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The Effect of Teachers' Level of Self-Regulated Learning and Internet Self-Efficacy on Teaching Innovation in the Constructivist Curriculum

Eka Budhi Santosa[1(*)], Fatma Sukmawati[2], Ratna Juwita[3], Budi Tri Cahyono[4], Relly Prihatin[5], Suparmi[6]
[1,2,3,4,5,6]Universitas Sebelas Maret, Faculty of Teacher Training and Education, Surakarta, Indonesia

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Abstract

In the era of modern education, innovation in teaching is a crucial aspect for improving learning quality. This study aims to find out the extent to which Internet Self-Efficacy (ISE) of teachers affects learning innovation in the constructivist curriculum and the extent to which Self-Regulated Learning (SRL) affects teachers in making learning innovations in the constructivist curriculum. The research method used is quantitative with a survey approach. Data was collected through a questionnaire filled out by 97 junior high school teachers in Central Java who implemented a constructivist curriculum. Based on the results of the regression analysis, it was found that in the condition that teachers have a high level of Internet self-efficacy, self-regulated learning (SRL) has a significant effect on the learning innovations that are carried out by teachers. Another condition is the influence of SRL with low teacher ISE on teacher learning innovation. In the condition of low self-efficacy levels, SRL indicators of metacognitive skills, time management, and environmental settings did not have a significant effect on teachers' learning innovation. These findings indicate that teachers with high levels of self-regulated learning (SRL) and internet self-efficacy tend to be more innovative in implementing teaching methods that are in accordance with the principles of constructivism. The implications of this study emphasize the importance of developing teachers' self-regulated learning (SRL) and internet self-efficacy skills through continuous training and professional development programs to improve the quality of teaching in constructivist curricula.

Keywords: Constructivist Curriculum; Internet Self-Efficacy; Self-Regulated Learning; Teaching Innovation

(*) Corresponding Author: ekabudhisantosa@staff.uns.ac.id

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INTRODUCTION

Teacher performance is a key factor in improving the quality of student learning (Lede et al., 2024) Teachers who perform well are able to create a constructive learning environment according to the needs of students (Bautista-Quispe et al., 2023) and support their learning so that each student can reach their maximum potential (Mailool et al., 2020); (Tambunan et al., 2021). In addition, professional and dedicated teachers are also able to apply innovative and adaptive teaching methods (Wahyudi et al., 2023)as well as being able to develop students' critical thinking skills and creativity (Imms & Byers, 2017) Thus, improving teacher

performance directly contributes to improved student learning outcomes and the achievement of overall educational goals (Morgan et al., 2014)

The main challenges faced by teachers regarding the implementation of a constructivist curriculum are teacher perception (Yildirim & Kasapoglu, 2015) and teachers' technical readiness in its implementation (Tuasikal et al., 2021); (Garnett, 2013);(Wilkerson, 2022). The constructivist curriculum in Indonesia is called the "Independent Curriculum." The curriculum requires teachers to deeply understand the principles of student-focused, creative, innovative, and project-based learning. However, not all teachers have adequate access to the training and resources to implement this approach effectively. Many teachers are still accustomed to more rigid and structured conventional teaching methods, so they have difficulty adapting to the demands of a more flexible and innovative curriculum (Garnett, 2013) In addition, differences in infrastructure and access to technology in various regions are also obstacles (Santosa et al., 2020); (Sumarmi et al., 2022), especially in remote areas that may not have adequate internet access or devices to support digital learning, which is one of the essential aspects of the Constructivist curriculum.

Another challenge in implementing the Constructivist curriculum for teachers is time management and administration. The independent curriculum provides greater freedom for teachers to design and organize learning according to the needs and potential of students (Tuasikal et al., 2021) However, this freedom also requires better time management skills and the ability to conduct authentic and sustainable judgments (C. Y. Chen et al., 2023) Teachers are often burdened with time-consuming administrative and bureaucratic responsibilities, reducing the time and energy they could have dedicated to creative and innovative learning planning and execution. In addition, performance evaluations based on learning outcomes and impacts require more complex assessment methods, which not all teachers feel ready or have experience (Dindar et al., 2020) Support from the government and educational institutions in the form of continuous training and reducing administrative burdens is urgently needed to help teachers overcome these challenges and succeed in implementing the independent curriculum (Purwanta, 2023)

