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**Design Research in Learning Loss Recovery to Prevent Students' Dropouts
in Loei Primary Educational Service Area Office 2**

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ABSTRACT

The coronavirus disease 2019 (COVID-19) outbreak has caused dramatic changes across the world especially students' learning. The purposes of this research were to 1) diagnose students' learning recession and group the students according to the problem condition and needs, 2) design and develop an prototype for rehabilitation of learning recession, and 3) analyze the results of rehabilitation of students learning recession. Quantitative and qualitative data were collected by 5 sets of research tools: 1) Learning Recession Diagnosis Recording Form 2) Stress and Mental Health Assessment Toolkit 3) Innovation Prototype Design and Development Recording Form 4) Supervision Toolkit 5) Reflection Recording Form in the academic year 2022. The participants were 152 affiliated schools selceted by purposive sampling. Quantitative data were analyzed using descriptive statistics while content analysis were used for qualitative data . The results showed that students were grouped into 3 groups: 1) Risk group 2) Recovering group and 3) Encouraging group. The students had problems with class attendance, learning behavior and academic skills. In addition they also had a family limitation. They needed flexible and happy learning and digital literacy in order to create technology immunity including the individualized education program and drug prevention network. The developed innovation consisted of 3 levels: district level, school level and class level. This was a short-term recovering program, and long-term recovering program. The recovering program helped students became more ready to learn and stakeholders were satisfied.

Keywords: Design Research, Learning Loss Recovery, Students' Dropouts

1. INTRODUCTION

The coronavirus disease 2019 (COVID-19) outbreak has caused dramatic changes across the world. It is the phenomenon that has had the most serious impact on education in the past several decades. In addition, it causes school closures for a long time, it also results in a cognitive decline. The pandemic has further deteriorated the innovations and developments in education that have taken place in response to the Sustainable Development Goals. The Equitable Education Fund (EEF) found that families' incomes declined by 56.7% and the burden of the economy on their relatives was reduced by 25.5 percent, while 65 percent of students were afraid of infection. There is no school attending cost for 39 percent, and the other 28% don't have a mask or protective gear. School closures put children's learning, nutritional status, mental health and overall development at risk. School closures also make screening and referrals in child protection more difficult. Some students, particularly those in the very poor, are at risk of never returning to school (UNICEF, 2021). This is consistent with the Secretariat of the Education Council (2021 a) who said that the spread of the COVID-19 virus had a huge impact on the education sector especially the orders of closing schools and providing online teaching at home by using technology to assist in teaching and learning. Parents had to adapt to the teaching and learning system with the unpreparedness and readiness

according to the strength of each family.

From the above problems, it leads to learning recession (Learning Losses), stress and mental health problems, malnutrition and social skills problems of learners caused by school closures indefinitely due to the COVID-19 situation. All of which will lead to a crisis in human development and well-being that continues and lasts for a long time after the end of the pandemic. Although the situation of COVID-19 shows the potential and benefits of bringing innovation in learning and managing distance learning or online in a large and fast way. However, distance learning or online learning efforts during the COVID-19 pandemic could not fully replace face-to-face or one by one learning. The recent disruptions in the education system have caused enormous losses and inequality in learning. Therefore, an effective and equitable way to recover from the COVID-19 situation is not only a post COVID-19 situation but must be studied, developed and implemented throughout the situation and after the epidemic continuously. (The Secretariat of the Council of Education, 2021 b) However, just reopening schools after the COVID-19 situation subsides may not be enough. Students should continue to need appropriate support to help them adapt and keep up with the lessons. It is therefore necessary to help schools prepare, support and tackle the big challenges (UNICEF, 2021).

There was research from abroad that showed that there were corroborating evidences of learning recession during the COVID-19 crisis. In Thailand, the Research Institute for Policy Evaluation and Design (RIPED), the University of the Thai Chamber of Commerce, in collaboration with the Office of Equitable Education, collected data from children from many areas across the country that were significantly different especially in provinces where school was closed for a long time. It found that children's absence from school had a negative impact on math skills and working memory. That meant children's ability to remember information and process information for reuse which was a skill that directly promotes children's learning were negative associated with the school closure time. Some of these subjects had lost up to 90% of their skills. These data remind that all departments have a collective duty to recover declining knowledge and create appropriate learning strategies in response to the COVID-19 situation which is still uncertain (Workpoint Today, 2021).

