

Hands-on Learning Impact to Learning Engagement

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ABSTRACT

At Asia Pacific International University in the Education Department, education major students need to manipulate different hands-on activities in their learning requirements. Hands-on learning is an activity in which students need to manipulate their psychomotor skills and they learn and gain a better understanding of this skill through experience. This study aims to assess the impact of these hand-on activities on the learning engagement of the education major students. Employing a quantitative approach, the research utilized a self-constructed 20-item instrument to collect data from 95 participants selected through random sampling. The sample included 31 males and 64 females. The findings indicate a positive correlation between hands-on learning activities and learning engagement, suggesting that hand-on activities effectively enhance students' engagement in their educational experiences.

Keywords: Hands-on learning, Learning engagement, psychomotor skills, education major students.

INTRODUCTION

In learning at the Asia Pacific International University, especially in the Education Department, some courses require students to complete project-based performances like hands-on learning activities. Throughout my studies and taking different courses, we have completed different hands-on learning as university projects to fulfill my academic learning. For instance, we have created dioramas and bulletin boards. We have conducted simple science experiments, used microscopes, and made hands-on crafts to display learning projects. Therefore, when we had a chance to do this hands-on learning, we felt and learned better. We have concentrated on doing my tasks, engaged, and using time effectively.

The benefit of the study on this topic is to understand the importance of hands-on learning and its impact on students' learning engagement. To encourage students to participate in different hands-on learning in their learning activities and to promote hands-on learning activity teaching methods to the students and teachers. Moreover, to develop students' creative ideas and thinking skills through activities.

Locally, in the 21st Century, educators in Thailand have discussed the education practices that they need to improve to align with today's world of learning. Therefore, new methods in teaching will need to be implemented for better education. Researchers have reflected that they need new methods of teaching and one of them is hands-on learning activities in the classrooms because this promotes students' understanding, critical thinking, engagement, and problem-solving skills through hands-on learning activities. Therefore, across Thailand, schools have recognized the importance of hands-on learning which can make an impact on the students' learning (Teemuangsai & Meesoo, 2017).

Moreover, the hands-on learning method was applied internationally and this method evolved over 15 years at Frankston High School, a Government School in Victoria, Australia. Hands-on Learning supports young people to be active and connected at school. This method helps students to meet with small groups for creative building projects that can make a positive impact on the school and community. So, having hands-on learning is the key to success in learning because students feel connected, belong to the group, and achieve learning through activity. The evidence of hands-on learning allows students to demonstrate their talents and feel accomplished towards their real projects (Kerr, 2013).

Statement of the Problem

Today situation, classroom simulation has lost connection to provide students with an education that is engaged, challenging, and stimulating for them to have a motive to learn. In other words, students' engagement level has decreased in their learning as schools are using lecturing styles of learning more often. Schools and communities have failed to support enough academic and social-emotional development. Students found that they are disconnected from adults who care and are in charge of them, like teachers in the classroom. So, young people today are unconvinced to invest their time in schools and learning (Yonezawa, Jones, & Joselowsky, 2009).

Furthermore, educators' efforts are not enough to engage students directly in learning. Disengagement becomes a crisis that can affect the success of the learning achievement. So, learners become disconnected from their learning and as well as the environment in which they can have a positive attitude toward them to be ready and active to acquire new learning. Relatedly, educators pay less attention to the curriculum and instruction as the learning needs and when they cannot develop the need with the alignment of the students, students are in trouble to motivate them to be active in their learning. So, when students don't meet their needs as learners, they are disengaged and affect their schooling (Yonezawa, Jones, & Joselowsky, 2009).

Next, maintaining learning engagement was a challenge among students since there are too many levels of assignments students have to complete, as well as they are difficult and demanding for them. Also, there is a lack of interaction with the instructors and students. More importantly, there is a lack of interest in the learning materials which students are motivated and engaged to learn with. Therefore, students didn't meet their expectations for them to acquire in their learning. So, learning engagement is a problem that draws back students from achieving

their best performances in learning (Buelow, Barry, & Rich, 2018). If the schools can uplift the learning engagement levels of the students, their performances in school will be productive and achievable.

Purpose of the Study

It's a passion to encourage students to learn and engage and students are less engaged in learning because of unavailable active activities and experience-related learning. The study's purpose is to discover if hands-on learning like bulletin boards, dioramas, science experiments, microscope activities, laboratory work, crafts, scientific instruments, clay manipulatives, DIY items, and cut-out activities can make an impact on the learning engagement of the Education Major students at Asia Pacific International University, Muaklek, Thailand. In the education department at this university, based on the courses that students are taking, they have to complete hands-on learning every semester as part of their learning requirements. So, this research is discovering the experience of the students on manipulating the hands-on learning and the increased level of the learning engagement by doing the hands-on learning.