Using the Internet in learning provides many opportunities for innovation in teaching and learning (Moreno & Martínez, 2022); (Li et al., 2022). Online learning models, hybrid learning models, flip classrooms, inquiry learning, and other digital media can be used by teachers in learning (Zhang, 2010a); (Ratnawati & Idris, 2020). The development of Artificial Intelligence also provides opportunities for teachers to take advantage of learning innovations (Chiu, 2024); (Chiu, 2024). Although internet-based learning has several drawbacks such as lack of social interaction, isolation from the real environment, and difficulty in controlling the learning process (Ellianawati et al., 2021)), internet-based learning has expanded in education at all levels. The main benefit of online learning over traditional classroom learning is its flexibility in terms of time and place. Students can also innovate in learning according to their learning styles and interests (Ratnawati & Idris, 2020)

In the internet-based learning process, teachers' self-regulated learning (SRL) is an important skill that allows teachers to adjust their behavior in order to succeed in learning implementation and achieve satisfactory results (Liao et al., 2023) Teachers who are less confident in their ability to use the Internet may be less

interested in digital learning (P. C. Hsu et al., 2020) and have fewer possibilities to connect with students or fellow teachers, resulting in internet-based learning failures (Kao & Chien, 2017). In addition, time management, planning, and self-evaluation are the biggest challenges faced by teachers in internet-based learning (Sui et al., 2024) However, few studies have investigated the influence of technology or Internet self-efficacy and self-regulated learning on learning innovations by teachers in constructivist curricula. In addition, although self-regulated learning has been extensively researched over the past few decades, the impact of self-regulated learning strategies on teachers' abilities in learning innovation remains variable (Karlen et al., 2024)

Teaching innovation is incorporating new strategies, ideas, and tools into educational practice to improve learning outcomes and adapt to the evolving needs of students (Moreno & Martínez, 2022) This approach often includes the integration of technologies such as interactive digital platforms, augmented reality, and artificial intelligence-based personal learning systems (Androutsos & Brinia, 2019); (Batool, 2022). These tools can provide an immersive learning experience and tailor educational content to individual learning styles, making education more engaging and effective. Additionally, teaching innovations encourage educators to adopt pedagogical strategies such as flip classrooms, project-based learning, and gamification, which encourage active learning and critical thinking skills among students (W. Chen et al., 2022)

In addition, teaching innovation includes not only technology integration, but also curriculum redesign and the development of collaborative learning environments (Yildirim & Kasapoglu, 2015) By rethinking traditional curriculum structures, educators can create interdisciplinary learning that reflects real-world complexities and prepares students for diverse career paths. Collaborative learning environments, both physical and virtual, support interaction between peers and teamwork, which is an essential skill in today's global workforce (Ludvigsen, 2016) Innovation in teaching not only aims to improve academic performance but also to equip students with the adaptive skills necessary for lifelong learning and success in a rapidly changing world (Liang & Hainan, 2019)

Teachers' ability to innovate with a constructivist curriculum approach also involves the use of various resources and technologies that can support the learning process (Yildirim & Kasapoglu, 2015) Innovative teachers will use digital tools, educational apps, and social media to enrich students' learning experiences (Moreno & Martínez, 2022) Technology allows students to access information in a more engaging and interactive way, such as through simulations, educational games, and learning videos (Vidal, 2020) Teachers can also leverage online platforms for collaborative projects that involve students from different locations, thereby expanding their horizons and learning networks (Mangkhang et al., 2022) These innovations help create a learning environment that is more engaging and relevant to students' modern lives.

In addition, teachers who are innovative in the constructivism curriculum can integrate project-based learning (Bell, 2010) and problem-based learning (Santosa et al., 2020); (Nantha et al., 2022) in their curriculum. This approach allows students to engage in in-depth research and solve real problems, which are relevant to the subject being studied. Teachers serve as mentors who guide students through the

discovery process, from project planning to outcome evaluation. Thus, students not only acquire theoretical knowledge, but also practical skills such as cooperation, communication, and time management (Pellegrino et al., 2012) This innovation in teaching with a constructivist approach results in more meaningful learning and equips students with the competencies needed to face real-world challenges (W. Chen et al., 2022)

The level of self-regulated learning of teachers and the ability to innovate in learning are very close and mutually supportive (Vilkova & Shcheglova, 2021) Self-regulated learning refers to the ability of teachers to independently regulate, monitor, and assess their own learning process (Zimmerman, 1986); (Zimmerman et al., 2004); (Zimmerman, 2008) Teachers who have good self-regulated learning skills tend to be more reflective, proactive in seeking new knowledge, and committed to continuous professional development. These skills allow them to constantly update their teaching methods and techniques, according to the latest developments in education and the needs of students. Moreover, teachers who use the constructivist curriculum. In the context of innovation, teachers with strong self-regulated learning skills are better equipped to identify areas that need improvement and implement creative and effective solutions (Mejeh et al., 2024)

