

Influence of students' prior learning experiences, learning conceptions and approaches on their learning outcomes



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***Abstract:** Previous studies showed that students' prior learning experiences, learning conceptions, and learning approaches influence their learning outcomes. To date, however, little is known about the extent of their relationship. This study was, therefore, conducted to clarify the relationships of these variables. Data were gathered from 119 college students. Factor analysis was used to obtain measures for prior learning experiences, learning conceptions, and learning approaches. The variable, learning outcomes, was measured through a test on students' understanding of environmental problems caused by ecologically unsound agricultural practices. The recursive path analysis showed four paths to learning outcomes. One path shows that the experience of learning as collaboration and knowledge construction leads to a conception of learning as development of perspectives. This conception positively affects learning outcomes. Another path combines the effects of the experiences of learning as knowledge construction, situated in real-life situations, and collaboration, leading students to consider learning as collaboration. This results in the use of inter-relating approaches, which in turn, produces positive effects on learning outcomes. The two other paths originate from experience of learning as absorption of information, indicating that such an experience either results in a conception of learning as intake of information or use of surface learning approaches. Both paths show negative effects on learning outcomes.*

***Keywords:** learning outcomes determinants, understanding, environmental problems*

Introduction

The issue on how to improve the quality of students' learning outcomes continues to be the focus of research in education and psychology. This interest is driven by research findings showing a mismatch between school learning and skills required by the workplace (see for instance, Tynjala, 1999; Burgess, 2000). In the literature, it is generally agreed that students' prior learning experiences, conceptions of learning, and study approaches underpin the quality of their learning outcomes. Such pioneering studies, for instance, by the Gothenburg scholars

as the concept of price (Dahlgren & Marton, 1978) showed that students who use deep approaches had deeper understanding of price. This result was replicated in a recent study on students' conceptions of mathematics (Crawford, Gordon, Nichols, & Prosser, 1998). More specifically, the study showed an association between fragmented conception of mathematics with surface approaches, while a cohesive conception, with deep approaches.

Research also shows that students' use of learning approaches is determined by their conceptions of learning. The study by Purdie, Hattie, and Douglas (1996) of Japanese and Australian students' conception of learning and their use of self-regulated learning strategies could attest to this. Among others, the study found a main effect for the "understanding" conception of learning but did not show any association between the conception of learning as memorization and total strategy use. These results were interpreted as suggesting that students who are more proactive in their learning, that is, who demonstrate greater overall use of learning strategies, are more likely to think of learning as a complex cognitive process than as a process of collecting information. The above findings corroborate the results of an earlier study by Van Rossum and Schenk (1984) showing an association between a constructive learning conception and the use of deep-level approach and relatively high quality learning outcomes.

Literature, however, reveals that students' conceptions of learning are shaped by their prior learning experiences. This is evident in a study by Eklund-Myrskog (1997) showing that educational contexts influence students' ways of experiencing learning and tackling tasks. This is consistent with the synthesis by Entwistle, McCune, and Walker (2001) indicating that meanings students attach to the concept of learning are derived from the cumulative effects of previous educational and other experiences. Watkins (2001) agrees, saying that the ways students learn are a function of how they perceive their learning task and their environment.

Based on these and other similar studies, many authors have argued that students' prior learning experiences, learning conceptions, approaches, and outcomes are related. This position is explained in Prosser and Trigwell's (1999) 3P (presage-process-product) model and Entwistle's (2000) graphical representation of the influences on students' approaches to study and learning. Accordingly, if students think of learning as reproduction of information, they will use surface learning approaches. As a result, their understanding of the subject matter is superficial. On the other hand, if they perceive learning as transformation of knowledge, they will adopt deep learning approaches, thus leading them to a thorough understanding of the topic. However, although studies conducted provide support to this position, little is known about the extent of these relationships. This study aimed to fill this gap in the literature by determining the causal relationships of these factors.