As a result, it reflects the learning recession of students that needs to be solved urgently. Loei Primary Educational Service Area Office 2 therefore conducts Design Research in Learning Loss Recovery to Prevent Students' Dropouts which creates awareness and participation to solve students' problems in a systematic way by the 3 purposes; 1) To diagnose learning recession of students at Loei Primary Educational Service Area Office 2 and group students according to learning recession problems and needs 2) To design and develop an innovative model to rehabilitate student learning recession that is feasible in the short-term and long-term practice of relevant stakeholders in line with student needs and school contexts through design research 3) To analyze the results of the rehabilitation of learning recession among students in Loei Primary Educational Service Area Office 2.

2. METHOD

a. Participants

The target group of the research was 152 schools in the academic year 2022 by purposive sampling consisted of 140 school administrators 1,394 teachers and 20,665 students.

b. Measures

There were 5 sets of research data collection tools used for phases 1-3 as follows:

2.1 Student learning recession diagnosis recording form. It was an open-ended questionnaire used to analyze and group students according to their problems and needs. This was grade level data that the teachers analyzed students in their own class.

2.2 A toolkit for assessing stress and mental health of students. It was a standard tool of the Department of Mental Health. Three copies were used to diagnose students' mental health, namely, 1) the stress assessment form (ST-5), 2) the anxiety screening form for COVID-19, and 3) the adolescent depression assessment (applied to secondary school students)

2.3 Prototype design and development recording form. This tool was used in innovations design to recover school learning recession. The school administrators organized PLC activities with school teachers to design innovations to revive students' learning recession starting from the classroom level. Then, design innovations at the school level using Design Thinking Process.

2.4 Supervision toolkits consisted of 3 supervision forms: 1) short-term supervision form, 2) long-term supervision form (Online) and 3) long-term supervision form (Onsite) used for follow-up supervision when the school used the innovations developed to recover learning recession of students as follows:

2.4.1 Short-term supervision form was an open-ended questionnaire used to monitor students' progress in rehabilitating learning recession by using a short-term recovering program which the schools operated before the end of the second semester of the academic year 2021 or during the end of the semester of the academic year 2021 or before the beginning of the semester of the academic year 2022, which was an urgent rehabilitation for a group of students with serious problems or rehabilitation in subject content, behavior, attributes, or mental health of students that need to be accelerated.

2.4.2 Long-term (Online) supervision form was an open-ended questionnaire used to monitor the students' progress in rehabilitating learning recession by using a long-term program which the schools conducted in the first semester of the academic year 2022 with all students in the school grouped according to the diagnosis results in the phase 1 research through an online supervision process.

2.4.3 Long-term (Onsite) supervision form was an open-ended questionnaire used to monitor the students' progress in rehabilitating learning recession by using a long-term program which the schools conducted in the first semester of the academic year 2022 with all students in the schools classified by group according to the diagnosis results in the research phase 1. This tool was used during the site visit supervision method. The supervision issue will delve into innovations to recover the recession in learning at the classroom level and highlight schools that had good practices and can be role models.

2.5 Assessment and reflection recording form was an open-ended questionnaire used to evaluate and reflect on the student's learning recession performance at the end of the school's innovation trial process. This tool was used during after action review process which allowed the schools to analyze the satisfaction of stakeholders, effects on students' development, readiness for learning after being recovered throughout the semester. Furthermore, this tool focused on what the school did well and prodded and what the school needed to improve.

