

Correlation of Learning Systems with Student Engagement and Learning Outcomes

*Mochamad Desta Pradana¹, Punaji Setyosari², Saida Ulfa³, Made Duananda
Kartika Degeng⁴

¹Institut Agama Islam Negeri (IAIN) Kediri, Jl. Sunan Ampel No.7, Kediri, East Java, Indonesia

^{2,3,4}Universitas Negeri Malang (UM), Jl. Semarang No.5, Malang, East Java, Indonesia

*destapradana83@iainkediri.ac.id

ABSTRACT: *Ubiquitous Project Based Learning (UPBL) offers learning opportunities that are not limited by time and place, adapts to students' level of mastery, and creates learning communities where students can engage with each other while working on learning projects. UPBL actively contributes to achieving learning goals as best as possible. This research aims to determine the relationship between Ubiquitous Project Based Learning (UPBL) and Self-Regulated Learning (SRL) with student involvement and to choose the relationship with learning outcomes. This research uses a one-group pretest-posttest design. The parametric statistical test analysis technique of Pearson product-moment correlation was used to calculate the research data findings. The output of data calculations using SPSS is correlation data between Ubiquitous Project Based Learning (UPBL) and Self-Regulated Learning (SRL) students with student involvement and learning outcomes which is known to indicate a significant relationship between UPBL and SRL students, with student involvement and learning outcomes. , which is 0.000 and 0.005, which is smaller than the value of 0.05, it can be concluded that there is a significant relationship between UPBL and SRL students with student engagement and learning outcomes. The research results show that UPBL is substantially related to SRL regarding student engagement and learning outcomes.*

Ubiquitous Project Based Learning (UPBL) menawarkan kesempatan belajar yang tidak dibatasi oleh waktu dan tempat, menyesuaikan dengan tingkat penguasaan siswa, dan menciptakan komunitas pembelajar di mana siswa dapat terlibat satu sama lain saat mengerjakan proyek pembelajaran. UPBL secara aktif berkontribusi terhadap tercapainya tujuan pembelajaran sebaik-baiknya. Penelitian ini mempunyai tujuan yaitu untuk mengetahui hubungan antara Ubiquitous Project Based Learning (UPBL) dan Self-Regulated Learning (SRL) dengan keterlibatan siswa dan untuk mengetahui hubungan dengan hasil belajar. Penelitian ini menggunakan one-group pretest-posttest design. Teknik analisis uji statistik parametrik korelasi product moment pearson digunakan untuk menghitung temuan data

¹  orcid id: <http://orcid.org/0009-0008-1830-6880>

²  orcid id: <http://orcid.org/0000-0003-0187-9785>

³  orcid id: <http://orcid.org/0000-0002-2302-7172>

⁴  orcid id: <http://orcid.org/0000-0002-6749-6237>

penelitian. Hasil keluaran perhitungan data menggunakan SPSS adalah data Korelasi siswa *Ubiquitous Project Based Learning* (UPBL) dan *Self-Regulated Learning* (SRL) dengan keterlibatan siswa dan hasil belajar diketahui yang menandai adanya hubungan yang signifikan antara siswa UPBL dan SRL, dengan keterlibatan siswa dan hasil belajar, yaitu sebesar 0,000 dan 0,005 lebih kecil dari nilai 0,05, maka dapat disimpulkan bahwa terdapat hubungan yang signifikan antara siswa UPBL dan SRL, dengan keterlibatan siswa dan hasil belajar. Hasil penelitian menunjukkan bahwa UPBL berhubungan secara substansial dengan SRL ditinjau dari keterlibatan siswa dan hasil belajar.

Keywords: Ubiquitous Learning, *Self Regulated Learning*, *Project Based Learning*.

Received: December 15, 2023; *Revised:* January 6, 2024; *Accepted:* February 29, 2024

I. INTRODUCTION

Digital learning media based on information and communication technology not limited by space and time is more popular with students in higher education today. This can affect the conditions and quality of students' learning. Ubiquitous Project Based Learning (UPBL) facilitates learning that is not limited by space and time. Ubiquitous Project Based Learning is a project-based learning model implemented based on flexible time, place, and appropriate information. According to (Aljawarneh, 2020), a new era in the higher education sector begins with Ubiquitous technology and context-aware learning. Ubiquitous tools enhance context awareness and learning experiences by offering unlimited availability at all times, regardless of location. Ubiquitous learning also helps build easy interactions between offline and online learning environments through digital learning resources.