Research Questions

Question: (1) What is the experience of participants regarding hands-on learning and learning engagement?

Question: (2) Is there a significant difference in hands-on learning and learning engagement considering age group?

Question: (3) How much does hands-on learning impact on learning engagement?

Limitation

The study is only conducted with education major students in the education department at Asia Pacific International University in the academic year of 2023-2024 second semester. Therefore, the results will be only interpreted and represented by students in the education department at Asia Pacific International University; however, it's understandable to generalize with general students (who have done hands-on activities) on how hands-on learning impacts the learning engagement of the students.

LITERATURE REVIEW

Hands-on Learning

Hands-on learning is defined as learning by experience. For instance, students handle scientific instruments to manipulate the objects they are learning with. In other words, hands-on learning offers effective realistic, and exciting learning experiences. Most studies prove that conducting hands-on activities will lead to positive motivational outcomes in learning. The

hands-on learning approach facilitates the motivation of the learning (Holstermann, Grube, & Bogeholz, 2010).

Further, Hands-on learning mostly comprises relevant topics of students, especially with practical work. So, students can conduct experiments or work with microscopes which have a high learning level. Also, hands-on learning like laboratory work helps students to have more interest in their learning compared with instructional formats like watching films or listening to the teacher only (Holstermann, Grube, & Bogeholz, 2010).

Hands-on learning, in other words, is the psychomotor skills of the learners. So, psychomotor abilities can be categorized as the ability of the learners to use their sensory data and strong motor coordination in doing hands-on activities. These psychomotor skills are involved in controlling muscles signaled by the brain. While learners are engaged with psychomotor activities, their brain works and connects to their body signals which helps the learners to receive positive motives in learning (Khan, Inamdar, Munage, Khare, & Farooq, 2010).

Psychomotor is another consideration for the children's development and this skill is related to kinesthetic intelligence which is from the multiple intelligence. Psychomotor aspects have gross motor and excellent motor aspects. Gross motor is the movement of the large muscles and fine motors are smaller muscles. Therefore, these significant muscles are related to learner activities in learning which need to be manipulated (Supartini, Weismann, Wijaya, & Helaluddin, 2020)

John Dewey, who supports innovative educational philosophies, has a strong opinion on the experience of learning, especially hands-on activities. Through hands-on learning, learners can align theory and practice which is a mental foundation for learning and future thought. Also, these activities support learners to see, raise, and find out solutions for personal and motivational thinking. So, increasing the manipulability of a body of knowledge can create both physical and mental effectiveness in learning, so learning with experience becomes more meaningful. Through manipulative learning activities, learners are engaged both in manual skill and technical efficiency to find satisfaction in learning and prepare this skill for future usefulness in education. Therefore, activities are intellectually beneficial (Korwin & Jones, 1990).

Hands-on learning is also called manipulative media in the form of cardboard, cloth, plastic, pencils, bottle caps, rubber, leaves, rocks, flowers, seeds, and others. These objects play an important role as a visual aid in hands-on learning activities. Also, using these manipulative media can create play activities that provide a positive learning experience to learners. The manipulative media helps learners to think and react to their environment, as well as explore their curiosity while manipulating the task. Therefore, this strategy enhances learners' motivation and enthusiasm for learning (Palupi, 2020).

Learning Engagement

Learning engagement can be defined as a mental effort and investing energy for the individual which they put in to understand the knowledge and skills. Learning engagement is the effort to master the learning of knowledge and skills. While having learning engagement, students will have absorption, vigor, and dedication. Students who have effective learning engagement can predict academic achievement and better performances. When students are engaged in learning, they don't suffer from academic burnout, and more importantly, it can effectively prevent and reduce it. Therefore, learning engagement is the prevention for students of fatigue and drop out from schooling (Xiao, et al., 2023).