Most of the tools in this research were qualitative data collection tools, namely the students' learning regression diagnostic recording form, prototype design and development recording form, supervision toolkit, assessment and reflection recording form. These tools were conducted a psychometric property by content validity with IOC index. The toolkit for assessing stress and mental health of students was a standardized tool created by specialized agencies and widely used so it was not reviewed for psychometric property.

c. Procedure and design

This research used the design research in education methodology (Suwimon Wongvanich, 2020) by 3 phases of the research process were used: Phase 1, analyze and survey, Phase 2, design and develop of prototypes to rehabilitate student learning recession, and Phase 3, assessment and reflection. The research details were as follows:

3.1 Phase 1: Analyze and Survey

This step, the teachers diagnosed students' learning recession based on Office of the Basic Education Commission (OBEC) learning indicators and then grouped students into 3 groups:

- Group 1, Risk group meant students were frequently absences or difficulty communicating or pre-existing learning problems.
- Group 2 Recovering group meant students who passed the necessary learning indicators less than 50 percent.
- Group 3 Encouraging group meant students who passed the necessary learning indicators more than 50 percent.

After that, analyzed the problems, limitations, and needs of each group of students from the diagnosis. Finally, surveyed missing children in the school service area.

3.2 Phase 2 Design and Development of prototypes to recover students' learning recession

The school administrators met teachers and used a 5-step design thinking process to design and develop an innovation prototype to recover student learning recession at the school and grade level as follows:

- 1) Empathize: Understood the problems, limitations, and needs of each group of students.
- 2) Define: Indicated the problem and asked questions to lead to solutions.
- 3) Ideate stage: Applied brainstorming ideas to solve problems from related theories.
- 4) Prototype stage: Designed the intervention.
- 5) Test: Bring the prototype to trial in the schools.

After the design stage, the research team did supervision and monitoring the use of innovation to recover students' learning recession in short-term trials, which the school operates before the semester of the academic year 2022 and long-term in the first semester.

3.3 Phase 3: Assessment and Reflection

Evaluated and reflected on student learning recession recovery performance at the end of the school innovation trial process using the After-Action Review: AAR technique which allowed the schools to analyze the satisfaction of the stakeholders, effects on students' development, readiness for learning after being recovered throughout the semester. Furthermore, this tool focused on what the school did well and prodded and what the school needed to improve.

d. Data Analysis

The data from this research was a combination of quantitative and qualitative data. The quantitative data were analyzed using descriptive statistics consisted of frequency and percentage by a computer program. The content analysis was applied for qualitative data.

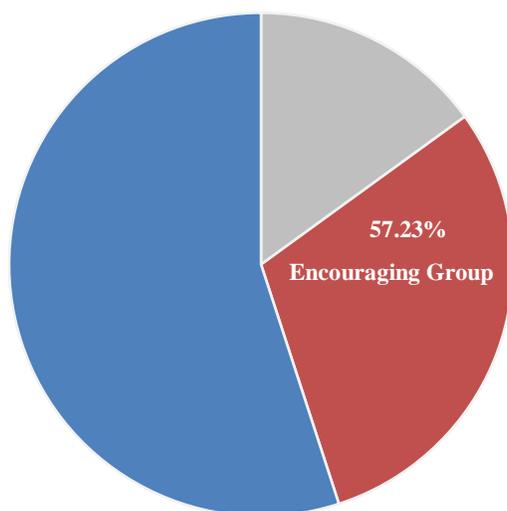
3. RESULT AND DISCUSSION

1. The results of analyzing and grouping students according to the state of learning recession classified by district showed that in general, most students were in the encouraging group, followed by the recovering group and the risk group respectively. If considering by group, it was found that

- 1) the risk group was the highest number in Wangsaphung District, followed by Erawan District and Phuluang District respectively. The district with the least number was Phukradueng District.
- 2) The recovering group had the highest number in Nonghin District, followed by Erawan District and Wangsaaphung District respectively. The lowest number of districts was Phakhao District.
- 3) The encouraging group had the highest number in Pha Khao District, followed by Phu Luang District and Phu Kradueng District, respectively. The district with the least number is Nong Hin District as table 1 and picture 1.

Table 1 The results of analyzing and grouping students according to the state of learning recession classified by district.

