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Effects of Teachers' Use of Active Learning Techniques on Secondary School Students' Development of Lower Order and Higher Order Thinking

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Abstract
This study looked at how secondary school students' lower-order and higher-order thinking skills were affected by teachers' use of active learning techniques. 389 students from secondary public schools participated in a quantitative, cross-sectional survey. One-way ANOVA and post hoc comparisons were used to analyze the data, which were gathered using a structured questionnaire based on Bloom's taxonomy. The findings showed that while moderate and high implementation levels of active learning significantly improved students' higher-order thinking skills, there was no significant difference between these higher levels. In contrast, teachers' high-level implementation of active learning significantly improved students' lower-order thinking skills. These results demonstrate how teachers play a critical role in promoting cognitive development through intentional instructional design and active engagement techniques. The study offers implications for teacher preparation, curriculum design, and educational policy in secondary education, highlighting the significance of regularly incorporating active learning to support the progression from basic knowledge to complex reasoning.

Keywords: *Active learning, Lower-order thinking, Higher-order thinking, Secondary education*

Introduction
In modern schooling, the main goal of education has shifted away not only to imparting factual knowledge to students but also to cultivating cognitive skills in students that empowers them to think critically, creatively solve problems, and use knowledge in a meaningful way in real life situation. This is an indication of the emerging awareness that in the twenty-first century, one needs to have learners who are able to think complexly, adapt to emergent circumstances and think critically about information (Trilling and Fadel, 2009). Subsequently, there is an increased focus by teachers and policy makers on instructional strategies that promote the development of both the lower order thinking skills (LOTS) and the higher order thinking skills (HOTS) in students, especially in the secondary school level where cognitive development is more abstract and analytical.

The theoretical basis of the classification of cognitive abilities is based mostly on taxonomy of educational objectives provided by Bloom (Bloom, Engelhart, Furst, Hill, and Krathwohl, 1956), later revised by Anderson and Krathwohl (2001). Using this framework, the simplest outcome of cognitive learning is simple recall of information and simple understanding (LOTS), whereas the most complicated outcome is the analysis, evaluation, and creation (HOTS). Basic abilities in lower order thinking are vital in the development of basic knowledge, but unless instructional initiatives are undertaken to stimulate higher order thinking, the students will not be able to transfer knowledge, reason individually as well as solve problems they have never encountered (Anderson and Krathwohl, 2001).

Although it is commonly recognized that higher order thinking is important, in most cases, teaching methods in many secondary schools are still teacher-oriented. The old style of teaching via lectures, textbooks and focus on examinations are the common

forms that tend to promote memorization and regurgitation of information instead of comprehending the information and asking questions (Cuban, 2013). These methods can allow the students to do fairly well in terms of recall-based tests but often they fail to acquire a higher order of thought and thus fail to progress in life-long learning and intellectual development.

As a way of dealing with these drawbacks, active learning strategies have become an effective alternative to pedagogy. Active learning may be defined as the methods of instruction that involve the active participation of the students in the learning process by making them to think, discuss and collaborate, solve problems and reflect as opposed to just listening (Bonwell and Eison, 1991). The theory underpinning these strategies is constructivist learning theory which postulates that learners actively build knowledge by interacting with content, fellow learners and their environment (Piaget, 1972; Vygotsky, 1978). Active learning provides a setting that promotes the acquisition of foundational knowledge as well as the higher order thinking through involvement of students both cognitively and socially.

Along with this, studies have always demonstrated that an active learning strategy increases student engagement, motivation, and performance at all levels of education (Prince, 2004; Freeman et al., 2014). On a secondary level, these strategies comprise collaborative learning, problem-based learning, inquiry-based teaching, discussion in the classroom, peer instruction, and project based learning. These strategies persuade students to make use of information, explain why they believe so, consider other points of view, and formulate original thoughts processes that are highly similar to higher levels in Bloom's taxonomy.

Teachers are key determinants of the level of successful active learning strategy in the classroom. Instructional choices, questioning strategies, classroom management abilities and beliefs regarding learning by teachers have a significant impact on the cognitive engagement of students (Hattie, 2009). With carefully planned lessons that feature active learning, teachers can provide the students with the opportunity to engage in both HOTS and LOTS equally. On the other hand, a teacher who only uses the didactic approach may not be able to sustain the cognitive growth of students to a higher level of the surface learning.