Learning Engagement is well-known in three dimensions such as behavioral engagement, emotional engagement, and cognitive engagement. So, engagement in the classroom refers to how students act, feel, and think toward their learning. Through this, students gain interest, motivation, and self-regulated learning. Moreover, engagement defines the time, energy, and resources students invest in educational activities both inside and outside of the classroom. This is the practice in which students participate in the learning activities. As it's engaged in learning, learners are active, collaborative in learning, and have good interaction with the class learning. More importantly, learning engagement can be influenced by the school's efforts to uplift the learning experiences and performance (Buelow, Barry, & Rich, 2018)

Learner's cognitive and emotional energy is important to be involved in engagement. To accomplish the learning, learners must be engaged through academic achievement, persistence, satisfaction, concentration, and a sense of community. So, this aspect allows students or learners to have creative thinking in learning and develop the potential for positive behavior and a sense of commitment to promoting positive learning outcomes. Therefore, it's important to have consistency in learning engagement that is emphasized by the schools and teachers in classroom learning (Yang, Lavonen, & Niemi, 2018)

Similarly, learning engagement is being strengthened through academic involvement with faculty, and student peer groups. Learning engagement can translate as a social construct so, students' behavioral engagement involves students participating in activities like completing assignments. Emotional Engagement is like a learner's attitude towards peers, professors, and course perspective. Then, cognitive engagement through understanding the important aspects of the learning course. Since students being engaged is related to social contact, it involves a social process in which students are connected to the environment and make better reactions through their learning (Buelow, Barry, & Rich, 2018).

Today, learning engagement is a priority for student satisfaction and one of the needed strategies for success. Therefore, it's essential to provide different factors to develop learning engagement like communication, interaction, and effective instruction with the collaboration of the learners and providers. Further, learning engagement considers the academic component of the learners that they receive supportive learning materials and environment, academic supervisors, and challenging academic activities. Lastly, learning engagement involves incorporating behaviors, emotions, and cognition toward learning participation. So, learning

engagement can determine on the learners' progress in schooling and academic achievement (Buelow, Barry, & Rich, 2018).

Learning engagement is a significant factor in educational outcomes influencing students' motivation, academic performance, and accomplishment. One factor that is considered in the education world is age. In the study (Voyer, 2014), found a linkage between age and engagement in learning activities because older students tend to engage in learning compared to younger students. The factors behind this could be improved self-control, self-regulation skills, and maturity. Regarding the older students' increase in self-control, self-regulation, and maturity, the probability of accuracy is high due to the function of the human body; the older you are, the more accurate metacognitive knowledge leads to increased thinking and performance in how they plan. The research has proved this point, saying that older students are better at controlling themselves, a natural progression in maturity (Duckworth, 2014). This differentiates them from younger students because their maturity and self-regulation skills enable them to participate in learning activities and perform better in educational settings. Although age plays a significant role in shaping learning engagement, it should not be the limitation or reason for the student's engagement in learning regarding receiving and sharing knowledge. Therefore, educators should prioritize appropriate instructional methods that foster a supportive and meaningful learning environment for all ages. First-year students may need help fully engaging in learning due to unfamiliar social environments and academic systems. Research indicates that some challenges faced during the first year are less connection with peers and adjusting academically and socially to a new environment (Rishi, Cliff, Susan, & Joseph, 2020). Hence, the data is valid; it can be said that first-year students neither fully participate in all learning activities nor engage in them fully. Moreover, the second year of university is typically familiar with the learning environment and enhanced by experiences. However, it tends to lead students to search for meaning in life, more independence, try new things, and be in the middle of making career decisions. Some may need more motivation regarding academic requirements such as assignments or even exhaustion with group work (Duggar, 2023).

Related Studies

Hands-on activity involves all the activities that have direct experience of students with objects that students practice with a whole thing with the touch of a hand to manipulate hands. By this activity, students can access information, ask questions, do the findings, and make their own conclusions based on their learning activity. So, hands-on learning is activity-based learning which provides experience learning for students to understand and construct their knowledge. In mathematics learning, hands-on learning is a manipulative and practical activity (Nurjanah, Dahlan, & Wibisono, 2020).

So, research has shown that students can get significant results when students apply hands-on learning. This activity supports students to improve their creative skills and problem-solving abilities, and appreciate the value of collaborative learning. Further, hands-on based learning activities enhance students' achievement and attract their interest in learning. Studies have found that students with hands-on learning had more impact than students who learn usual

activities like knowledge, understanding, and application (Nurjanah, Dahlan, & Wibisono, 2020).

So, in the field of mathematics teaching, hands-on learning improves the conceptual understanding ability of junior high school students. Therefore, this approach could build students' understanding of the concept of plane geography, impact the visualization of children, and students have longer memory about the learning content (Nurjanah, Dahlan, & Wibisono, 2020).