Ubiquitous Learning, also known as U-Learning, has a positive impact on education, both at primary and tertiary levels. The positive contribution of ubiquitous learning in the world of education, according to (Champakul et al., 2022), is that the ubiquitous learning management system using imagineering has good efficiency. This is shown by the experimental class's learning achievement and multimedia creation skills being higher than the control class. There is evidence that ubiquitous learning management systems improve student achievement.

U-learning has several indicators of effectiveness when applied in the learning process. These effectiveness indicators have a good influence on achieving the expected learning objectives. According to (Wong, 2018), U-learning effectiveness indicators consist of ten categories, namely: 1) learning achievement, 2) perceived usefulness, 3) motivation, 4) ease of use, 5) satisfaction, 6) learning attitude, 7) cognitive load, 8) system use, 9) self-efficacy, and 10) social engagement.

One of the learning characteristics of U-Learning is accessibility, this makes it easy to carry out the learning process anytime and anywhere. According to (Herlandy & Purwanto, 2022), learning carried out during the Covid-19 pandemic in infrastructure areas with low internet networks can be carried out with the help of the U-Learning strategy. U-Learning can help students learn and attend lectures and improve their learning outcomes.

Active learning is the learning model that is widely implemented in line with the independent curriculum's implementation in today's world of education. All learning processes involve the activeness of students in their activities. The higher education sector, in general, has utilized ubiquitous learning (U-learning) technology and its ubiquitous learning tools so that the active involvement of students in the learning process becomes the main point. However, the U-learning application has yet to be optimal because the search still needs to describe the relationship between U-learning when applied in a project-based learning process, namely UPBL, towards students' Self-Regulated Learning (SRL) and learning outcomes. According to (Suartama et al., 2021) there is a significant interaction between U-learning and E-learning strategies integrated with SRL on student learning activity and learning achievement, but only limited to U-learning so that further researchers can develop and innovate more deeply to improve learning outcomes. Therefore, researchers describe a significant relationship between UPBL and SRL and learning results.

Ubiquitous learning research provides special meaning for researchers who apply universal tools and context-aware characteristics to project-based learning processes. According to (Pimmer et al., 2016), ubiquitous learning increasingly attracts interest from academics and society, especially in higher education environments. A systematic analysis of 36 empirical papers supports the view that distributed learning activities facilitate knowledge acquired based on instructional learning design and are more often activated by motivational mechanisms. They also enable student activity during lecture classes. In addition, the advantage of U-learning tools is that students create multimodal representations outside the classroom and then discuss these evidential experiences with peers and educators, helping to link formal and informal learning and a personalized learning environment.

Context awareness is fundamental to U-learning and plays a significant part in the continuous UPBL process. Context-awareness in U-learning is based on integrating real-world experiences into online learning. According to (Hsu & Hwang, 2014), the ability to create context-aware ubiquitous learning environments that can recognize students' real-world learning status and contextual context has been made possible by the quick development of mobile, wireless communication, and sensor technologies. As a result, pupils can receive accurate information at the appropriate location and time. Nonetheless, the researchers draw attention to the fact that additional variables must be considered when creating learning systems that assist students' intelligent learning in authentic settings.

SRL is the ability of students to plan and carry out learning activities that involve human psychological elements. According to (Suartama et al., 2021), SRL is a student's ability to direct, regulate, monitor, and control behaviour to employ specific methods to achieve particular learning objectives and incorporate social, emotional, intellectual, physical, and motivational elements.

The attainment of learning outcomes and student activity are directly correlated. Behaviour, cognition, and emotion are the three components of engagement. According to (Lester, 2013), behavioural engagement is a student's interest in social and academic activities. Positive behaviour, learning engagement, and involvement in school-related activities are the three primary aspects of behavioural engagement. Student attitudes, values, and interests regarding favourable or unfavourable interactions are all part of emotional involvement. Cognitive involvement can be

divided into two categories: mental and psychological. The psychological aspect strongly emphasizes students' motivation and commitment to study. The cognitive component includes self-regulated learning, metacognition, using learning strategies, and thinking and learning in a "strategic" way.