Additionally, self-regulated learning allows teachers to be more responsive to classroom dynamics and individual needs of students (Cristea et al., 2023) Teachers who are highly engaged in self-regulated learning tend to be more flexible in adapting their curriculum and teaching approach based on their feedback and observations. They not only focus on achieving academic standards, but also on the holistic development of students (Nurullin, 2019) The ability to independently manage their own learning process gives teachers the confidence and autonomy to experiment with a variety of innovative strategies, such as project-based learning, the use of technology in learning, and collaborative approaches. Thus, SRL and innovation in learning have a synergistic relationship (Heikkinen et al., 2023) where improvements in one aspect will support progress in another, creating a more adaptive and dynamic educational environment.

Self-regulated teacher learning is the internal process of individual teachers being able to take active control of their own learning experience by setting goals, choosing strategies, and monitoring their own learning progress (Zimmerman et al., 2004); (Karlen et al., 2024). This approach empowers teachers as lifelong learners (Nguyen et al., 2024) to be independent and proactive, taking responsibility for their professional competency journey (Dignath et al., 2023) Techniques such as goal setting, effective note-taking, and self-reflection are important components of Self-regulated learning (Zimmerman et al., 2004) By using this method, teachers as lifelong learners can increase their intrinsic motivation and self-efficacy, leading to improved academic performance and a deeper understanding of the material (Thwe & Kálmán, 2024) Self-regulating lifelong learners are better equipped to navigate the complexities of the learning process, making adjustments as needed to achieve their learning goals (Nguyen et al., 2024)

Furthermore, self-regulated learning of teachers involves the ability to overcome obstacles and adjust strategies when facing the complexity of challenges as adult learners while learning new technologies that are rapidly evolving for self-competency (Oyelere et al., 2021) Lifelong learners who are proficient in self-

regulation tend to be more resilient and able to identify and correct mistakes independently (Nguyen et al., 2024) They use feedback constructively to further develop their skills and knowledge about information technology developments (Androutsos & Brinia, 2019) This form of learning is not only about achieving instant academic success but also about developing lifelong learning skills. By developing SRL, teachers as lifelong learners are able to build the necessary tools to manage their learning in various contexts, which ultimately prepares them to face the dynamic demands of the world of education as the development of information technology is associated with the constructivist curriculum (Bommel et al., 2015)

The level of internet self-efficacy of teachers, which refers to teachers' self-confidence in using, regulating and implementing a series of actions in the environment of internet technology for learning purposes, has a significant influence on the learning innovations they implement in the classroom (Eastin & LaRose, 2000) In the context of online learning, Internet Self-Efficacy (ISE) is the key to determining its success (Shen et al., 2013) Teachers who have high internet self-efficacy tend to be bolder and more creative in exploring and integrating digital technology into their teaching methods (Hung, 2016); (Duradoni et al., 2022). This allows them to design more interactive and engaging teaching materials, as well as leverage various online platforms to enrich the student learning experience. With high confidence in using technology, teachers can be more effective in finding and adapting the latest learning resources, which can ultimately improve the quality of learning and student learning outcomes (Joo et al., 2000); (Dinh & Nguyen, 2022).

A high level of self-efficacy will encourage teachers to continue to develop their professional skills in developing learning innovations (Hung, 2016) Teachers who feel comfortable and competent with technology tend to be more active in participating in training or workshops related to digital learning innovation. They are also more open to change and are ready to adopt new approaches to teaching (Kao & Chien, 2017) This has the potential to create a more dynamic and responsive learning environment to the needs of the times, as well as being able to prepare students to face challenges in the digital era (Bećirović et al., 2022) Thus, increasing internet self-efficacy among teachers is one of the essential keys to encouraging sustainable and relevant learning innovation. Previous research on the impact of internet self-efficacy on teachers' ability to innovate learning is still limited (Guskey, 1988) Other studies reported a variation in the positive impact of ISE on learners' learning achievement (Xing & Lu, 2022); (Gupta & Bamel, 2023). With the rise of online learning, it has become increasingly important to test ISE as a predictor of online learning success (Bećirović et al., 2022)

Therefore, this study aims to answer two main questions below, namely the extent to which teachers' Internet Self-Efficacy (ISE) affects learning innovations in the constructivist curriculum and the extent to which Self-Regulated Learning (SRL) affects teachers in making learning innovations in the constructivist curriculum.

METHODS

This study uses a verifiable descriptive method with a quantitative analysis approach. The variables used in this study are self-regulated learning (X) as an influential variable, internet self-efficacy as a moderator variable, and teacher learning innovation level as an affected variable. The respondents of this study are junior high school teachers in Central Java. The number of respondents was 97 teachers from several schools. The sampling technique in this study uses a nonprobability incidental technique.