In learning mathematics, it's important to learn conceptual understanding which is a basis for thinking and solving mathematical problems. To understand mathematical concepts, it needs other mathematical abilities like mathematical communication, mathematical reasoning, mathematical connections, and mathematical learning. So, to be able to understand these basic concepts, hands-on learning can support much better for effective understanding. For instance, grouping objects based on certain properties, applying concepts in a step-by-step chart, finding patterns from a set of examples, presenting concepts in various forms of mathematical representation, and using concepts and procedures in solving problems related to everyday life. Therefore, hands-on learning in mathematics is very helpful in have better understanding (Meilon, Mariani, & Isnarto, 2019).

As mathematics is a very important subject in learning, especially in humans thinking logically and analyzing problems in real life, students should learn and master mathematics education. So, to develop good teaching competency in math, it's necessary to consider the learning process. One of them is hands-on learning. So, student learning activities like hands-on learning are designed for children to explore information and ask questions, move and find, collect data, analyze, and make conclusions. In learning mathematics, students can formulate ideas to think critically and logically which increases their learning. So, they receive this skill through their learning experience and they can develop their learning and thinking skills more productively through mathematics education (Meilon, Mariani, & Isnarto, 2019).

METHODS

Research Design

This study is a quantitative descriptive research designed to discover the impact of hands-on learning on learning engagement under quantitative research. Quantitative research uses methods like questionnaires or structured interviews that can formulate statistics. This research reaches many people, and the process is quicker than other types of methods (Dawson, 2009). Also, quantitative research collects and analyzes data; through this, the researcher learns more about the demographics of a population, can measure how something happens, and examines attitudes and behaviors. Then, this research method comprises frequencies as well as relationship factors. So, the findings generated from the quantitative research do not have insight into people's thinking, feeling, and acting factors (Goertzen, 2017).

Population

The population of this study were students from the education department at Asia Pacific International University, Saraburi, Thailand during the second-semester academic year 2023-2024. There were 135 students are registered in the education department.

Sampling Techniques

The random sampling technique was used to obtain the participants for the study. There were 135 students who were registered in the 2023-2024 academic year in the education department, the researchers targeted 70% of the population. (Noor, Tajik, & Golzar, 2022). The benefit of random sampling is an equal chance of being selected for individuals in the population. It is an impartial selection method, so when it is designed carefully, the sample can represent the whole population (Noor, Tajik, & Golzar, 2022).

Statistical Procedures

This research will be conducted by providing questionnaires to students majoring in education using random sampling. The research questionnaires are self-constructed, and 20 items were constructed. Initially, there is a simple acknowledgment of the participant's contribution to this research, and information about the participants is also accessed as primary personal data of the participants such as age, gender, nationality, and year of the student at the Education Faculty. Then, the researcher will collect the data when it is ready. Next, the collected data will be entered through the Excel Program and processed to interpret the findings. Therefore, this research will use the Statistical Package for the Social Science approach. Statistical Package for Social Science Approach is a software package used in statistical data analysis, case selection, data creation, and file interpretation. This program is applicable to running data and providing means, correlation, and prediction of outcomes. It is a complete program package that can help with a simple solution for the researcher to explore complex statistical data or findings in a descriptive approach. This finding can be represented through scatter plots, pie diagrams, etc. (Soluade, Idowu, & Sofadekan, 2022). Therefore, this research will be using this package to find the outcomes.

There is participation in different levels of age. Least number of participants are aging 18-19 years old which comprises 5% of the participants. The highest number of participants are from students ageing 22 years old and above (76%). There are 95 participants. There are 31 males (33%) and 64 females (67%).

The participants' country of origin is varied. The countries indicated are Myanmar, Thailand, Cambodia, Malaysia, and others (including Philippines, China, South Africa). The two most represented country is Myanmar (60%) and the least represented country is Cambodia (6%). The junior level has the least number of participants. Only 18 juniors participated in the study. This is 19%. The seniors have the most representation, 32 (34%).

RESULTS

Research Question: (1) What is the experience of participants regarding to hands-on learning and learning engagement?

The Mean of hands-on learning is 3.574737 and the Standard Deviation is 0.771289. The participants' responses span a wide range, from 2.803448 to 4.346026, indicating a variety of experiences. Some respondents have engaged in diorama projects, bulletin boards, experiments, and microscope activities. However, others have not had the opportunity to participate in laboratory work, crafts, cut-out activities, or use scientific instruments. This diversity of experiences underscores the variability in participants' learning encounters.

Respondents who have done hands-on learning are receiving practical work from the instructors. So, learners were involved in planning several hands-on learning. Also, schools and teachers allowed time for them to process different activities, and teachers' organizational skills and the social and emotional climate of the class were included to support hands-on activities. Furthermore, the quality of experience during the practical work motivates the students in hands-on learning. It is efficient for activation, cognitive learning, and motivation. Also, the quality of the experience in hands-on learning influences the students' intrinsic motivation. So, respondents' answers agree with doing hands-on learning (Nina, Dietmar, & Bogeholz, 2009).