Methods

Participants

Participants in this study were 119 college students (27 male; 91 female) taking a fundamental course on ecology, a required program of study in the university where this study was conducted. Their ages ranged from 16-29 ($M = 19.31$; $SD = 1.86$). Coming from different parts of the country, students were pursuing various fields of specialization, including agriculture, communication, agricultural engineering, biology, animal science, home economics, forestry, statistics, and chemistry.

Instrument

Data were gathered using a questionnaire that contained a 4-option Likert-type scale on prior learning experiences, conceptions, and approaches. In the prior learning experiences and learning conceptions sections, students were asked to indicate their agreement to each

statement. Choices were: 4--strongly agree, 3 -- agree, 2 -- disagree, and 1--strongly disagree. The items were developed based on earlier interviews. Discussions with education professors and graduate psychology students revealed that the items were appropriate measures for the constructs but needed revisions to improve clarity.

For learning approaches, students were asked to indicate the extent to which they apply the specific strategy: 4--all the time or nearly all the time, 3 --usually, though not always, 2 -- sometimes, but mostly not, and 1 -- almost never or not at all. Items were adapted from the scale by Waugh (1999). The inventory covered five study approaches: deep approaches, strategic approaches, surface approaches, clarity of study direction, and academic self-confidence.

The questionnaire included a test on students' understanding on how such ecologically unsound agricultural practices as cultivation of hilly areas without the use of erosion control measures, excessive application of inorganic fertilizer, and heavy pesticide spraying cause sedimentation, eutrophication, and development of pest resistance, respectively. Consistent with the current thrust of higher education – that is, to equip students with skills in analysis, decision-making, and communication (Allan, 1995)– the test asked students to reason and explain. Specifically, the question was: “How could cultivation of hilly areas without the use of erosion control measures (or excessive application of inorganic fertilizer or heavy pesticide spraying) cause sedimentation (or eutrophication or development of pest resistance)? What techniques should farmers use to help minimize these problems?” Prior to data gathering, a series of pretests was conducted to improve the comprehensibility of the items and the test.

Procedures

The questionnaire was administered during regular classes. Prior to data gathering, arrangements were made with the instructors. Data gathering proceeded only after obtaining the instructors' consent. Before answering the questionnaire, a short orientation was conducted to explain the purpose of the study. Students were also assured of the confidentiality of their identity.

Students were requested to work independently. Thus, talking was discouraged while answering the questionnaire. When they had questions, they were requested to approach the researcher (the first author who gathered the data). Average time spent to answer the questionnaire was 75 minutes.

Scoring and analysis

The variable, learning outcomes, was measured by taking the students' scores of their explanation of the environmental problems. The second author, whose background is on watershed management and forest influences, evaluated the answers blind using the following criteria: completeness and correctness (for discussion of the problems) and completeness, correctness, appropriateness, and functionality (for the recommendations). The highest possible score for each problem was 100%. The mean score from the three problems was taken as index for learning outcomes. The ANOVA showed that although the students were in different year levels, their understanding score was not significantly different ($F(3,115) = .83, p > .10$).

For prior learning experiences, learning conceptions, and approaches, students' mean score in each factor was used as index. As will be explained below, the factors were determined through a principal components analysis with promax rotation. The path analysis was used to determine the causal relationships of the variables.

Results and discussion

Prior learning experiences, learning conceptions, and approaches

Factor analysis was conducted to obtain measures for prior learning experiences, learning conceptions, and learning approaches. The method involved repeated analyses and inspections. Items that did not show clear loadings in a factor – that is, items that had a magnitude of less than .40 or had an absolute discrepancy with any other factor of less than .10 – were deleted. Table 1 presents the scales and typical items of each factor.

The analysis showed four distinct dimensions that represent students' learning experiences in their classes. The first factor groups statements referring to experiences in collaborative learning. Items in this factor are on the advantages of group learning: collaborative learning provides them the opportunity to share their ideas and opinions and develops their interpersonal relations skills. In the second factor, items pertaining to learning experiences characterizing absorption of information showed high loadings. In this factor, students feel that their examinations are based on facts, they memorize terms and concepts, cram around examination time, and change in opinions and ideas is less emphasized. Items in the third factor have something to do with experiences in situated learning. Performance evaluation focuses on the process and outputs, not on examination scores. Activities emphasize application of understanding to the students' day-to-day activities and relating experiences in class discussions. Factor 4, on the other hand, have items relating to students' experience of constructing knowledge. Students choose their own methods of learning and explore their own meaning.

