International Journal of Learning, Teaching and Educational Research
Vol. 23, No. 3, pp. 48-66, March 2024
https://doi.org/10.26803/ijlter.23.3.3
Received Jan 16, 2024; Revised Mar 7, 2024; Accepted Mar 15, 2024

Development of Alternative Thinking Strategy Curriculum Design to Improve Academic, Social and Emotional Competence

Nirmalasari*, Dinn Wahyudin and Deni Darmawan
Department of Curriculum Development, Universitas Pendidikan Indonesia, Bandung, Indonesia

Abstract. The majority of curriculum designs focus on academic competencies, and only very few curricular are designed that not only improve academic abilities but also improve students' social emotional and psychological competencies. In this research, the researcher designed an alternative thinking strategy curriculum and investigated its impact in improving students' social emotional competence, psychological health and academic competence. Quasi-experiment design was used involving 30 secondary schools who participated in the study. The research sample was divided into two groups, a control and experimental group, from a random cluster. The experimental group received the alternative thinking strategy curriculum (15 schools) and the control group followed the regular national curriculum (15 schools). The subjects investigated are science and language. Two-level hierarchical linear model analysis was used to investigate the impact of an alternative thinking strategies curriculum. Findings of this research show that alternative thinking strategy curriculum design is not only able to improve students' social and emotional competence, but is also able to increase students' academic achievements. This can be seen in the average increase in student academic achievement and better student attitudes compared to students in the control group who received the national curriculum intervention. The most superior in providing an impact on each aspect is the cluster with medium frequency or the second cluster (C2). Another cluster shows that the implementation of the alternative thinking strategy curriculum is less than optimal regarding aspects of suitability, quality, responsiveness and reach of the curriculum. This is due to differences in the duration of implementation time. This alternative thinking strategy curriculum design also needs to consider students' cultural aspects related to geographic location. This is important to do as content for intervention in improving students' social and emotional competence.

Keywords: alternative thinking strategy curriculum design; social and emotional competence; academic competence; hierarchical linear model

*Corresponding author: *Nirmalasari; nirmalasari@upi.edu*

1. Introduction

Social and emotional competence is very important and has an impact on their adaptability in carrying out their duties and responsibilities as students (Khazanchi et al., 2021; Omasta et al., 2020). Apart from that, social and emotional competencies are also claimed by educational institutions to be able to increase student motivation, attendance, enthusiasm in participating in the learning process, avoid exclusion, better retention ability, adaptation from primary to secondary school, and students' ability to take exams. Curriculum that promotes social and emotional competence is experiencing very rapid development in England, especially in primary and secondary schools (Anderson, 2020; Datu & Restubog, 2020). This curriculum that promotes social and emotional competence is carried out with social and emotional learning. This learning seeks to improve students' social and emotional competence through modifying classroom climate, student ethos, and interacting within the family and in the classroom. There are several competencies from the results of a meta-analysis of the impact of quality social and emotional learning interventions, namely students' social and emotional competencies, students' attitudes and behaviour, mental health, and students' academic competencies. This is proven by several findings in previous research which found that social and emotional learning from curriculum designs that promote alternative thinking strategies can improve students' academic competence (Hellman & Milling, 2020; Omasta et al., 2020).

This social competency can be transferred into the student's academic domain which can improve the student's academic abilities. Second, social and emotional learning uses a structured approach and emphasises positive relationships between students, teachers and the environment, so as to create dynamic and participatory classes. The third principle is that all teachers and staff in schools receive social and emotional learning training so they are able to manage the classroom and be able to anticipate student behaviour that disrupts the learning process (Duncombe et al., 2023; O'Brien et al., 2023). The learning process contains the meaning of a social process that facilitates students' social skills and contributes to improving students' academic abilities. Academic competence is the final result that is the target of social and emotional learning. This theory is supported by several previous studies which found that social and emotional learning has an impact on academic abilities but is not very significant with values ranging from $d = 0.19$ to $d = 0.46$ compared to the impact on students' psychological domains (Willis, 2021; Yuen et al., 2018).

Social and emotional learning has advantages in the education system and has begun to be used in several countries with adaptation to each country's culture. Curriculum that promotes alternative thinking strategies is one that is generally implemented in elementary and middle schools. This implementation is carried out to direct students' attitudes and behaviour in a better direction while also being able to improve students' academic competence (Hadianto et al., 2021b; Lashley & Halverson, 2020). This curriculum was designed by teachers to promote several aspects, namely emotional awareness, the ability to control oneself, solving problems, establishing positive relationships with friends, and the ability to understand lesson material (Byrne & Prendergast, 2020; Menzi

Çetin & Akkoyunlu, 2020). Teachers are required to organise activities and techniques that can encourage new skills for students during the learning process. Several previous studies tried to test alternative thinking strategy curriculum designs that were adapted to the school culture of each country, showing that this curriculum made a positive contribution to students' social and emotional competence (Haigh, 2020; Stokes & Harmer, 2018). This alternative thinking strategy curriculum is still limited in contributing to students' academic competence. However, recent research shows that this alternative thinking strategy curriculum is able to improve students' academic competence in elementary and middle school students. Research trends on alternative thinking strategy curricula only focus on one dimension in the field. A more comprehensive study was conducted with the finding that there was a positive relationship between the quality of curriculum implementation and better student response or responsiveness (Mavilidi et al., 2019; Roth McDuffie et al., 2018).