Likewise, respondents who experience hands-on learning have experienced a student-centered approach to their learning. This is an active process of learning where learners are encouraged to discover and develop new concepts and ideas with their learning. Through this approach, learners can extend the ability in their minds critically and creatively. With hands-on learning experience, people develop positive results in the development of their learning (Saroja & Shan, 2014).

On the other hand, some respondents do not experience hands-on learning, and according to study, different areas around the world need help finding enough funding to spend on resources. So, the lack of resources and trained personnel affects the students in different ways. For instance, learners need to receive complete or deserved education and learning equipment to perform different learning activities at school. So, there is no maximum chance of achieving the most out of education. So, while learning, learners learn parts of topics, but they need to get the whole picture. A majority of students learn better with hands-on experience in classrooms. However, more resources can help the students experience hands-on learning; therefore, this can be one of the considerations for the respondents who did not experience hands-on learning (Maffea, 2020).

Moreover, the hands-on learning approach is time-consuming in class, and schools and teachers need to plan well with the time to implement hands-on learning activities. So, with this constraint, schools are limited to applying hands-on learning in class, leading to a lack of

experience for learners to perform different manipulative activities (Linkedin, 2024). Next, a strictly theoretical curriculum is one reason learners do not have an opportunity to participate in hands-on learning activities. In the real world, there are different perspectives on the effectiveness of learning, and some prefer the cognitive learning approach, while others may choose psychomotor skills. So, the schools and curriculum approach may vary in implementing the different learning activities (Linkedin, 2024).

Consequently, every learner is unique, and different learners have different learning styles, and hands-on learning only fits with some learners. So, based on diverse learners, the methods of teaching may vary, and experience may be different. Normally, students bring their interests, personal experiences, and attitudes to each learning moment in school. With this diverse learning environment, teachers need to develop a deep understanding of not only factual but also conceptual knowledge. Customized teaching and learning can benefit various students and may go beyond hands-on learning (Gayle H. Gregory, 2012).

The Mean of learning engagement is 3.707368 and the Standard Deviation is 0.634008. This indicates that the participants' responses span from 3.07336 to 4.341376, reflecting a range of responses from Undecided to Agree. The respondents expressed positive views on their learning engagement, indicating a strong dedication and interest in learning. They actively participate in class, investing their energy in the learning process. They demonstrate a clear understanding of the learning content and can master the knowledge and skills. Their high level of learning effort, coupled with a lack of academic burnout and no thoughts of withdrawal from schooling, further highlight their positive learning engagement.

For behavioral learning engagement, learners are engaged in class events, attending classes, obeying rules, and performing tasks. Similarly, emotional engagement is related to the learner's thoughts toward interactions and feelings of participation and belonging in the learning environment. Next, cognitive engagement is the degree of interest in learning in which learners show high interest through actively questioning in learning and mastering the subject. In learning engagement, being motivated and engaged improves learning much better. So, this can lead to access to learning in which the respondents have learning engagement degrees from 3.07336 to 4.341376 (Suharti, Suherdi, & Setyarini, 2020).

In addition, engagement in learning is a psychological process that shows students' attention, interest, investment, effort, and engagement in the learning process. Engagement is effective if learners are in a comfortable learning environment through engaging activities. From this, learners achieve pleasant learning time and experience of learning fulfillment with less stress condition with learning. Schools provide comfortable and positive interpersonal relationships with learners with the development of good learning engagement (Susanti, Firman, & Daharnis, 2021).

Table 1: Hands-on Learning and Learning Engagement

	Mean	Standard Deviation
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Hands-on learning	3.574737	0.771289
Learning engagement	3.707368	0.634008

Research Question: (2) Is there a significant difference on hands-on learning considering the age group of the participants?

Based on the results, an ANOVA statistical analysis reveals a notable variation in experiential educational possibilities among age groups. The p-value of 0.046713 indicates that there is a significant difference in the hands-on learning of the participants considering the age groups.

This discovery becomes much more evident when the mean scores for each age group are examined. With a mean score of 3.684722, participants who are 22 years and older had the highest mean hands-on learning experience score. Participants in the 20–21 age range came in second with a mean score of 3.222222, and participants in the 18–19 age group scored 3.26. The observed trend indicates a gradual rise in experiential learning opportunities as people enter their early 20s and beyond.