The student's Self-Regulated Learning measurement instrument consisted of 34 modified statements from the instrument developed by Janssen (Jansen et al., 2018) After a validity test, it was found that r calculates ≥ r table, which means that the instrument is declared valid. Meanwhile, the instrument used to measure the level of *Internet self-efficacy* in this study uses the *Internet Self-efficacy* Scale *(ISS) made by* (Kim & Glassman, 2013) The questionnaire consisted of 20 statements translated from the original language, English, into Indonesian. After a validity test, it was found that r calculates ≥ r table, which means that the instrument is declared valid. The instrument for measuring learning innovation was also tested for validity and reliability, which was declared valid and reliable.

The analysis method in this study begins by conducting descriptive statistical analysis of data to determine the characteristics of teacher learning innovations, which include bound variables and predictor variables, which include Self-Regulated Learning and the level $YX_1\ X_2$*, of self-efficacy* of teachers' internet. Then, a regression analysis was conducted to examine whether (1) SRL variables with Metacognitive skills indicators with Low ISE have an effect on teacher learning innovation, (2) SRL variables with *Time management* indicators with Low ISE have an effect on teacher learning innovation, (3) SRL variables with Environmental structuring indicators with Low ISE have an effect on innovation teacher learning, (4) SRL variables with Persistence indicators with Low ISE have an effect on teacher learning innovation, (5) SRL variables with help-seeking indicators with Low ISE have an effect on teacher learning innovation, (6) SRL variables with Metacognitive skills indicators with Medium ISE have an effect on teacher learning innovation, (7) SRL variables with Time Management indicators) with ISE Medium affects teacher learning innovation, (8) SRL variable with the indicator of Environmental structuring with ISE Medium affects teacher learning innovation, (9) SRL variable with Persistence indicator with ISE Medium affects teacher learning innovation, (10) SRL variable with the indicator of Seeking Help (Help seeking) with ISE Medium affects teacher learning innovation, (11) SRL variables with Metacognitive skills indicators with High ISE have an effect on teacher learning innovation, (12) SRL variables with *Time management* indicators with High ISE have an effect on teacher learning innovation, (13) SRL variables with Environmental structuring indicators with High ISE have an effect on teacher learning innovation, (14) SRL variables with indicators Persistence with High ISE affects teacher learning innovation, (15) SRL variable with Help seeking indicator with High ISE affects teacher learning innovation.

RESULTS & DISCUSSION

Before the regression analysis was carried out, a model reliability test (F test) was first carried out. The F test between SRL and ISE, is high on teacher learning innovation; it was found that the prob. F calculation (sig.) in the table above has a value of 0.000, meaning it is less than the significance level of 0.05. It can be concluded that the estimated regression model is feasible to use to explain high SRL and ISE for the variables bound by Learning Innovation.

Table 1. Model Reliability Test (Test F)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.968	5	3.194	61.722	.000[a]
	Residual	4.657	90	.052		
	Total	20.625	95			

a. Predictos: (Constant), Help seeking, Time Management, Metacognitive Skills, Environmental structuring, Persistence
b. Dependent Variable: Learning Innovation

The results of regression analysis of SRL indicators, which include Metacognitive skills, Environmental structuring, Persistence, and Help-seeking with high ISE on teacher learning innovation, are obtained as follows:

Table 2. Regression Coefficient Test (Uji t)

No	Self Regulated Learning (Indikator)	Uji t (sig.)	Result Test
1	Metacognitive skills	0,00	Accepted
2	Time management	0,030	Accepted
3	Environmental structuring	0,00	Accepted
4	Persistence	0,001	Accepted
5	Help to seek	0,00	Accepted

The value of the calculated prob t of the SRL-Metacognitive skills free variable is 0.000, which is smaller than 0.05, so the SRL-Metacognitive skills free variable significantly affects the Learning Innovation bound variable at alpha 5%. Furthermore, the influence of the SRL-Time management independent variable on the bound variable of Learning Innovation is important because of the prob value. t calculated 0.030, which is smaller than 0.05, so it can be said that the SRL-Time management independent variable significantly affects the Learning Innovation bound variable at alpha 5%. The effect of the SRL-Environmental structuring independent variable on the Learning Innovation bound variable is because the value of the prob. t calculation 0.000 is smaller than 0.05, so it can be said that the SRL-Environmental structuring independent variable has a significant effect on the learning innovation bound variable at alpha 5%. Meanwhile, the effect of the SRL-Persistence independent variable on the bound variable of Learning Innovation is due to the prob value. t calculated 0.001, which is smaller than 0.05, so it can be said that the independent variable SRL-Persistence significantly affects the bound variable of Learning Innovation at alpha 5%. The effect of the SRL-Help seeking independent variable on the Learning Innovation bound variable, because the value of the prob. t calculation 0.000 is smaller than 0.05, so it can be said that the SRL-Help seeking independent variable has a significant effect on the Learning Innovation bound variable at alpha 5%.