The learning outcomes to be achieved optimally through the Ubiquitous Project Based Learning method are cognitive learning outcomes. According to (Sudatha et al., 2018), learning outcomes are all effects that can be used as indicators of the value of using learning methods under different conditions. A suitable learning method has a structured framework for smooth teaching and learning. A contextual framework was proposed by (Phahlane & Kekwaletswe, 2012) to support ubiquitous learning through LMS and mobile tools. Students in higher education are not fixated on a specific location, but access to learning resources tends to remain in a particular area and time. Ubiquitous learning can be realized if these resources are available consistently through a learning management system that supports student mobility. LMS can provide ubiquitous learning support if context and learner background are considered in its design and implementation.

II. METHOD

This research uses a one-group pretest-posttest approach to determine the relationship between UPBL and SRL and learning outcomes. One group pretest-posttest design is a design that only involves one test group. An initial test or pretest is given before the treatment, and a final examination or posttest is given after the group is assigned treatment. This research procedure uses a one-group design with Pretest-Posttest. One group pretest-posttest design This design includes a pretest measure followed by a treatment and a posttest for a single group (Creswell, 2019).

Group A O1———X———O2

The research subjects used in this research sample were 42 students of Islamic Education IAIN Kediri. Meanwhile, the sampling technique used in this research is randomized samples for limited product testing. A random sample, in which each individual is equally likely to be selected (a systematic or probabilistic sample). However, getting a random sample of participants may take time. Alternatively, a systematic sample can have precision-equivalent random sampling (Creswell, 2012; Ikhwan, 2021). The data collection technique in this research uses pre-test and post-test questionnaire instruments to determine the relationship between Ubiquitous Project-based Learning and Self-Regulated Learning. The type of instrument used is an instrument with closed questions in the form of a five-point Likert scale. The resulting data was analyzed and adjusted to categories based on decision-making criteria using score conversion on a 5-point Likert scale (1 = very bad to 5 = very good) (Norman, 2010).

Meanwhile, to find out the relationship between Ubiquitous Project-based Learning and learning outcomes, a pre-test and post-test learning outcomes test instrument of 20 objective questions (multiple choice) with one correct answer was used. A score of 1 is given if the answer is correct, and 0 is given if the answer is wrong. The learning outcomes measured here are cognitive domain learning outcomes. The lowest score and the highest score are scores of 100.

The data analysis technique used to determine the effect of UPBL on the level of SRL and student learning outcomes is the Pearson correlation parametric statistical test analysis technique, which is used to calculate research data findings. A correlation shows predictions about one variable concerning another. This correlation indicates covariance. By graphing paired measurements, one can assess the relationship between two variables. A flow (plot) for each observed pair is presented with a point realized in a scatter diagram. According to (Creswell, 2019), an approximation of the correlation coefficient (r). Finding comparable research that has documented the strength of the association between hours worked and burnout symptoms is a frequent method for estimating this value. The IBM SPSS Statistics for Mac program calculates the correlation results of UPBL and SRL with student engagement using the Pearson correlation formula parametric statistical test analysis technique.

III. RESULT AND DISCUSSION

Identify the Correlation between SRL and Student Engagement

Identification of the correlation results of SRL and student engagement can be seen in Table 1.

Table 1. Correlation of SRL and student engagement

		SRL U-learning	Engagement U-learning
SRL U-learning	Pearson Correlation	1	,650 **
	Sig. (2-tailed)		,000
	N	42	42
Engagement U-learning	Pearson Correlation	,650 **	1
	Sig. (2-tailed)	,000	
	N	42	42

** . Correlation is significant at the 0.01 level (2-tailed).

(IBM SPSS Statistic)

Output results of data calculations using SPSS are the correlation of UPBL data with SRL, and student engagement is known to mark a significant connection between UPBL with SRL, and student engagement is of more than 0,000 minor from value 0.05, then can conclude that there is a significant relationship between UPBL with SRL and student engagement.

Identify the Correlation between SRL and Learning Outcomes

The correlation between SRL and learning outcomes are identified in Table 2.

Table 2. Correlation of SRL & learning outcomes

		SRL U-Learning	U-learning pretest	U-learning Posttest
SRL U-Learning	Pearson Correlation	1	,120	,424 **
	Sig. (2-tailed)		,451	,005
	N	42	42	42
U-learning	Pearson	,120	1	,434 **

pretest	Correlation			
	Sig. (2-tailed)	,451		,004
	N	42	42	42
U-learning posttest	Pearson Correlation	,424 **	,434 **	1
	Sig. (2-tailed)	,005	,004	
	N	42	42	42

** . Correlation is significant at the 0.01 level (2-tailed)

(IBM SPSS Statistic)

Output results of data calculations using SPSS are The correlation between UPBL data and SRL and learning outcomes is known that mark significance connection UPBL with SRL and learning outcomes are of 0.005 and 0.004 more _ small from value 0.05, then can conclude that there is significant relationship _ between UPBL with SRL and learning outcomes.