According to the data, age is a crucial element that influences hands-on learning experiences, with students 22 years of age and older showing the highest levels of participation in hands-on activities. This research highlights how crucial it is to consider age when developing courses and educational procedures to effectively meet the various educational requirements and preferences of people of all ages. Older students are viewed as more mature and may have taken professional training programs that prioritize hands-on learning or joined the workforce. Increased levels of hands-on learning may result from exposure to real-world tasks and practical applications. This suggests that older pupils might have more efficient study and learning techniques, especially when applying and contextualizing information from the real world (Stoten, 2015).

Table 2: Hands-on Learning Considering Age

Groups	Count	Sum	Average	Variance
18-19	5	16.3	3.26	0.373
20-21	18	58	3.2222	0.4665
22-above	72	265.3	3.6847	0.6041

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>	<i>F critical</i>
Between Groups	3.6030	2	1.8015	3.168	0.0467	3.0954
Within Groups	52.316	92	0.5686			

Question: (3) How much does hands-on learning impact learning engagement?

The correlation coefficient of hands-on learning and learning engagement is $r = 0.324753$. This means a moderate positive relationship exists between hands-on learning and learning engagement. So, when students actively participate in hands-on activities, they are more likely to be engaged in the learning process. For instance, students who create dioramas, make bulletin boards, and take part in project-based learning could focus on the school lessons in the classroom. Therefore, this finding emphasizes that hands-on learning has a significant impact on students’ learning engagement. Moreover, hands-on learning opportunities are crucial for students to arouse their interests and improve learning outcomes.

Students are more interested in inquiry-based learning, which is regarded as an effective teaching method in their studies (Andrew, Stacy, & Joseph, 2021). Moreover, students can learn technical and soft skills through project-based learning in their classroom. When the research is conducted with students and teachers from the mathematics class, most believe that math is more captivating if they learn from the hands-on aspects as they improve their motivation and active engagement (Holstermann, Grube, & Bogeholz, 2010). Students barely engage in class activities if they feel dissatisfied, bored, and have unfavorable circumstances (Kong, 2021). Besides, dropping out is a reasonable factor for poor learning engagement. Engagement is a mixture of construct phenomena, which includes perceptions, feelings, and motivation. It is connected with self-determination and intrinsic motivation (Kong, 2021).

Hands-on learning activities help students apply their acquired skills effectively in real-life situations (Kong, 2021) An actively involved student demonstrates engagement not just in

social and academic/institutional aspects but also intellectually (Frezell, 2018). Engagement includes higher-quality activities that make students think critically, overcome problems, and find logical solutions. Learning in a fun and interesting way gives students adequate academic opportunities with the help of requisite materials (Frezell, 2018). Children are more interested in play-based learning than conventional learning due to their nature (Ivy, n.d). Students remember only 5% of their lectures after the class (Cecilia & Esther, 2015). However, students could practice 75% of what they have learned with the help of hands-on activities. Therefore, it can be said that students’ retention rate increases significantly when interactive and activity-oriented teaching methods are used.

To conclude, hands-on learning activities have a huge impact on students’ learning engagement in terms of achieving learning outcomes, active participation, evoking their interest, and improving the retention rate. Chinese philosopher Confucius said, “Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand.” We learn better if we devote our time and effort physically and mentally to learning. That is why hands-on learning should be a part of teaching approaches in the educational setting.

Table 3 Correlation between Hands-on Learning and Learning Engagement

	Hands-on Learning
Learning Engagement	0.324753

CONCLUSION

To sum up this research report, the effectiveness of hands-on learning impacts learning engagement positively, as shown in three research questions. The majority of the data collection showed that students' ages play a significant role both in hands-on learning and their learning engagement. However, students' years of study have a profound impact only on learning engagement. As a result, this research still proves that hands-on learning promotes students' learning engagement.

REFERENCES

- Andrew, R. K., Stacy, A. K., & Joseph, P. C. (2021). Student Perspectives of Hands-on Experiential Learning’s Impact on Skill Development Using Various Teaching Modalities. *International Conference on Social and Education Sciences*, 1-10. Retrieved from <https://files.eric.ed.gov/fulltext/ED626321.pdf>
- Buelow, J. R., Barry, T., & Rich, L. E. (2018). Supporting Learning Engagement with Online Students. *Online Learning*, 22(4), 313-340. doi:10.24059/olj.v22i4.1384