Results also showed three discernible dimensions representing students' understanding of the concept of learning. The first factor can be interpreted as conception of learning as development of perspective. In this factor, students think of learning as looking for relationships, development of new perspectives, change of ideas and opinions, making sense of the world, applying understanding to a new situation, and change of behavior as a result of understanding. The second factor relates to a view in which a lot of value is attached to studying in cooperation with fellow students and sharing the tasks of studying with them. According to this conception, collaborative learning facilitates accomplishment of learning tasks, enables them to refine their ideas and concepts, widens their perspectives, and develops teamwork. The third factor refers to a conception that learning is intake of information. More specifically, the items pertain to the view that learning is memorization and regurgitation of information during examinations, listening to lectures, and performing skills as described in manuals. Most importantly, students think that learning is an activity done by a teacher to the students.

As regards learning approaches, the analysis showed five distinct dimensions. Factor 1, like that in Waugh's (1999) scale, showed substantial loadings of items that pertain to students' feelings of confidence in their studies. These include the feelings that they understand the subjects they are studying, ease in performing learning tasks, and confidence of their ability to achieve the standards set for themselves. The second factor duplicates the Strategic Approaches Subscale in Waugh's scale. Items are on students' desire to achieve higher in their studies, exerting efforts in their studies, systematic organization of their activities, and proper time management. Factors 3 and 4 are composed of items classified under the deep approaches subscale in Waugh's scale. In this study, however, Factor 3 shows substantial loadings of items about students' use of evidence to arrive at a conclusion. Factor 4, on the other hand, are strategies where students relate and connect concepts and ideas to seek for understanding. These concepts may be in the same or in other fields. Factor 5 shows loadings of items on surface approaches. These include unclear study direction (taking a course just to

please other people, other people's influence on the choice of subjects, and unclear reasons for studying) and surface approaches (coping and reading without understanding).

Table 1. Scales and typical items for prior learning experiences, conceptions of learning, and learning approaches.

Scales and Subscales	Sample Items	Percentage contribution	Cronbach's α
Prior learning experiences		47.64	.77
Collaborative learning	In our group work, we learn different information and ideas from our classmates.	20.01	.76
Absorption of information	Our examinations focus more on testing what we have memorized rather than what we have understood.	12.32	.75
Situated learning	Things we discuss in our classes are relevant to our daily life.	7.89	.65
Construction of knowledge	In our classes, we are able to form new ideas and opinions, not just take the teacher's point of view.	7.42	.61
Conceptions of learning		44.14	.84
As development of perspectives	Learning is seeing things and issues from a different point of view.	26.05	.83
As collaboration	Group work facilitates accomplishment of learning tasks – i.e., assignments, projects, and other requirements.	7.64	.79
As intake of information	Learning is answering such objective type of examinations as enumeration, filling the blanks, or multiple choice tests.	7.64	.64
Learning approaches		50.27	.83
Academic self-confidence	I feel I have a good understanding of the subjects I'm taking.	23.89	.78
Strategic approach	I aim to be systematic and organized when I study a lesson.	8.05	.77
Use of evidence	I try to look at the evidence carefully and reach my own conclusions.	7.21	.72
Inter-relating	I relate ideas from other topics and other courses whenever possible.	5.93	.73
Surface approaches	I drift into studying various subjects without deciding for myself what I really want to do. I feel I'm drowning in large amount of materials to cope with my course.	5.69	.65