The current research seeks to design an alternative thinking strategy curriculum and investigate the effectiveness of the curriculum in improving students' social, emotional and academic competence, especially in English and Science subjects. Application is carried out on elementary and middle school students. Through this research, researchers designed an alternative thinking strategy curriculum and investigated the impact of implementing this curriculum on students' social, emotional, mental and academic competencies and investigated the role of implementation variability in moderating the implementation results of curriculum implementation. The difference between this research and previous research is that this research accommodates all social, emotional, mental health and academic competencies. This is different from previous research which only focused on one competency domain. Apart from that, the student participants in this research had various statuses ranging from low, medium and high socioeconomic status. Through the implementation of an alternative thinking strategy curriculum, the researchers are trying to narrow the gap in the academic achievement of students with low and high socioeconomic status. Based on this explanation, the researcher formulated the objectives of this research, which are as follows.

1) Design an alternative thinking strategy curriculum and investigate the impact of curriculum design on academic improvement in English and Science subjects,
2) Investigate the impact of implementing the curriculum on academic improvement in students with low socioeconomic status,
3) Investigate aspects of variability in curriculum implementation and investigate the role of curriculum implementation in moderating student academic outcomes.

2. Literature Review

2.1 Development of alternative thinking strategy curriculum design

Curriculum designs that promote alternative thinking strategies have begun to be implemented in several countries, including England, the USA, and Japan. Some findings on the implementation of curriculum design implemented in England are still mixed. Its implementation still focuses on social and emotional

competence, attitudes and behaviour and students' mental health, not on students' academic competence (Bopardikar et al., 2021; Brown & Livstrom, 2020). Based on this development, the latest research was carried out in Ireland by designing an alternative thinking strategy curriculum modified to suit the culture of Northern Ireland. Research findings in Ireland show that this curriculum as a whole has a positive impact on several student subjects. Research in England was carried out again by not only focusing on social competence but also on academic competence. The results of the research show that this curriculum design is able to improve the academic abilities of students at the final elementary school level (Byrne & Prendergast, 2020; Mavilidi et al., 2019; Roth McDuffie et al., 2018).

Alternative thinking strategy curriculum designs have not been carried out in Indonesia that are adapted to Indonesian culture. The majority of curricula that have been used in Indonesia focus on students' academic abilities. The curriculum in Indonesia has changed several times and all of it focuses on students' academic abilities, even though social competence has a significant impact on students' academic competence (Anderson, 2020; Hadianto et al., 2022). This curriculum which promotes alternative thinking strategies is a new breakthrough for students in Indonesia which not only focuses on academic competence, but also on students' social emotional competence. This curriculum can be adapted by Indonesian stakeholders and used in primary and secondary schools. This research seeks to design a curriculum that promotes alternative thinking strategies implemented in elementary and middle schools. This research can be a reference for stakeholders in formulating alternative thinking strategy curriculum designs that are adapted to suit Indonesian culture.

2.2 Implementation of alternative thinking strategy curriculum

The application of the alternative thinking strategy curriculum is still not significant because the variability aspect in its application is a very vital moderator of the results of curriculum implementation. The application of this alternative strategy thinking curriculum might have a different impact if applied in other countries with different cultures (Foster et al., 2021; Turner et al., 2020). Therefore, it is important to evaluate the results of implementing a curriculum designed according to the cultural characteristics of Indonesia. Most of the research investigating the implementation of this alternative thinking strategy curriculum only displays descriptive analysis, which includes the frequency of implementation and level of validity and is used to strengthen the level of internal validity of the experimental results (Richerme, 2020; Roth McDuffie et al., 2018).

There are still very few analytical models that investigate aspects of curriculum implementation variability and are used as moderators of the impact of intervention outcomes. This analysis model was carried out to determine the level of significance of the results of curriculum experiments and the level of validity of internal and external experiments. The majority of previous research only focuses on one domain and ignores other domains, for example, focusing on the social and emotional domain and ignoring the academic or cognitive domain or vice versa (Ahlqvist et al., 2019; Kumaravel et al., 2020; Mavilidi et al.,

2019). Research that accommodates all domains (social, emotional and academic) needs to be carried out to see the suitability of the alternative thinking strategy curriculum design with the character of students in Indonesia. The implementation of this curriculum design can be a reference for the government in adopting alternative thinking strategy curriculum designs that are adapted to Indonesian culture (Haigh, 2020).