Table 3. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.880[a]	.774	.762	.227

Predictors: Constant, Help seeking, Time management, Metacognitive skills, Environmental structuring, Persistance

Based on the determination coefficient of the R-Square value of 0.774, the proportion of the influence of the five independent variables on the Learning Innovation variable is 77.4%. This means that the five independent variables of the SRL indicator have a proportion of influence on Learning Innovation of 77.4%, while the remaining 22.6% are influenced by other variables that are not in the regression model.

In the F test between SRL and ISE on teacher learning innovation, the result was obtained that the prob. F calculates (sig.) in the table the value is 0.000, meaning it is less than the significance level of 0.05. It can be concluded that the estimated regression model is feasible to use to explain high SRL and ISE for the variables bound by Learning Innovation.

Table 4. Model Reliability Test (Test F)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.425	5	.285	14.529	.000[a]
	Residual	2.453	125	.020		
	Total	3.878	130			

a. Predictors: Constant, Help seeking, Time management, Metacognitive skills, Environmental structuring, Persistance
b. Dependent Variable: Learning Innovation

Next, conduct a regression coefficient test (t-test) on a fixed variable with a moderate ISE on teacher learning innovation. The results of the analysis show the following:

Table 5. Regression Coefficient Test (t-Test)

No	Self Regulated Learning (Indikator)	Uji t (sig.)	Test Result
1	Metacognitive skills	0,009	Accepted
2	Time management	0,657	Rejected
3	Environmental structuring	0,555	Rejected
4	Persistence	0,000	Accepted
5	Help seeking	0,032	Accepted

It shows that the value of the calculated prob t from the SRL-Metacognitive skills free variable is 0.009, which is smaller than 0.05, so the SRL-Metacognitive skills independent variable significantly affects the Learning Innovation bound variable at alpha 5%. Furthermore, the influence of the SRL-Time management independent variable on the bound variable of Learning Innovation is important because of the prob value. t calculated 0.657 which is greater than 0.05 so it can be said that the SRL-Time management independent variable does not have a significant effect on the Learning Innovation bound variable at alpha 5%. The effect of the SRL-Environmental structuring independent variable on the bound variable of Learning Innovation, because of the prob value. t calculated 0.555, which is greater than 0.05, so it can be said that the SRL-Environmental structuring independent variable does not have a significant effect on the Learning Innovation bound variable at alpha 5%. Meanwhile, the effect of the SRL-Persistence independent variable on the bound variable of Learning Innovation, due to the prob value.

t calculate 0.000 which is smaller than 0.05 so it can be said that the SRL-Persistence free variable has a significant effect on the Learning Innovation bound variable at alpha 5%. The effect of the SRL-Help seeking independent variable on the Learning Innovation bound variable, because of the prob value. t calculated 0.032 which is smaller than 0.05 so it can be said that the SRL-Help seeking independent variable has a significant effect on the Learning Innovation bound variable at alpha 5%.

Based on the analysis of the determination coefficient, the results were obtained that because the R-Square value of 0.368 showed that the proportion of the influence of the five variables of the independent variable on the Learning Innovation variable was 36.8%. This means that the five independent variables have a proportion of influence on Learning Innovation of 36.8% while the remaining 63.2% are influenced by other variables that are not in the regression model.

Table 6. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.606[a]	.368	.342	.140

Predictors: Constant, Help seeking, Time management, Environmental structuring, Persistance, Metacognitive skills

In the F test between SRL and ISE on teacher learning innovation, the result was obtained that the prob. F calculates (sig.) in the table the value is 0.000, meaning it is less than the significance level of 0.05. It can be concluded that the estimated regression model is feasible to use to explain high SRL and ISE for the variables bound by Learning Innovation.