DISTRICTS	Number	Risk Group		Recovering Group		Encouraging Group	
		Number	%	Number	%	Number	%
PHUKRADUE NG	3,161	287	9.08	954	30.18	1,920	60.74
WANGSAPHU NG	5,402	916	16.96	1,743	32.27	2,743	50.78
PHAKHAO	3,043	328	10.78	574	18.86	2,141	70.36
PHULUANG	1,939	222	11.45	467	24.08	1,250	64.47
NONGHIN	2,058	196	9.52	924	44.90	938	45.58
ERAWAN	2,823	340	12.04	929	32.91	1,554	55.05
TOTAL	18,426	2,289	12.42	5,591	30.34	10,546	57.23



Picture 1 Students groups according to the state of learning recession

In addition, the limitations and needs of students found that most of the problem conditions and limitations found were fundamental problems concerning attendance and family needs. The problematic students needed flexible study as appropriate and needed scholarship support. In terms of mental health, students needed relaxed learning activities that

encouraged students to enjoy learning which there were various motivational activities for learning. On the academic side, students needed rehabilitation, reading and writing review including other learning skills that formed the basis of advanced learning. It was also necessary to learn digital intelligence to have the skills and immunity to use technology. For students with disabilities, they needed individualized education. However, in terms of drugs, it was necessary to coordinate networks of those involved in monitoring and preventing problems from affecting students.

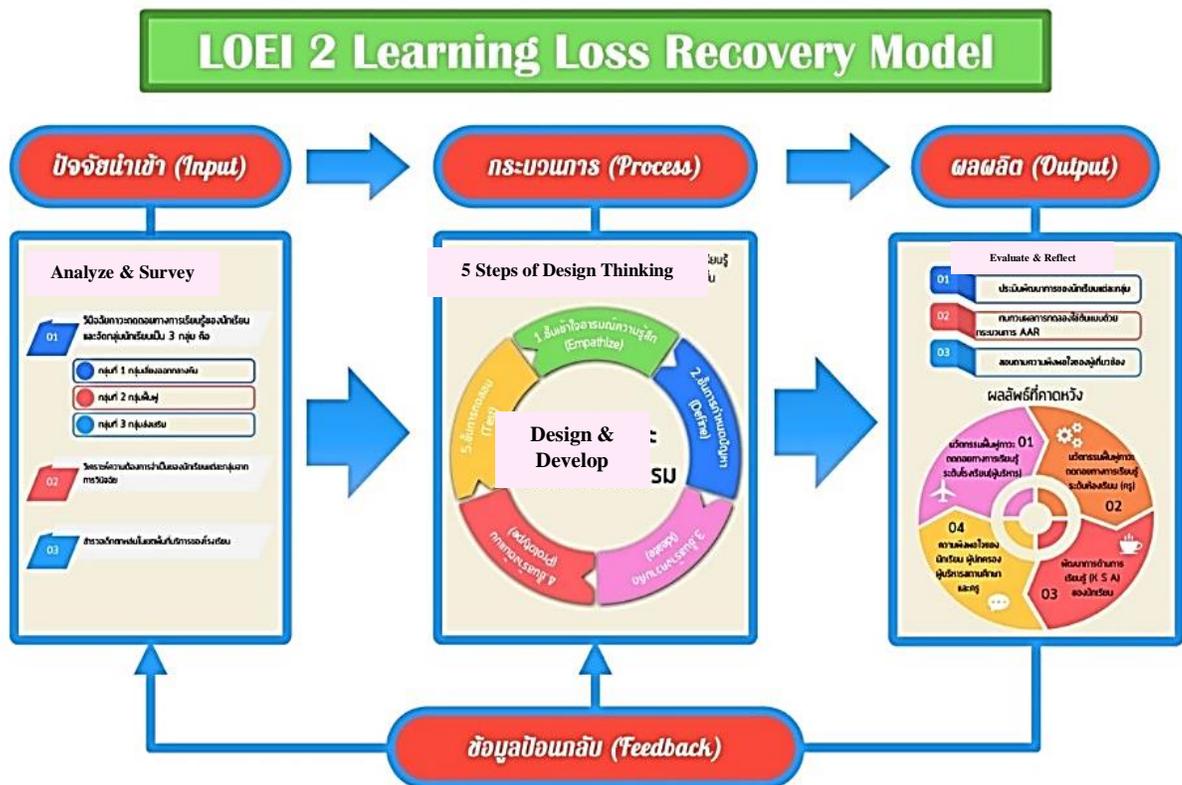
2. The results of the design and development of innovative prototypes to recover students' learning loss.