Identify the Correlation between UPBL and SRL with Engagement and Learning Outcomes

Identification of the correlation results of UPBL and SRL with student engagement and learning outcomes can be seen in Table 3.

Table 3. Correlation of UPBL and SRL with engagement and learning outcomes

		SRL U-Learning	U-learning pretest	U-learning posttest	Active U-learning
SRL U-learning	Pearson Correlation	1	,120	,424 **	,650 **
	Sig. (2-tailed)		,451	,005	,000
	N	42	42	42	42
U-learning pretest	Pearson Correlation	,120	1	,434 **	,070
	Sig. (2-tailed)	,451		,004	,660
	N	42	42	42	42
U-learning posttest	Pearson Correlation	,424 **	,434 **	1	,335 *
	Sig. (2-tailed)	,005	,004		,030
	N	42	42	42	42
Active U-learning	Pearson Correlation	,650 **	,070	,335 *	1
	Sig. (2-tailed)	,000	,660	,030	
	N	42	42	42	42

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

(IBM SPSS Statistic)

Output results of data calculations using SPSS are the correlation of UPBL and SRL data with student engagement and learning outcomes are known that mark the significant connection between UPBL and SRL, with student engagement and learning outcomes, of 0.000 and 0.005 smaller from value 0.05, then can conclude that there is a significant relationship between UPBL and SRL, with student engagement and learning outcomes.

Identification of the correlation results of UPBL and SRL with student engagement and learning outcomes can be seen in Figure 1.

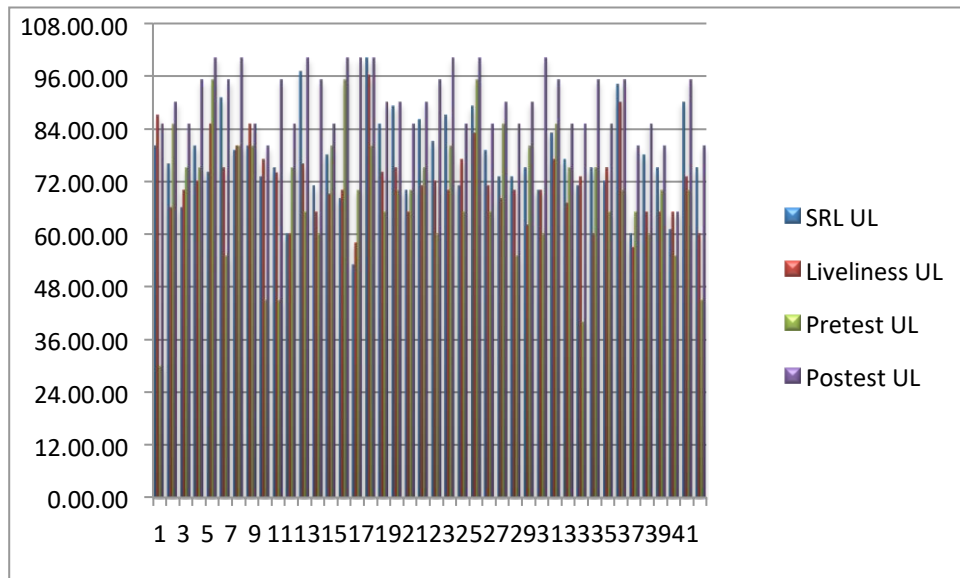


Figure 1. Correlation of UPBL and SRL with engagement and learning outcomes

Correlation of Ubiquitous Project Based Learning and Self Regulated Learning

A high-quality final result is required; all schematics and typography must be computer or ink-drafted. Ubiquitous Project Based Learning is a learning approach that uses the many readily available ubiquitous tools to let students learn whenever and wherever they are. According to (Mouri & Ogata, 2015), ubiquitous technologies like mobile devices, QR codes, RFID tags, and wireless networks have been utilized to develop universal learning systems based on u-learning and Computer Supported Ubiquitous Learning (CSUL). This education encompasses classroom instruction and learning from diverse sources outside the classroom, like libraries, museums, and homes. Finding connections between learners and other learners in various situations can be challenging, though, given the majority of the learning resources offered by ubiquitous learning systems are created by instructors or instructional designers.