Table 7. Model Reliability Test (Test F)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.054	5	2.211	33.530	.000[a]
	Residual	3.429	52	.066		
	Total	14.483	57			

a. Predictors: Constant, Help seeking, Environmental structuring, Time management, Persistance, Metacognitive skills
b. Dependent Variable: Learning Innovation

Table 8. Regression Coefficient Test (t-Test)

No	Self Regulated Learning (Indikator)	t Test (sig.)	Test Result
1	Metacognitive skills	0,061	Rejected
2	Time management	0,130	Rejected
3	Environmental structuring	0,849	Rejected
4	Persistence	0,026	Accepted
5	Help seeking	0,003	Accepted

The table above shows that the value of the calculated prob t of the SRL-Metacognitive skills free variable is 0.061 which is greater than 0.05 so that the SRL-Metacognitive skills free variable does not have a significant effect on the Learning Innovation bound variable at alpha 5%. Furthermore, the influence of the SRL-Time management independent variable on the bound variable of Learning Innovation, because of the prob value. t calculated 0.130 which is greater than 0.05 so it can be said that the SRL-Time management independent variable has no significant effect on the Learning Innovation bound variable at alpha 5%. The effect of the SRL-Environmental structuring

independent variable on the bound variable of Learning Innovation, because of the prob value. t calculated 0.849 which is greater than 0.05 so it can be said that the SRL-Environmental structuring free variable has no significant effect on the Learning Innovation bound variable at alpha 5%. Meanwhile, the effect of the SRL-Persistence independent variable on the bound variable of Learning Innovation, due to the prob value. t calculated 0.026 which is smaller than 0.05 so it can be said that the SRL-Persistence free variable has a significant effect on the Learning Innovation bound variable at alpha 5%. The effect of the SRL-Help seeking independent variable on the Learning Innovation bound variable, because of the prob value. t calculated 0.003, which is smaller than 0.05, so it can be said that the SRL-Help seeking independent variable significantly affects the Learning Innovation bound variable at alpha 5%.

Furthermore, the Coefficient of Determination analysis was carried out which obtained that the R-Square value of 0.763 showed that the proportion of the influence of the five variables of the independent variable on the Learning Innovation variable was 76.3%. This means that the five independent variables have a proportion of influence on Learning Innovation of 76.3% while the remaining 23.7% are influenced by other variables that are not in the regression model.

Table 9. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.874[a]	.763	.740	.257

a. Predictors: Constant, Help seeking, Environmental structuring, Time management, Persistance, Metacognitive skills
b. Dependent Variable: Learning Innovation

Based on the results of the regression analysis, it was found that, in the condition that teachers have a high level of Internet self-efficacy, self-regulated learning (SRL) significantly affects the learning innovations that teachers carry out. Internet self-efficacy reflects a teacher's confidence in using Internet technology for learning purposes. When a teacher has a high level of confidence in accessing, navigating, and utilizing online resources, they tend to be more able to manage the learning process effectively and innovatively (P. C. Hsu et al., 2020) with a variety of creative learning strategies (Buchanan et al., 2013). In addition, effective self-regulated learning in teachers with high internet self-efficacy encourages the development of sustainable learning innovations (Dinh & Nguyen, 2022) When teachers have good access to information and technology, they can take advantage of various digital tools and platforms to support their own and students' learning processes. As such, teachers tend to be more innovative in creating teaching materials, increasing student engagement, and implementing interactive and adaptive teaching strategies (Gupta & Bamel, 2023) As a result, teachers not only improve their own performance but also bring a positive impact to the learning environment in schools.

According to Eastin and LaRose (2000), internet self-efficacy greatly influences the way individuals use the internet in various activities, including learning. This confidence encourages teachers to use technology more creatively and innovatively, allowing them to adopt more varied learning approaches such as flipped classroom and blended learning. Teachers who feel comfortable and confident with technology are more likely to try new methods and adapt their teaching strategies to meet the diverse needs of students (Bandura, 1997). In addition, teachers with high internet self-efficacy are also more likely to adopt innovative learning approaches, such as flipped classroom, blended learning, and the use of game-based learning applications. They not only use technology to deliver subject

matter, but also to engage students in more collaborative and participatory learning activities. In this situation, SRL serves as a support mechanism that helps teachers proactively manage their own learning process, set goals, monitor progress, and reflect on the results (Zimmerman, 2002). Thus, the combination of internet self-efficacy and SRL allows teachers to be more adaptive and responsive to students' learning needs, as well as improve the quality and effectiveness of learning in the classroom. Overall, these findings emphasize the importance of improving internet self-efficacy and SRL among teachers through ongoing professional training and development programs. By equipping teachers with the skills and confidence necessary to make effective use of technology, we can drive innovation in teaching and create more meaningful and engaging learning experiences for students (Schunk & Zimmerman, 2007).