- Cecilia, O. E., & Esther, E. E.-N. (2015). The Impact of Hands-On-Approach on Student Academic Performance in Basic Science and Mathematics. *Higher Education Studies*, 47-51. doi:doi:10.5539/hes.v5n6p47
- Dawson, C. (2009). *Introduction to Research Methods A Practical guide for anyone undertaking a research project*. United Kingdom : Little, Brown Book Shop.
- Duckworth, A. L. (2014). Self-control in school-age children. *Educational Psychologist*, 49(3), 199-217. Retrieved from <https://doi.org/10.1080/00461520.2014.926225>
- Duggar, T. R. (2023). Examining Second-Year Retention: Student Perceptions. *Doctoral dissertation, Georgia Southern University*. Retrieved from <https://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=3894&context=etd>
- Frezell, D. (2018). *Impact of Inquiry Based Learning on Students' Motivation, Engagement and Attitude in Science*. Ontario: University of Windsor. Retrieved from <https://scholar.uwindsor.ca/cgi/viewcontent.cgi?article=8358&context=etd>
- Gayle H. Gregory, C. C. (2012). *Differentiated Instructional Strategies: One Size Doesn't Fit all*. California: Corwin Press. Retrieved from https://books.google.co.th/books?hl=en&lr=&id=Uzx6ZmBz7UAC&oi=fnd&pg=PR1&dq=hands+on+learning+is+not+fit+for+all&ots=DVsCOUPhoj&sig=LBbycPVYwdl8oBiyNO35aYp08PE&redir_esc=y#v=onepage&q=hands%20on%20learning%20is%20not%20fit%20for%20all&f=false
- Goertzen, M. J. (2017). Introduction to Quantitative Research and Data. *Library Technology Reports*, 53(4), 12-18. Retrieved from https://journals.ala.org/index.php/ltr/article/view/6325/8274?fbclid=IwZXh0bgNhZW0CMTAAAR3SeMGLL81U0OV8w4NxXsuVPw13-TND7_4YiWB6wmHIS6wL6kM4xxCRbCM_aem_AWfKJLjXxvVM4VdI-gH9HOgU6uG5_UVEPhYVdL-kvUuszS0GmNROmIK9B0E93QzW2WvA-URuXaJyOv88Z4caDuSA0
- Holstermann, N., Grube, D., & Bogeholz, S. (2010). Hands-on Activities and Their Influence. *Res Sci Educ*, 743-757. doi:10.1007/s11165-009-9142-0
- Ivy, E. I. (n.d). *Effects of Hands-on Learning on Short-Term Retention in Third-Grade Students*. Hanover: Hanover College. Retrieved from <https://psych.hanover.edu/research/thesis11/papers/ivers-helton-final-draft.pdf>
- Kerr, R. (2013). *The Power of Hands-on Learning Experience*. Oman: The Gulf Comparative Education Society. Retrieved from <https://publications.alqasimifoundation.com/en/tag/gces>

- Khan, S., Inamdar, M. N., Munage, S., Khare, N., & Farooq, M. U. (2010). Development of Psychomotor Skills in Dentistry Based on Motor Learning Principles: A Review. *World Journal of Dentistry*, *11*(3), 247-251. doi:10.5005/jp-journals-10015-1734
- Kong, Y. (2021). The Role of Experiential Learning on Students' Motivation and Classroom Engagement. *Educational Psychology*, *12*, 1-4. doi:<https://doi.org/10.3389/fpsyg.2021.771272>
- Korwin, A. R., & Jones, R. E. (1990). Do Hands-on, Technology-Based Activities Enhance Learning by Reinforcing Cognitive Knowledge and Retention? *Journal of Technology Education*, 1-12. Retrieved from <https://scholar.lib.vt.edu/ejournals/JTE/v1n2/html/jones.html#:~:text=A%20review%20of%20literature%20revealed,lead%20to%20greater%20cognitive%20gains.>
- LinkedIn. (2024, April 11). *LinkedIn*. Retrieved from LinkedIn: <https://www.linkedin.com/advice/0/what-do-you-your-lessons-lack-hands-on-learning-skills-teaching-czqpe>
- Maffea, J. (2020). *Lack of Resources in Classrooms*. Pennsylvania: Kutztown University. Retrieved from <https://research.library.kutztown.edu/wickedproblems/38/>
- Meilon, B., Mariani, S., & Isnarto. (2019). Analysis of Mathematical Representation Skills Based on Student Learning Activities in Hands on Activity Assisted PBL Learning Model. *Unnes Journal of Mathematics Education Research*, 213-219. Retrieved from <https://journal.unnes.ac.id/sju/ujmer/article/view/27777/14579>
- Nina, H., Dietmar, G., & Bogeholz, S. (2009). Hands-on Activities and Their Influence on Students Interest. *Res Sci Educ*, 743-759. doi:DOI 10.1007/s11165-009-9142-0
- Noor, S., Tajik, O., & Golzar, J. (2022). Sampling Method. *International Journal of Education and Language Studies*, *12*, 78-82. doi:10.22034/ijels.2022.162982
- Nurjanah, Dahlan, J. A., & Wibisono, Y. (2020). The Effect of Hands-on and Computer-Based Learning Activities on Conceptual Understanding and Mathematical Reasoning. *International Journal of Instruction*, *141*, 143-160. doi:10.29333/iji.2021.1419a
- Palupi, A. N. (2020). Use of Manipulative Media as A Stimulation of Ability To Understand The Concept of Early Children's Age. *Early Childhood Research, Journal*, 41-57. Retrieved from https://www.researchgate.net/publication/350488622_Use_of_Manipulative_Media_as_A_Stimulation_Of_Ability_To_Understand_The_Concept_of_Early_Children's_Age