The influence of instructional strategies on cognitive development is especially strong in the field of secondary education where the students start to think abstractly. With instructional environments that enable such engagement, adolescents are cognitively able to think through complex reasoning, test hypotheses and think in a reflective manner (Ormrod, 2016). Strategies of active learning are particularly appropriate at this level therefore because they are in line with the developmental level of the students in terms of capability to engage in higher order cognitive activities.

In spite of the accumulating mass of evidence that has been proposed to support the idea of active learning, empirical and theoretical ambiguity on how the application of active learning strategies by teachers specifically influences the development of lower and higher order thinking still exists. A lot of the literature out there focuses on general success or advanced performance and rarely considers how underlying cognitive abilities and advanced cognition interact. This kind of relationship is critical in the design of instruction practices that neither overlook acquisition of simple knowledge nor stimulate the advancement of deep learning.

Thus, the current study aims at investigating the effects of the application of the active learning strategies by teachers on lower order and higher order thinking development among secondary school students. Placing the discussion in the frame of the well-known cognitive theory and a context of empirical studies, this article is likely to make a contribution to a more detailed comprehension of the significance of instructional practices in the cognitive development of students. With the findings, the teacher education, curriculum development, and instructional policy are likely to be influenced to enhance the quality of secondary education.

Literature Review

Taxonomy by Bloom offers a conceptual model of the cognitive learning results. The taxonomy which was originally created by Bloom et al. (1956) had six levels of hierarchical educational objectives (knowledge, comprehension, application, analysis, synthesis, evaluation). The updated taxonomy was introduced by Anderson and Krathwohl (2001) to reorganize these categories as remembering, understanding, applying, analyzing, evaluating, and creating with a focus on cognitive processes as opposed to the fixed types of knowledge.

The basis of learning is lower order thinking skills, that is, remembering and understanding. These are skills that allow students to remember facts, define concepts and explain ideas. But higher order thinking skills of analyzing, evaluating, creating involve manipulating information, and examining relationships, drawing judgments and creating new knowledge (Anderson and Krathwohl, 2001). A good teaching must therefore facilitate development of these levels instead of restricting learning to the low level of thinking domain.

Theoretical Basics of Active Learning

Constructivist and social learning theories form the basis of active learning. According to Piaget (1972), cognitive development would be realised through active interaction with the environment where learner would assimilate and accommodate new information into the mental structures that are in existence. Vygotsky (1978) also brought out the social aspect of learning by noting the importance of dialogue, collaboration and scaffolding in the zone of proximal development.

In this respect, the active learning strategies should not be viewed as instructional methods but they can be considered as cognitive tools that allow learners to internalize higher levels of mental functioning. Active learning allows students to have more conceptual knowledge and cognitive restructuring by having them dialogue, inquire, and solve problems (Bransford, Brown, and Cocking, 2000).

Active learning is a very broad topic of instructional practices. Discussion, cooperative learning, case studies, role-playing and problem solving are mentioned as the primary active learning strategies that Bonwell and Eison (1991) identified. Prince (2004) has also stated that such strategies force students to be involved in meaningful cognitive action and this makes such learning more lasting and transferable.

Collaborative learning in the secondary classrooms has been demonstrated to facilitate academic success and cognitive growth. According to a study conducted by Johnson, Johnson and Smith (1998), organized collaborative learning systems increase reasoning abilities, understanding of concepts and information retention. On the same note, both inquiry and problem-based learning strategies enable students to investigate issues of real life and thus develop an analytical and evaluative thinking (Hmelo-Silver, 2004).

HOTs, LOTs and active learning

An extensive literature proves that active learning strategies have a great influence on improving higher order thinking skills. Zohar and Dori (2003) discovered that the teaching strategies whose implementation was clearly aimed at encouraging the high order of thinking resulted in improvement in the reasoning and argumentative skills of the students. Students who were subjected to inquiry-based and discussion oriented teaching had better analytical and evaluative skills than their counterparts who were taught by lectures.

In a huge meta-analysis of STEM education research, Freeman et al. (2014) found that students in active learning settings met higher conceptual level of understanding and have better performance in assessments based on higher order thinking. These results are valid to the claim that active learning generates cognitive demand that prompt students to perform at higher levels of Bloom taxonomy.