Another condition is the influence of SRL in moderate ISE. When the level of teachers' internet self-efficacy is at a moderate level, two indicators of self-regulated learning, namely time management and environmental regulation, do not have a significant effect on teachers' learning innovation. However, indicators of metacognitive skills, perseverance, and seeking help had a significant effect on the innovation. Metacognitive skills allow teachers to reflectively supervise and regulate their own learning processes, helping them to identify and address weaknesses in the use of technology. Perseverance helps teachers to keep trying and exploring new methods despite difficulties, while seeking help shows teachers' openness to seeking information and external support, broadening their horizons and skills in technology-based learning (M. H. Hsu & Chiu, 2004); (Kao & Chien, 2017). Thus, while time management skills and environmental settings are less impactful, the combination of metacognitive skills, perseverance, and seeking help allows teachers to stay innovative in learning.

According to Eastin and LaRose (2000), internet self-efficacy greatly influences the way individuals use the internet in various activities, including learning. This confidence encourages teachers to use technology more creatively and innovatively, allowing them to adopt more varied learning approaches such as flipped classrooms and blended learning. Teachers who feel comfortable and confident with technology are more likely to try new methods and adapt their teaching strategies to meet the diverse needs of students (Bandura, 1997). However, in other conditions where the level of teachers' internet self-efficacy is at a moderate level, the influence of SRL on learning innovation shows variation. Two SRL indicators, namely time management and environmental regulation, did not have a significant effect on teacher learning innovation. This may be because time management and environmental settings are more mechanical in nature and do not directly affect creativity in learning. However, indicators of metacognitive skills, perseverance, and seeking help turned out to have a significant effect on learning innovation. Metacognitive skills allow teachers to plan, monitor, and critically evaluate their teaching approaches, which in turn encourages them to constantly look for new ways of delivering material (Zimmerman, 2002). Perseverance helps teachers stay focused and not give up easily when facing challenges in implementing new teaching methods. Seeking help, both from peers and online resources, also allows teachers to enrich their knowledge and skills, making them better prepared to innovate in teaching (Schunk & Zimmerman, 2007). The importance of improving internet self-efficacy and SRL among teachers through ongoing training and professional development programs. By equipping teachers with the skills and confidence necessary to make effective use of technology, we can drive innovation in teaching and create more meaningful and engaging learning experiences for students (Schunk & Zimmerman, 2007).

Another condition is the influence of SRL with low teacher ISE on teacher learning innovation. In the condition of low self-efficacy level of teachers, SRL indicators of metacognitive skills, time management, and environmental settings did not have a

significant effect on teachers' learning innovation. This happens because low confidence in using technology hinders teachers' ability to effectively apply and utilize these skills in a digital context (Kim & Glassman, 2013b) However, indicators of perseverance and seeking help still have a significant effect on learning innovation. Perseverance allows teachers to keep trying and not give up easily in the face of technological challenges, encouraging them to find new ways of teaching despite their limitations. Meanwhile, the search for help shows the openness and initiative of teachers to seek external support, either from peers, online resources, or additional training, which can enrich their knowledge and skills in using technology for learning. Thus, although metacognitive skills, time management, and environmental settings are less impactful, perseverance and seeking help help teachers stay innovative in the learning process. This condition shows that when teachers feel less confident in using internet technology, their ability to manage the learning process independently is not enough to encourage innovation in teaching. Metacognitive skills that normally assist teachers in planning, monitoring, and evaluating their teaching strategies become less effective. This may be because their lack of exposure and experience with digital technologies hinders their ability to implement new ideas in teaching (Zimmerman, 2002).

Time management, which is important for organizing various tasks and activities in learning, also does not have a meaningful impact on learning innovation. Teachers with low ISE may feel overwhelmed by the demands of using technology so they spend more time completing basic tasks than looking for new ways to improve their teaching. Environmental settings, which include the ability to create and manage conducive learning environments, also do not contribute significantly to innovation. This can be caused by a lack of understanding or skills in adapting physical and virtual environments to support innovative learning methods (Bandura, 1997). These findings emphasize that improving ISE is an important prerequisite for maximizing the potential of SRL in driving learning innovation. Without sufficient confidence in using technology, even good SRL skills will not be effective in creating innovative changes in teaching practices. Therefore, a professional development program focused on improving ISE should be a priority. Training designed to improve technology skills and build teachers' confidence in the use of the internet can help overcome these barriers. Thus, teachers will be better equipped to make effective use of SRL, which in turn will drive innovation in learning and improve the quality of education (Schunk & Zimmerman, 2007).