2.1 Innovation to recover the learning loss of students at the educational service area office level using a systematic concept as a model to drive the operation. It consisted of 3 components namely;

1) Input: there were 3 main activities comprised of (1) diagnosis of student learning recession by considering students into 3 groups (2) analyzing the student needs of each group (3) surveying and searching for missing children in the service area.

2) Process: designed and developed a prototype to recover students' learning loss by using 5 steps of Design Thinking that was composed of (1) Empathize, (2) Define (3) Ideate (4) Prototype and (5) Test.

3) Output: checked the results of the experimental innovation by assessment and reflection process which consisted of assessing the development of each group of students, reviewing of the results of the prototype trial and questioning the satisfaction of related parties shown as picture 2.



Picture 2 Model of Learning Loss Recovery to Prevent Students' Dropouts
in Loei Primary Educational Service Area Office 2

2.2 School-level innovation to recover the learning loss of students used the same concepts and processes as the educational service area office level. However, the second component, the design and development of innovative prototypes had a framework for 6 parts: 1) short-term rehabilitation design 2) long term rehabilitation design 3) enhancing mental health 4) coordination of networks and stakeholders 5) teacher capacity building and 6) supervision, monitoring and evaluation.

2.3 Classroom-level of student learning loss recovery innovation used the same concepts and processes as the educational service area office level and school-level innovations. There were 6 operational frameworks, similar to the school level, but focusing on subject or class that teachers were responsible for.

3. The results of learning loss recovery of students in Loei Primary Educational Service Area Office 2 found that there were 147 schools participated in the learning loss recovery process. There were 46 innovations with excellent quality at school level and 101 innovations with good quality. At the school level, there were 216 innovations excellent quality and 1,079 innovations with good quality. The innovations developed effected more development of knowledge skills and attribute (K S A) of all groups of students. Teachers and school administrators reflected from observing the behavior of students at school that classroom interactions included teachers answering questions in the classroom, homework submission reading and writing skill shown improvement in learning readiness.

Students were satisfied with the implementation of the learning loss recovery based on student attendance statistics. The number of students absent from school had decreased. Students were happier to study and the student's undesirable behavior was reduced. The students wanted to come to school early in the morning. In addition, parents were satisfied with the implementation of the learning loss recovery because their students' learning especially reading, writing and behavior were improved. For the school administrators, they reflected that this operation had a systematic process. It encouraged all involved parties to realize the problem of students learning loss. Teachers realized the importance of serious problem solving and the implementation of the educational area office guidelines. As a result, the school had a clear operating method and had the same goal to solve students' problems. Moreover, they also encourage collaborative learning, create and develop innovations creatively. This reflected that the people involved were satisfied with the operation.

1. The results of analyzing and grouping students according to learning recession classified by district found that in general, most students were in the encouraging group. This may be due to the learning ability of the students, teaching skills of teachers including parental attention. This was consistent with the results of the study of the Secretariat of the Council of Education, Ministry of Education (2021) reported that factors influencing student learning recession included self-direction in students' own learning, teachers' distance learning skills, parents' support in promoting distance learning and providing an environment for distance learning.

According to the analysis and survey of the problems, limitations and needs of students, it was found that most of the problems and limitations were fundamental problems and

essential needs. Students with attendance difficulties and family needs required flexible learning and scholarship support. In terms of mental health, students needed relaxed learning activities that encouraged students to enjoy learning and motivated learning variously. This was consistent with the study of Fitzpatrick et al. (2020) stated that policy makers should provide resources or train teachers for online teaching strategies or techniques and using technology to provide clear guidelines for teachers with an emphasis on progress informal assessments, teacher-generated tests, avoiding standardized tests, repetitive teaching remedies, emphasizing with essential basic skills, teaching tailored to individual learners' skill levels, integrating formal and informal curriculum or an intensive course to help students with problematic content and prepare them before the start of classes.