- Rishi, S., Cliff, H., Susan, D. W., & Joseph, C. &. (2020). Student Demographics and Experiences of Deeper Life. *Learning Communities Research and Practice*, 8(1). Retrieved from <https://files.eric.ed.gov/fulltext/EJ1251603.pdf>
- Saroja, D., & Shan, E. W. (2014). A STUDY OF THE EFFECTIVENESS OF HANDS-ON EXPERIMENTS IN LEARNING SCIENCE AMONG YEAR-4 STUDENTS. *International Online Journal of Primary Education*, 3(1), 20-31. Retrieved from https://www.researchgate.net/publication/351985060_A_STUDY_ON_THE_EFFECTIVENESS_OF_HANDS-ON_EXPERIMENTS_IN_LEARNING_SCIENCE_AMONG_YEAR_4_STUDENTS
- Soluade, O., Idowu, S. O., & Sofadekan, A. O. (2022). Attitudes of Undergraduate Teachers Towards the Application of Statistical Package for Social Science When Teaching Statistics in Social Studies. *Journal of Lexicography and Terminology*, 6(1), 134-144. Retrieved from <https://conferences.unza.zm/index.php/jlt/article/view/918/721>
- Stoten, D. W. (2015, September 30). *International Higher Education Teaching & Learning Association*. Retrieved from International Higher Education Teaching & Learning Association : <https://www.hetl.org/age-and-students-approaches-to-learning-at-university/>
- Suharti, D. S., Suherdi, D., & Setyarini, S. (2020). Exploring Student's Learning Engagement in EFL Online Classroom. *Advanced in Social Science, Education and Humanities Research*, 139-149. Retrieved from <https://www.atlantispress.com/proceedings/conaplin-20/125956056>
- Supartini, T., Weismann, I. T., Wijaya, H., & Helaluddin. (2020). Development of Learning Methods through Songs and Movements to Improve Children's Cognitive and Psychomotor Aspects. *European Journal of Education Research*, 9(4), 1615-1633. doi:10.12973/eu-jer.9.4.1615
- Susanti, R. E., Firman, & Daharnis. (2021). Contribution of School Well-being and Emotional Intelligence to Student Engagement in Learning. *International Journal of Applied Counseling and Social Sciences*, 02, 48-54. doi:: <https://doi.org/10.24036/005397ijaccs>
- Teemuangsai, S., & Meesoo, C. (2017). Thailand's classroom learning practices in secondary level: Are we ready for learning in the 21st- Century? *International Journal of Science and Technology Educational Research*, 8(1), 1-12. doi:10.5897/IJSTER2017.0403
- Voyer, D. &. (2014). Gender Differences in Scholastic Achievement: A Meta-Analysis. *Psychological Bulletin*, 140(4), 1174-1204. Retrieved from <https://www.apa.org/pubs/journals/releases/bul-a0036620.pdf>

- Xiao, F., Zhang, Z., Zhou, J., Wu, H., Zhang, L., & Lin, M. (2023). The relationship between a growth mindset and the learning engagement of nursing students: A structural equation modeling approach. *Science Direct*, 73, 1-7. doi:10.1016/j.nepr.2023.103796
- Yang, D., Lavonen, J. M., & Niemi, H. (2018). Online learning engagement; Critical factors and research evidence from literature. *Themes in e-learning*, 11(1), 1-22. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1204753.pdf>
- Yonezawa, S., Jones, M., & Joselowsky, F. (2009). Youth engagement in high schools: Developing a multidimensional, critical approach to improving engagement for all students. *J Educ Change*, 191-209. doi: 10.1007/s10833-009-9106-1