Grasping the causal relationships

The central focus of this study was to determine the causal relationships of prior learning experiences, learning conceptions, learning approaches, and learning outcomes. Thus, a recursive path analysis using multiple regression was done. Recursive path analysis allows the

estimation of direct and indirect relationship between variables. The prediction variables were prior learning experiences. Endogenous variables were learning conceptions, strategies and outcomes. Figure 1 shows four paths with different effects on learning outcomes: from conception of learning as development of perspectives, use of inter-relating approaches, conception of learning as intake of information, and use of surface approaches. Based on the coefficients, the effects of conception of learning as development of perspectives and use of inter-relating approaches are positive but are only marginally significant ($\beta = .21, p < .10$ and

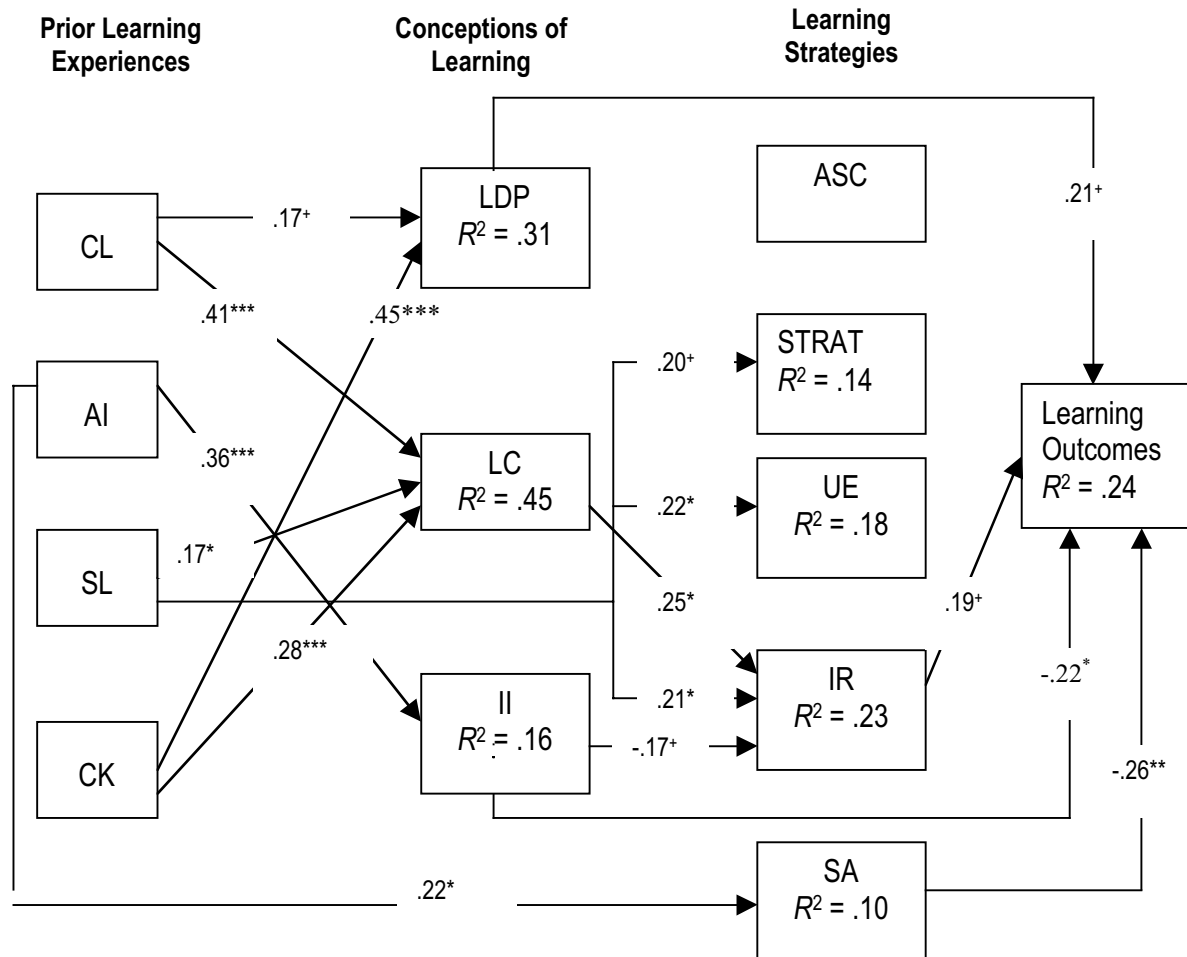


Figure 1. Path diagram of prior learning experiences, conceptions of learning, study approaches, and learning outcomes. $^+p < .10$; $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$. Note: CL – Collaborative learning; AI – Absorption of information; SL—Situating learning; CK – Construction of knowledge; LDP – Learning as development of perspectives; LC – Learning as collaboration; II – Intake of information; ASC – Academic self-confidence; STRAT – Strategic approaches; UE – Use of evidence; IR – Inter-relating; SA – Surface approaches