The implementation of the alternative thinking strategy curriculum takes into account several components, namely student involvement, reach of the curriculum programme, student participation, and the impact of curriculum implementation. Previous research examining alternative thinking strategies provides an explanation of these components. Several studies regarding the implementation of this alternative thinking strategy curriculum only present descriptive data, for example, the relationship between variability in implementation and the impact of treatment, but some of these findings cannot be generalised (Cheung et al., 2022; Ching et al., 2019; Lashley & Halverson, 2020). Previous research examined the relationship between implementation consistency and implementation outcomes. In addition, research was conducted to investigate the relationship between variations in the frequency of implementing the curriculum and student responses at school which showed that the majority of students at secondary level schools experienced an increase in reading and mathematics competence (Koglbauer, 2022; Potari et al., 2019).

3. Method

3.1 Design and participants

The method used in this research was quasi-experimental by dividing participants into two groups, namely the experimental group which received intervention with an alternative thinking strategy curriculum and the control group which received the regular curriculum. The schools sampled in this study consisted of 30 schools located in several areas ranging from rural to urban areas. The experimental group consisted of 15 schools and the control group consisted of 15 schools. In addition, the proportion who took part in this study was balanced, starting with those with low socioeconomic status who tended to have low academic scores. The research was carried out over one academic year or two semesters with a pretest and posttest design. Observations were carried out in a structured manner in both school groups. The experimental group received an alternative thinking strategy curriculum, while the control group received the usual curriculum with value ($F(7, 41) = 1.13$, $p = 0.342$); participating schools have English and Science as mandatory subjects. The school also pays attention to students' attendance in these two subjects (English and Science). The research only focuses on these two subjects because these are lessons that can represent students' academic, social and emotional abilities. The teachers involved in this research were 20 teachers at each elementary school level and 30 teachers at each junior high school level. The teachers involved have an average of 10 years of teaching experience. The gender of the teachers is mostly (75%) female, 55% have a postgraduate education level, and the majority of teachers at each school have more than six years of teaching experience, 60%. Thus, the teachers involved in this research have experienced several different curriculum changes.

Table 1. Characteristics of school participants

Characteristics of the schools involved	National average	Experiment mean (SD)	Control mean (SD)	Balance at randomisation (Cohen's d)
Size – the number of students attending full time	252.51	324.13 (114.24)	291.42 (97.50)	0.26
Attendance – absence (% missed half day)	6.32%	6.0% (0.93)	5.72% (1.32)	0.50
Socioeconomic status of students who have low socioeconomic status	19.32%	33.21% (22.24)	32.79% (20.14)	0.05
Additional language skills – students who can speak English	21.45%	22.70% (25.71)	24.67% (25.65)	0.13
Outcomes – the proportion of students achieving Level 4 (or above) in English and Science level 2	80.12%	82.81% (13.10)	77.40% (12.79)	0.45

Table 2. Characteristics of student participants

Characteristics of students	National average	Experiment Group (SD)		Control Group (SD)		Random balance (Cohen's d)	
		Class 6	Class 9	Class 6	Class 9	Class 6	Class 9
Gender – proportion of male students	51.12%	53.03%	51.62%	54.31%	51.45%	0.06	0.02
Socioeconomic status of students who have low socioeconomic status	29.03%	32.81%	31.31%	28.67%	26.31%	0.07	0.13
Additional language skills – students who can speak English	15.79%	21.32%	22.89%	23.15%	21.82%	0.09	0.10
Previous achievements – score for English stage 1	16.23	15.89 (4.78)	15.78 (5.12)	15.80 (4.02)	15.42 (4.10)	0.06	0.05
Previous achievement – stage 1 science score	16.82	16.50 (4.23)	16.42 (4.25)	17.40 (4.04)	16.78 (4.78)	0.04	0.10

The level of students involved in this research were students who were at the final level in elementary school and junior high school, namely class 6 and class 9. The proportion of students involved in this research from 30 schools was 350 boys and 350 girls with an age range 13-15 years old. Covariate analysis was used to consider the proportion of students who met the criteria for low socioeconomic status, who tended to have low academic scores. This is done to minimise bias from the intervention effect of implementing the curriculum. The results of the analysis of the intracluster correlation coefficient for the sample in grade 6 of elementary school showed a value of 0.09 with 40 children in each cluster. The average correlation in the pretest and posttest phases is 0.73 and the

alpha value for each phase is 0.9 and 0.07. To see the minimum influence that can be investigated, the alpha value was set to 0.20. After calculating the covariate analysis, the results of the class 9 intracluster correlation coefficient were determined to be 0.05. An average of 40 students per class had a posttest phase correlation value of 0.75 for the results data. The alpha values were determined at 0.85 and 0.05, respectively. To see the minimum influence that can be investigated, the alpha value was set to 0.23. This was done based on quite significant data from the results of social and emotional learning interventions on students' academic abilities. This analysis is considered suitable for use in research. The demographic characteristics of the student group are consistent with the national characteristics of students presented in Table 2.