Although active learning has been linked with the higher order thinking, it helps attain the lower order thinking cognitive skills. As pointed out by Bransford et al. (2000) meaningful learning entails the factual knowledge being systematized into conceptual

frameworks and this makes the learning effective in terms of recall and understanding. The required tasks like peer explanation, retrieval practice, and guided questioning are active learning activities that emphasize the memory and understanding as they involve active processing of information rather than passive processing of information.

The studies have shown that the students in active learning classes do not show a lower performance in the recall based assessment test, rather they usually show the same or better performance in the test than the students who were taught using the traditional method (Prince, 2004). This indicates that active learning would be useful in promoting both lower and higher order cognitive outcomes.

The success of active learning strategies relies on the teachers. As emphasized by Hattie (2009), the quality of instruction such as the explanation of both learning intentions as well as feedback and cognitive challenge influence student achievement significantly. Educators that use higher-order questioning, scaffold difficult tasks, and motivate the students to think are more inclined toward facilitating deep learning.

Nonetheless, research also shows that educators can experience lack of training and time, and pressure to test as other obstacles to active learning (Cuban, 2013). Institutional support and professional development is therefore significant in facilitating teachers into incorporating active learning in the secondary classrooms.

Research Objectives

1. To investigate how teachers' use of active learning techniques affects secondary school pupils' development of lower-order thinking skills.
2. To look into how secondary school pupils' development of higher-order thinking is affected by teachers' use of active learning techniques.

Null hypotheses

H_{01}: The development of lower-order thinking skills in secondary school students is not significantly affected by the degree to which teachers employ active learning techniques.

H_{02}: The development of higher-order thinking skills in secondary school pupils does not significantly differ depending on the degree to which teachers employ active learning techniques.

Methodology

The research design adopted in this study was a quantitative, cross sectional survey study to determine how the application of the active learning strategies by teachers affects the development of lower-order and higher-order thinking in secondary school students. The sample used was 389 secondary school students who were chosen using convenience sampling method in the public sector secondary schools. A structured questionnaire was used to gather data in three parts, including teachers use of active learning strategies, lower-order thinking skills of students, and higher-order thinking skills of students, which were formulated based on the taxonomy of Bloom. The measurements of the responses were based on a Likert-type scale. The data were summarized by descriptive statistics, and the One-Way Analysis of Variance (ANOVA) was used to assess differences in the thinking skills of the students with low, moderate, and high levels of the active learning strategy used by the teachers. Post hoc comparisons were done in order to determine certain group differences. The cutoff point was established as $p < .05$.

Table 1: Impact of Teachers' Use of Active Learning Strategies on Students' Lower Order Thinking Development Among Secondary School Students (One-Way ANOVA)

Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.477	2	1.239	3.143	.044*
Within Groups	152.138	386	.394		
Total	154.615	388			

Note: *p < .05

Table 1 shows the findings of a one-way ANOVA comparing the differences in the development of lower-order thinking in secondary school students under different conditions of the use of active learning strategies by teachers. The results of the analysis have shown that the between-groups effect is statistically significant with F(2, 386) = 3.143, p =.044, at the.05 level. This observation indicates that the development of lower-order thinking in students varies greatly based on how far the teachers are willing to apply active learning strategies in the classroom. The significance value (p <.05) obtained gives adequate reasons to reject the null hypothesis (H 0 1) that there is no significant difference between groups. The mean square value between groups (1.239) is relatively larger than the mean square value within groups (.394), which also supports the fact that there is a significant difference in the instructional practice of the teachers. On the whole, the findings indicate that the application of active learning strategies by teachers can substantially affect the development of lower-order thinking in students at the secondary school level.