One significant benefit of using U-learning in education is that it makes it easier for teachers to deliver learning messages. As stated by (Muñoz-Cristóbal et al., 2018). The advancement of education The term "Ubiquitous Learning Environment" (ULE) refers to the evolution of education over the past few decades from a traditional classroom to a complex technological and social ecosystem centred on mobile devices. Teachers now have more work to do due to these new technical opportunities. This is because they have to manage and coordinate the resources needed for intricate educational scenarios "orchestration". Assessment of the orchestration support offered by GLUEPS-AR, a technology designed to help teachers organize cross-room learning experiences conducted at ULE GLUEPS-AR supports educators.

The ubiquitous learning strategy is the latest evolution of electronic learning, which will later evolve into seamless learning, or what is usually called learning, which is not limited by space and time. This learning strategy provides excellent opportunities in the world of education. Ubiquitous learning also allows them to collaborate and interact in designing and implementing their projects in the best way. (Vallejo-correa et al., 2021) The use of mobile mobile technology has increased consistently in the last

ten years. This shows its great potential for various learning environments, such as ubiquitous (U-learning) and mobile (M-learning) learning environments.

Students prefer the most up-to-date learning strategies, including learning strategies in the ubiquitous learning environment which refers to constructivism theory rather than conventional learning which relates to behaviorism theory. This is because in ubiquitous learning they can share and exchange opinions when carrying out the learning process whenever and wherever they are, apart from that they are also able to master the material better because they can continue to re-study material that they have not learned (Mykytiuk et al., 2022).

Technological advances and digital convergence, for example, Netflix, allow users to watch TV and videos without time or place restrictions. These advances can be applied in education and training to enable ubiquitous learning (U-learning). However, there has yet to be an implementation of the U-learning model, explicitly showing the lack of alternative applications that can provide access to TV regardless of location and device. A reference model for implementing U-learning involving a cloud-supported TV/video platform is proposed to contribute to education. A group of experts validated the model in a university context and implemented it through a prototype in a natural setting with students. It showed results and increased student achievement (Moreno-López et al., 2022).

Research (Liu et al., 2022) regarding Chinese citizens' interest in learning English is relatively high, especially after using ubiquitous learning resource-sharing platforms and neural networks; it was found that there was an 85% increase in interest in learning English from the previous year. The platform has many advantages. This allows teachers to share resources at any time and from anywhere, and it is also very efficient. This proves that Ubiquitous learning provides many benefits in the world of education.

Ubiquitous learning provides participation that effectively improves student learning achievement. (Thongkoo et al., 2019) it is argued that ubiquitous learning-based inquiry learning implemented in web programming to evaluate learning performance offers positive results. Namely, it was found that the universal learning inquiry approach increased student learning achievement and positive perceptions of web programming systems.

The positive potential of ubiquitous learning is still being explored in education, one of which is augmented reality in ubiquitous learning. (Chu et al., 2016) argue that ubiquitous learning researchers are influenced by the rapid advances in wireless and sensor technology to improve learning achievement. Augmented reality (AR) learning strategies that use ubiquitous learning (U-learning) can be more effective in learning achievement than conventional approaches.

Ubiquitous learning in the learning process makes a positive contribution in terms of gender and location where the learning takes place. According to (Du et al., 2019), U-learning provides easy access anytime and anywhere for learning. Female students also have higher performance results than female students in the final exam. The main implication is that female students are more successful because they study at consistent locations and times, and all students who study at consistent times outperform those who use different time patterns. Gender differences in learning performance and spatio-temporal characteristics are supported by Brain research.

Ubiquitous project Based Learning (UPBL) is project-based learning that can be implemented flexibly and based on the correct information. UPBL makes it easy for students to create projects in groups that are not limited by space and time to achieve optimal learning according to learning objectives.

Project-based learning is collaborative learning in groups to work on a learning project. According to (Huang et al., 2019), a pedagogical strategy called project-based learning promotes active learning within constraints set by teachers. Under the project-based learning design, students ask and filter multiple questions correctly, propose numerous ideas, make predictions, plan and test, gather and analyze data, conclude, communicate various ideas and create new ideas, make questions distinct, and manage learning resources to find the best solution.

PBL is an approach to learning where the learning outcome is a product. (Soparat et al., 2015) define PBL as prioritizing long-term, multidisciplinary, student-centred, relevant learning activities. Learning activities aim to give students challenging assignments, innovative solutions, and real-world applications. According to (Grant, 2002), students can master the course objectives, acquire the course content, and select their themes, activities, or study aids. (Yu & Franz, 2018) put it this way: "creating is learning," which is applying what you already know to learn more. This can be accomplished in the classroom by producing projects like movies, robots, innovations, multimedia, and digital storytelling.