$\beta = .19, p < .10$, respectively). On the other hand, the effects of conception of learning as intake of information and use of surface approaches are negative and are significant ($\beta = -.22, p < .05$) and highly significant ($\beta = -.26, p < .001$), respectively).

The above result highlights the fact that the manner by which students learn the lesson determines their learning outcomes (Bransford, Brown, & Cocking, 2000). Based on the result, if learning is through absorption of information, learning outcomes are poor, but higher when learning is through collaboration, situating learning, and knowledge construction. This

substantiates the efficacy of the methods suggested by the constructivist view of learning (e.g., Jonassen, 1991; Fosnot, 1996; Duffy & Cunningham, 1996) that emphasizes that learning is building knowledge through collaboration and engagement in relevant tasks.

The result showing the negative effects of the experience of learning as absorption of information implies that methods that treat students as empty receptacles, *tabula rasa*, are undesirable. In this study, the factor analysis defined these methods to include memorization and regurgitation of information and less regard for change in ideas and opinions.

Unfortunately, these methods dominate in today's higher education classrooms. Since these methods make learning unproductive, efforts should be exerted to replace these with the ones that provide students with opportunities to learn collaboratively, perform learning activities relevant to their day-to-day activities, and to construct their own meanings. More recent works (e.g., Tynjala, 1999; Lord, 1999) have demonstrated the effectiveness of these methods.

This study, however, showed that academic self-confidence, strategic approaches, and use of evidence do not affect learning outcomes. For self-confidence, the reason could be gleaned from Watkins, Reghi, and Astilla's (1991) study showing an association between the adoption of deep and more achievement-oriented approaches and positive self-esteem. This suggests that academic self-confidence is an antecedent of the use of deep learning approaches. In the case of strategic approaches, the reason could be the ambiguity of the purpose for the adoption of these strategies. Examining this factor, one could immediately tell that students employ these approaches to create a condition conducive for learning. Either the purpose is studying for understanding or for examination is not, however, clear. Thus, like academic self-confidence, we suspect that a variable mediates the effect of the use of strategic approaches on learning outcomes. For the variable, use of evidence, its failure to show a linkage with learning outcome suggests that this factor alone, as a dimension of deep approaches to learning, is insufficient to affect learning. We speculate that for this strategy to affect learning outcomes positively, this should be used in concert with other dimensions of deep approaches.

Conclusion

This study clarified the causal relationships of students' prior learning experiences, conceptions of learning, and learning approaches on learning outcomes. As evidence shows, students' prior learning experiences shape their learning conceptions and predispose them to use a certain learning approach. For example, students are likely to think of learning as development of perspectives and as collaboration if they feel that their learning environment provides them with an opportunity to build their own knowledge, learn in collaboration with other students, and engage them in activities relevant to their lives as students and as future professionals. This will lead them to use deep learning approaches, thus resulting in better quality learning outcomes. However, if they feel that their learning environment promotes absorption of information, they are likely to think that learning is intake of information and use surface learning approaches. The result is a poor quality of learning.

There is, however, a need for more studies to reinforce these findings. One is a replication of the present study using a wider sample to verify the generalizability of the findings. Looking at the causal relationships of these variables using other indicators – say, grades or understanding of subject matters other than environmental problems – is also a facet worth

exploring to find out if the effects of the variables on learning outcomes would vary across subject areas. These studies should also be aimed at uncovering the effects of such variables as academic self-confidence, strategic approaches, and use of evidence.

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