2. Innovation to recover the learning loss of students at the educational service area office level using a systematic concept as a model to drive the operation. It consisted of 3 components namely; 1) Input 2) Process 3) Output. The design and development of innovative prototypes had a framework for 6 parts: 1) short-term rehabilitation design 2) long term rehabilitation design 3) enhancing mental health 4) coordination of networks and stakeholders 5) teacher capacity building and 6) supervision, monitoring and evaluation. This was consistent with the results of Kaffenberger (2021). It was discussed creating a program and training teachers to be able to create continuous instruction as soon as the school opens using progress assessment methods to identify learners' learning levels. Some of the material that students learned when the school was closed should be repeated at the next grade level. In addition, teachers should adjust their teaching methods in accordance with the proficiency level of the students.

This was also consistent with UNESCO (2021a) recommended that schools implement rehabilitation programs for students with learning difficulties who need additional, targeted support along with regular classes. This program was designed for students who need short-term content or skill support to succeed in formal learning, including (1) In-class interventions that separated students into small group. Each group was taught different skill and knowledge. This approach was similar to adaptive teaching which assessed a student's skills and knowledge level. Then designed different learning programs for students with lower grades than their peers. (2) Micro-teaching, this type of teaching was used with small groups of students both on-site and online. Micro teaching often focused on micro learning which meant learning small content in a short time. Student-centered learning strategy can be implemented in the program. Formal teaching based on school time structure or non-formal learning programs in which students must be self-directed informal. An example of micro-teaching was tutoring, small group or one-by-one instruction. (3) Pull-out interventions were specialized tutoring and after-school tutoring, such as a reading rehabilitation program with a reading specialist. This included private tutoring. Teachers must complete diagnostic assessments and progress assessments as indicated. Teachers have an important role to play in assessing student learning loss and deciding on appropriate teaching approaches to support student learning rehabilitation. A single approach may not be suitable for all students. Teachers should receive additional training, professional development opportunities to assist in conducting ongoing diagnosis and assessment, as well as integrating SEL into academic content. Teachers are primarily engaged in the emotional and social well-being of students, as well as identifying and referring students in need of professional mental and psychosocial services.

3. The results of learning loss recovery of students in Loei Primary Educational Service Area Office 2 found that there were 147 schools participated in the learning loss recovery

process. There were 46 innovations with excellent quality at school level and 101 innovations with good quality. At the school level, there were 216 innovations excellent quality and 1,079 innovations with good quality. This was congruence with UNESCO (2021b) stated that schools should plan their implementation of detailed programs to address learning loss and rehabilitate learning gaps. Other teaching and administrative activities. It should be restructured along with the classroom size. School directors may consider various situations, programs and school-level methods such as ability grouping. Regular classroom arrangements are combined with other solutions, or even combining face-to-face activities with distance learning arrangements. Ideally, administrators must think about how to best adapt the school to the long-term needs of the students. A communications strategy has been developed. Teachers, staff and families should have clear communications about the learning rehabilitation approach adopted by the school. School administrators can explore avenues and steps to ensure that no family falls short of the school plan. Schools can set clear expectations about everyone's role in regularly refreshing and updating information, as well as developing appropriate participation mechanisms. School administrators may consider strategies for students, teachers and families to reconnect with the school and create new routines to facilitate learning activities. Some students and families may not respond to contact. Therefore, inventing mechanisms to connect with schools is the first step in rehabilitating learning and academic, personal and social needs should be restored.

This was also in line with the concept of Wichai Wongyai and Marut Pattaphol (2020) proposed that co-creation of teaching and learning innovations between teachers and parents can be done in five steps: 1) encourage stakeholder interest 2) analyze, synthesize and collaborate to seek ideas, 3) discover cooperation, 4) develop together, and 5) expand and share results. In addition, schools should adapt national guidelines to the school context with the participation of teachers. Identifying the strengths of school personnel and their professional development needs are good to start as well as supporting and empowering teachers. Administrators play a key role in ensuring that teachers are prepared and well supported in their efforts to implement learning recession programs. Administrators should listen to teachers' views on training needs, encourage and support their network of peers and communities. Providing clear guidance, training, or even communicating clear expectations is a great way to support teachers.