Table 2: Post Hoc Analysis of the Impact of Teachers' Level of Active Learning Strategy Use on Students' Lower-Order Thinking Development at the Secondary School Level

Comparison	Mean Difference	Std. Error	Sig.	Interpretation
Low vs Moderate	0.011	0.106	.994	Not significant
Low vs High	−0.169	0.115	.308	Not significant
Moderate vs High	−0.181	0.073	.037*	Significant

The post hoc comparison results in Table 2 that investigated the differences in the development of lower-order thinking in secondary school students under different levels of teacher use of active learning strategies. The results show that there is no significant difference between the low and moderate levels of using the active learning strategy (p = .994), as well as between the low and the high levels (p = .308). Nevertheless, the moderate and high levels of teachers using active learning strategies have a statistically significant difference (p =.037). This finding implies that students that are instructed by teachers who have a high degree of active learning strategy use have vastly different lower-order thinking development in comparison with students who are taught at an intermediate level. Considering these findings, the null hypothesis (Ho1) is not completely accepted, and there are significant differences between certain groups. On the whole, the post hoc analysis can explain that significant difference in the development of lower-order thinking is observed especially when moderate and high levels of the active learning strategies implementation are compared.

Table 3: Impact of Teachers' Use of Active Learning Strategies on Students' Higher Order Thinking Development Among Secondary School Students (One-Way ANOVA)

Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.757	2	3.378	8.881	.000***
Within Groups	146.841	386	.380		
Total	153.598	388			

Note: ***p < .001

Table 3 shows the findings of a one-way ANOVA that was used to determine the differences in the development of higher-order thinking in secondary school students when the use of active learning strategies by teachers was varied. The results indicate that there is a very strong significant between-groups effect, F(2, 386) = 8.881, p <.001, which shows that the development of higher-order thinking among students varies significantly across the levels of active use of learning strategy. The between groups (3.378) mean square value is significantly bigger than the within groups (.380) mean square value, and this indicates that the variation observed is mostly due to the difference in the instructional practices of the teachers and not due to random error. Since the significance level (p < .001) is obtained, it is possible to reject the null

hypothesis (Ho2), which suggested that there would not be a significant difference between groups. In general, the findings indicate that the higher-order thinking development among students at the secondary level is significantly different with the increased utilization of the active learning strategies among teachers.

Table 4: Post Hoc Analysis of the Impact of Teachers' Level of Active Learning Strategy Use on Students' Higher-Order Thinking Development at the Secondary School Level

Comparison	Mean Difference	Std. Error	Sig.	Interpretation
Low vs Moderate	−0.341	0.104	.003	Significant
Low vs High	−0.478	0.113	.000	Significant
Moderate vs High	−0.137	0.072	.136	Not significant

Table 4 shows the post hoc results of development of higher-order thinking of secondary school students under different levels of application of active learning strategies by teachers. The results indicate that there are statistically significant differences in the low and moderate levels ($p = .003$) and the low and high levels ($p < .001$) of active learning strategy use. These findings suggest that students who are taught by teachers who use moderate or high levels of active learning strategies show much better levels of higher-order thinking development than students who are taught using the low levels of active learning strategies. Nonetheless, the moderate and high levels do not differ significantly ($p = .136$) which indicates similar results at the two higher levels of implementation. Considering these results, the null hypothesis (Ho2) is accepted to some extent, since there is a significant difference between specific groups. All in all, the findings highlight the significance of going beyond the low-level adoption of active learning strategies to nurture the ability of students to think in higher-order levels.

Discussion

The current research examined how the application of active learning strategies by teachers affects the development of lower-order and higher-order thinking in secondary school students. The results show that, the degree of teacher application of the active learning strategies has significant impact on the cognitive ability of the students, which is in line with previous studies that have noted that instructional approaches are central in facilitating learning outcomes (Hattie, 2009; Bransford, Brown, and Cocking, 2000).

The outcome of the one-way ANOVA (Table 1) showed that there was a significant difference in the development of lower-order thinking among teachers at the levels of the active use of the learning strategies, $F(2, 386) = 3.143$, $p = .044$. Post hoc tests (Table 2) showed that the significant differences were only apparent between moderate and high levels of strategy use ($p = .037$), but not between low and moderate levels of strategy use or between low and high levels of strategy use. These findings indicate that high-level application of active learning strategies is more effective in increasing lower-order cognitive skills of students, including remembering and understanding, than moderate implementation.

This observation is in line with the contribution of Bonwell and Eison (1991), who emphasized that effective learning strategies, including peer discussion and retrieval practice, help to make learning contentful, thus improving comprehension and retention of information. On the same note, Prince (2004) also argued that active learning enhances knowledge acquisition by involving students in active processing of information as opposed to passive processing of information. Bransford et al. (2000) also added that active engagement of the learners with the contents facilitates long-term learning and enhanced organization of the knowledge. On the whole, these findings suggest that the active learning implementation of high level gives a student a chance to consolidate the basic knowledge.