Project-based learning research is not only focused on the aspect of learning outcomes but also on various kinds of abilities that can be explored through the use of PBL strategies, one of which is creative thinking. According to (Chen et al., 2019), PBL can foster student creativity, especially regarding flexibility and fluency. In interviews, students said that using appropriate thinking tools is a way that can significantly improve their creativity. Hence, various creative thinking tools should be provided for students to take advantage of developing the habit of creative thinking.

By obtaining the best possible time and learning outcomes, a student's learning regulations are planned for, which is a crucial part of the learning process. (Yamada et al., 2017) found that other independent learning factors influence increased self-efficacy. According to the findings of the correlation study, test anxiety and self-efficacy are essential variables that affect how many slide pages high and bad performers read.

SRL has two divisions, namely high SRL and low SRL. Students with high SRL have higher learning outcomes than those with low SRL. According to (Suartama et al., 2021), there is a significant difference in learning activity between groups of students who have high SRL and groups of students who have low SRL, and there is also a substantial difference in learning outcomes between students who have high SRL and groups of students who have SRL low. In this way, the U-learning learning strategy has advantages over E-learning in achieving active learning and learning outcomes based on self-regulated learning.

Correlation of Learning Systems with Engagement and Learning Outcomes

Student engagement is a complex series of behaviours and experiences influencing student achievement outcomes. According to (Kearsley & Shneiderman, 1998), The basic theory of learning involvement is that students must be involved meaningfully through interactions with other people and practical tasks in learning activities.

Learning engagement can generally occur without the use of technology, but technology can facilitate engagement in ways that are otherwise difficult to achieve. So, engagement theory is intended as a conceptual framework for technology-based learning and teaching. According to (Ibanez et al., 2014), there is a positive influence on student engagement and a moderate increase in learning outcomes in learning activities with gamification learning strategies. Apart from that, there is also increased motivation for academic achievement.

Student engagement in learning can be increased through information and communication technology. According to (Schindler et al., 2017), computer-based technology significantly influences student engagement. These computer-based technologies include learning using digital games, web conferencing, Facebook, wikis, blogs and Twitter.

The final results attained once the learning process is implemented are known as learning outcomes. According to (Degeng, 2018), learning outcomes are all results that can be utilized as markers of the usefulness of using learning strategies in various contexts. The research investigates the cognitive learning effects of students using Ubiquitous Project Based Learning.

The effectiveness of learning outcomes has a significant influence if, after the treatment, research is carried out, there are substantial results or progress compared to before the research object was subjected to treatment. According to (Suartama et al., 2021), there are significant differences in learning outcomes for learning media courses between groups of students who study with U-Learning and study groups of students who use E-Learning.

Output results of data calculations using SPSS are the correlation of UPBL data with student SRL, and engagement is known that mark significance connection UPBL with student SRL and Engagement is of more than 0,000 minor from value 0.05, then can conclude that there is a significant relationship between UPBL with student SRL and Engagement.

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Output results of data calculations using SPSS are correlation of UPBL and SRL data with student engagement and learning outcomes is known that mark the significant connection between UPBL and SRL, with students engagement and learning outcomes, is of 0.000 and 0.005 smaller from value 0.05, then can conclude that there is a significant relationship between UPBL and SRL, with students engagement and learning outcomes. The research results show UPBL has a substantial relationship to SRL with student engagement and learning outcomes.

IV. CONCLUSION

This research aims to determine the relationship between UPBL and SRL with higher education student engagement and learning outcomes. The study found a significant association between UPBL and SLR self-regulated learning and student engagement.

Thus, Ubiquitous Project Based Learning and Self-Regulated Learning can influence student engagement and learning outcomes. In planning and managing knowledge, educators are advised to use Ubiquitous Project Based Learning, which is more oriented to the characteristics of each student. The importance of implementing UPBL and SRL oriented learning in higher education to increase student engagement and learning outcomes. Educators must consider individual student characteristics and utilize appropriate approaches, such as UPBL, which can significantly increase student engagement. In addition, using SRL is also essential in providing students with skills and strategies to organize and control their learning process. Thus, educators are expected to design learning experiences that support these two approaches to maximize student learning achievements in higher education.

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