-SPQ-2F) to Turkish. *Education and Science 35*(157), 55-67. https://doi.org/20.500.12619/44221

Özgür, H., & Tosun, N. (2012). Examination the deep and surface learning approaches of pre-service teachers in terms of some variables. *Journal of Mehmet Akif Ersoy University Faculty of Education, 1*(24), 113-125.

Pallant, J. (2016). *SPSS survival manual. A step by step guide to data analysis using IBM spss*. Balcı, S., & Ahi, B., (Ed). (6. Baskı). Anı.

Ramsden, P. (2003). *Learnig to teaching in higher education* (2nd Edition). Routhladge.

Şimşek, N. (2004). A critical approach to constructive learnıng and insruction. *The Journal of Educational Sciences and Practice, 3*(5), 115-139.

Trigweel, K., & Prosser, M. (1991). Relating approaches to study and quality of learning out-

comes at the course level. *British Journal of Educational Psychology*, *61*, 265-275. https://doi.org/10.1111/j.2044-8279.1991.tb00984.x

Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. Wittrock, ed. *Handbook of Research on Teaching* (pp.315-327). Macmillan.

Wiersma, W. (1995). *Research methods in education: An Introduction* (6th edition). Allyn Bacon.

Yıldırım, B. (2021). Integration of STEM into environmental education: Preservice Teachers' opinions. *Journal of STEM Teacher Institutes*, *1*(1), 50–57. Retrieved from http://jstei.com/index.php/jsti/article/view/5

Appendix A.

Turkish version of the original scale

Deep (Meaningful) Learning Perception Scale (DLPS)

No		Hiç katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Tamamen katılıyorum
1	Derste edindiğim bilgi ve becerileri, önceki bilgi ve becerilerimle ilişkilendirebildim.	(1)	(2)	(3)	(4)	(5)
2	…	(1)	(2)	(3)	(4)	(5)
3	Yeni edindiğim bilgi ve beceriler benim için anlamlıydı.	(1)	(2)	(3)	(4)	(5)
4	…	(1)	(2)	(3)	(4)	(5)
5	Dersi geçmek, benim tek motivasyon kaynağım değil idi.	(1)	(2)	(3)	(4)	(5)
6	Derste öğrendiklerimi gerçek yaşam uygulamalarına transfer edebilirim.	(1)	(2)	(3)	(4)	(5)
7	…	(1)	(2)	(3)	(4)	(5)
8	Çalıştığım her ders, konunun tamamını kavramam için katkı sağladı.	(1)	(2)	(3)	(4)	(5)
9	…	(1)	(2)	(3)	(4)	(5)