Based on the analysis of the Determination coefficient test, it was found that the influence of SRL with high ISE on learning innovation, had an R-Square value of 0.774. This means that the proportion of the influence of the fifth variable of the SRL indicator independent variable on the Learning Innovation variable is 77.4%. So there are still 22.6% of other variables that affect learning innovation. In the medium ISE, the R-Square value was found to be 0.368. This shows that the proportion of the influence of the fifth variable of the SRL indicator independent variable on the Learning Innovation variable is 36.8% and 63.2% influenced by other variables that are not in the regression model. Meanwhile, in a low ISE, an R-Square value of 0.763 was obtained, which means that the proportion of influence of the fifth variable of the SRL indicator's independent variable on the Learning Innovation variable was 76.3% and 23.7% was influenced by other variables that were not in the regression model. Based on the results above, it was found that the average proportion of the five independent variables of the SRL indikator, including high, medium and low ISE was 63.5% and there were 36.5% influenced by other variables. Other variables in question can be in the form of teacher age, teacher teaching experience, teacher education level and the environment that supports the teacher(Barnard et al., 2009); (Santosa & Sarwanta, 2021).

The results of this study demonstrate that Internet Self-Efficacy (ISE) plays a crucial role in determining teachers' ability to innovate in their teaching practices. Teachers with high ISE are more likely to incorporate technology into their classrooms, which supports the development of interactive and engaging learning materials.This finding aligns with previous research (Zhang, 2010b), suggesting that teachers with confidence in using technology tend to explore new teaching methods, such as blended learning or flipped classrooms. However, the data also reveal that teachers with low ISE struggle to integrate technology effectively, which hampers their ability to innovate. This points to a need for targeted interventions that focus on boosting ISE among teachers, particularly in regions with limited access to technology.

Moreover, the interaction between Self-Regulated Learning (SRL) and ISE is noteworthy. While SRL indicators like metacognitive skills and persistence showed a significant effect on teaching innovation under high and medium ISE conditions, other SRL factors like time management and environmental structuring did not significantly impact innovation under low ISE conditions. This suggests that teachers with low ISE may lack the confidence to manage their learning environments effectively, even if they possess the theoretical skills to do so. It is possible that their limited exposure to digital tools creates a gap between knowledge and application, reducing the overall impact of SRL on innovation.

These findings imply that while both ISE and SRL are critical for fostering teaching innovation, ISE serves as a foundational factor that amplifies the benefits of SRL. Without sufficient confidence in using technology, even teachers with strong SRL skills may be unable to effectively innovate in their teaching practices. As such, professional development programs should prioritize building both technical skills and self-efficacy among teachers to promote sustainable innovation.

The results of this study offer important insights for policymakers and educational institutions. To increase teaching innovation, it is essential to design continuous professional development programs that not only focus on enhancing SRL but also address the digital divide in ISE. Training should aim to improve teachers' comfort with technology and provide practical strategies for integrating digital tools into their daily teaching practices.

Future research should explore how other variables, such as teaching experience, access to resources, or school culture, might interact with ISE and SRL to influence teaching innovation. Additionally, a more in-depth qualitative exploration could provide valuable insights into the challenges teachers face in low-tech environments and how they overcome these barriers.

CONCLUSION

This research reveals the importance of innovation in teaching to improve the quality of learning in the modern education era, especially in the context of a constructivist curriculum. Through an analysis of 97 junior high school teachers in Central Java who implemented a constructivist curriculum, it was found that the level of Internet Self-Efficacy (ISE) and Self-Regulated Learning (SRL) had a significant influence on learning innovation. The results of regression analysis show that teachers with high ISE levels show a significant influence of SRL on learning innovation. This means that teachers who are confident in using internet technology are more able to manage their learning independently and innovatively. These conditions allow them to be more effective in managing their time, learning environment, and metacognitive skills, all of which contribute positively to teaching innovation. In contrast, in teachers with low ISE levels, SRL indicators such as metacognitive skills, time management, and environmental settings did not show a

significant influence on learning innovation. This signifies that without confidence in internet technology, even good SRL skills are not enough to encourage innovation in teaching. Therefore, low ISE is a major obstacle to the application of innovative teaching methods.

These findings highlight the need for SRL and ISE capacity development among teachers through ongoing training and professional development programs. The improvement of these two aspects will not only help teachers to be more confident in the use of technology, but also encourage them to continue to innovate in teaching in accordance with the principles of constructivism. Thus, implementing the constructivist curriculum can run more effectively, create a dynamic and interactive learning environment, and improve the overall quality of education. Overall, this study confirms that the combination of high SRL and ISE levels is essential to achieve optimal teaching innovation. Educational institutions should focus on a holistic professional development strategy to maximize teachers' potential in supporting and developing teaching methods that are innovative and in line with the demands of modern education.

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