The innovations developed effected more development of knowledge skills and attribute (K S A) of all groups of students. Teachers and school administrators reflected from observing the behavior of students at school that classroom interactions included teachers answering questions in the classroom, homework submission reading and writing skill shown improvement in learning readiness. Students were satisfied with the implementation of the learning loss recovery based on student attendance statistics.

This was consistent with the findings of the Hanover Research (2020) concluded strategies to reverse learning recession and educational outcomes consisted of: Extended School Periods and Days; For example, 9th-grade students in Chicago Public Schools (IL) who were given twice as much time to study math was significant improvements in their algebra test scores. Long-term results and academic performance also increased. Instructional Solutions through vertical curricular review and cross-grade collaboration, where teachers at different levels work together to understand each student. How can teachers fill in their students? Schools can use the Professional Learning Community (PLC) process in schools for tutoring. Some research, including Harvard (2016) found that students who were struggling in mathematics and reading when receiving intensive one-by-one instruction

(three times per week, 50 hours per semester) could improve learning outcomes and compensate for student learning losses which could be done quickly and in a short time. Using Individual Study Plans as Michigan Department of Education's Individualized Learning Plans outlines principles that districts could use to create individualized learning plans, including developing a weekly schedule and communicating with families on an ongoing basis. Individual learning plans helped districts and schools to develop and support targeted academic, social, and emotional needs.

Another form was Additional Instructional Programs that was after-school programs. It was a case study of Meriden Public Schools (CT) partnered with the YMCA and Boys & Girls Club to add 100-minute after-school instruction at three schools in the district, resulting in students from two among three schools participating that the test scores of the students were higher than the semester average. As a result, the area expanded the project to other elementary schools. The acceleration academies were the participation of students in the club also resulted in the development of math and reading. Acceleration clubs were “intense, targeted teaching programs taught during vacations by a group of highly qualified teachers that had been carefully selected.” Furthermore, Lawrence's study found that using Acceleration Academies of Public Schools (MA), school administrators recruited students based on test scores. The low Massachusetts Comprehensive Assessment System (MCAS) and students intended to attend classes showed increases in student math and reading achievement. The results of the analysis of learning recession rehabilitation of students in Loei Primary Educational Service Area Office 2 were consistent with the above research results. It reflected that the rehabilitation of students' learning recession affected the development of knowledge, skills and attributes (K S A) of students.

4. CONCLUSION

1. This research was designed to rehabilitate learning recession among students in Loei Primary Educational Service Area Office 2 at the district, school and classroom levels. In which schools and districts can continue to rehabilitate student learning recession in cases where students still do not have learning readiness by implementing a model to provide solutions that are consistent with the student problems and needs.

2. The learning loss of students, especially group 1, dropout risk group. It is necessary to constantly monitor and perform rehabilitation. Therefore, the action for this group of students cannot be stopped. Schools should design learning programs that have long-term feasibility.

3. This research found that the factors affecting the success of students' learning rehabilitation were school administrators, especially academic leadership. From the reflection of the research findings, it was found that creating an understanding with school teachers is a process that administrators must communicate clearly and have the ability to plan the whole school. Therefore, enhancing academic leadership of school administrators is an important research issue that should be further developed in future research.

4. The major problem and discovered from this research is that the recession remediation innovation at the classroom level is unable to address the individual students' problems. This is because teachers' ability to design learning activities is still limited. Therefore, further research should focus on teacher development in designing learning activities that are creatively tailored to individual students.

5. This research found that the recovery of students' learning loss focused on increasing the time to provide learning fulfillment activities for students. The problem was that the workload and study time of students and teachers increased which in the long run may cause operational problems. Therefore, the next research should try to adjust the structure of school time and integrated learning content so that children can learn more without increasing school time which

will reduce the workload of teachers and students.

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