Table 3 of the results of the ANOVA on the development of higher-order thinking showed a significant effect of high significance, $F(2, 386) = 8.881$, $p < .001$. Table 4 revealed significant differences between low and moderate ($p = .003$) and low and high

($p < .001$) levels of using strategies, but not between moderate and high levels ($p = .136$). These results suggest that students who were exposed to moderate or high intensities of active learning strategies have significantly better higher order thinking skills such as analysis, evaluation and creation as compared to those who were exposed to low levels of active learning.

The findings are consistent with Freeman et al. (2014) who showed that active learning strategies improve performance on tasks that demand complex reasoning. Zohar and Dori (2003) also discovered that inquiry-based teaching and problem solving activities enhance the higher order thinking in secondary school students. The lack of any meaningful differences between moderate and high levels of implementation might indicate that there is some ceiling effect, with moderate use of the active learning strategies already fully exploiting higher-order thinking benefits. This highlights the fact that a gradual incorporation of such measures is more significant than just raising the intensity to a high level.

The comparative impact of lower-order and higher-order thinking skills can be used to emphasize the subtlety of the connection between active learning and cognitive development. According to the taxonomies provided by Bloom (Anderson and Krathwohl, 2001), basic skills like remembering and understanding are the backbone of the higher level of thinking. The results of the study show that though lower-order skills tend to be better developed with the help of high-level active learning, higher-order thinking may be considerably enhanced even with the intermediate levels of implementation, as long as the learning environment encourages engagement, reflection, and problem-solving.

The results also highlight the key role played by teachers in mediating such effects. As noted by Hattie (2009), teacher quality, clarity of instruction and scaffolded learning are some of the determinants of student achievement. Johnson, Johnson, and Smith (1998) also define cooperative and collaborative learning strategies that also strengthen the reasoning and problem-solving abilities of students. Teachers do this by actively designing active learning strategies that enable the environment to support both the lower-order and higher-order cognitive development, which is in line with constructivist theories of learning (Piaget, 1972; Vygotsky, 1978).

Main Conclusions

1. The application of active learning strategies by teachers has a great influence on the development of lower-order thinking in secondary students, and the implementation of high-level strategies is the most beneficial.
2. The moderate level and the high level of active learning strategy use significantly contribute to higher-order thinking skills, and there is no significant difference in higher levels.
3. Active learning promotes transition of basic to advanced cognitive levels, according to the taxonomy of Bloom.
4. The quality of teacher instruction, active learning strategies, and professional development are important elements that should be used to enhance cognitive development in the secondary level.

Recommendations

1. It is advisable that teachers be motivated and trained to adopt active learning strategies on high levels because this research has shown that high level application of the strategies has a great impact in developing lower order cognitive abilities of students.
2. To meet the constructivist principles, schools and education authorities ought to offer continuous professional development and coaching to teachers so that they can design lessons that can effectively balance lower-order and higher-order thinking activities.

3. Implementation fidelity and student cognitive outcomes should be monitored and evaluated using mechanisms that would ensure that active learning is a structured and measurable aspect of classroom practice.

References

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

sBloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. Longman.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom* (ASHE-ERIC Higher Education Report No. 1). George Washington University.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school*. National Academy Press.

Cuban, L. (2013). *Inside the black box of classroom practice: Change without reform in American education*. Harvard Education Press.

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences, 111*(23), 8410–8415. https://doi.org/10.1073/pnas.1319030111

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). Cooperative learning returns to college: What evidence is there that it works? *Change: The Magazine of Higher Learning, 30*(4), 26–35. https://doi.org/10.1080/00091389809602629

Ormrod, J. E. (2016). *Human learning* (7th ed.). Pearson.

Piaget, J. (1972). *The psychology of the child*. Basic Books.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education, 93*(3), 223–231. https://doi.org/10.1002/j.2168-9830.2004.tb00809.x

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. Jossey-Bass.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Zohar, A., & Dori, Y. J. (2003). Higher order thinking skills and low-achieving students: Are they mutually exclusive? *Journal of the Learning Sciences, 12*(2), 145–181. https://doi.org/10.1207/S15327809JLS1202_1