3.2 Academic achievements

The main focus of academic achievement in this research is English and Science subjects. This is done because the alternative thinking strategy curriculum targets in several countries always focus on English and Science. Pretest data were taken from the results of implementing the national curriculum or before implementing the alternative thinking strategy curriculum design in both groups. Data taken were only on English and Science subjects for the pretest on the results of implementing the national curriculum. Assessments in the pretest phase are used for external validity in assessing students' academic achievement progress at each curriculum change. The data are also strengthened by academic results from previous databases resulting from the application of the previous curriculum to grade 6 and grade 9 students. Independent standard testing was carried out on these academic achievements in the posttest phase. Assessment in the posttest phase in English and Science subjects uses the Interactive Computerized Assessment System in which the level of reliability shows a value of 0.95 in each class. This reliability assessment was carried out by teachers from each different school in grades 6 and 9. The next stage was to measure the level of external validity to minimise biased data. Psychometric assessments were also carried out on pretest data by determining internal consistency values ($\alpha > 0.93$) and classification accuracy (> 86%) in each subject. This was also done in previous research to predict students' academic achievement in the future.

3.3 Procedure

The research procedure goes through several stages. The first stage was the development of the alternative thinking strategy curriculum and its validation. Second stage was the sample selection based on primary and junior high school levels, schools spread across rural and urban areas. Apart from that, the students selected were grade 6 and grade 9 students. This was done because these students had received previous curriculum intervention. After identification of participants, the intervention, which is the alternative thinking strategy curriculum, was implemented in the experimental group, then data collections were employed.

3.3.1 Development of Alternative Thinking Strategy Curriculum Intervention

The development of this alternative thinking strategy curriculum is supported by an affective behavioural and cognitive development model which focuses on the developmental effects of students' emotional styles, behaviour and cognitive

development in improving students' social, emotional and cognitive competencies. The design of alternative thinking strategy curriculum components is presented Table 3.

Table 3. Alternative thinking strategy curriculum components

Contents	Appropriate interdisciplinary content or product orientation		
Way of thinking	Think scientifically (question)	Creativity of thinking (Identifying and solving problems)	Thinking about the future (Creating and analysing concepts or materials)
Alternative thinking strategies	Formulation of the problem Hypothesis formulation information gathering Organising information Presentation of results or data	Problem definition Presentation of solutions Formulation of criteria Identify perspectives Determining the best solution Providing responses from different perspectives	Determination and inspection of components Classification and analysis Comparison process Relationship analysis Process identification Organising sections Prediction development
Tools and methods	Using the thinking wheel model Investigation stages	Use of different problem types Involvement of problem solving stages Use of thinking topics	Making mind maps Future content development
Evaluation tool	Creation of product assessment indicators with students Use of assessment indicators in formative and summative evaluations Self, peer, and teacher assessment		
Learning products	Mini research	Problem solution Action plan	Concept maps Developing learning models Time considerations Future model Future scenario
	Multicategory Written, spoken, and creative		
Reflection on the end of the learning process	use of metacognition/personal reflection in the thinking process Asking questions in the learning process Encourage thinking strategies with questions		

3.3.2 Implementation of curriculum

In this research, each class received a curriculum that included teaching and activities outside of school, such as at home, with an emphasis on the ability to identify feelings, control impulses, minimise stress, and understand other people's opinions. Physical learning media is also available, such as posters to

show feelings. The intervention was carried out by providing prior training to teachers, school principals and parents. Teachers at schools who participated in the research received training for three months first and were led by teachers who already had curriculum development certificates. The training includes several materials and activities, namely the formation of teaching skills in accordance with theories or concepts and an understanding of the alternative thinking strategy curriculum. Apart from that, support from trainers was also provided during the implementation of the curriculum, and was carried out over one academic year or two semesters.

Teachers were given implementation guidelines designed by researchers to increase the effectiveness of implementing alternative thinking strategy curriculum designs. Teaching in the classroom used a standard format starting from the introduction, core activities, and conclusion which were adapted to the material and implementation to the alternative thinking strategy curriculum. The implementation of the learning process was encouraged to obtain student responses to the material at each phase of the learning process. The implementation of this curriculum uses a spiral curriculum model, namely by organising learning material according to student development and reviewing the material again. Apart from that, this material is also designed and delivered by the class teacher.

The learning process takes approximately 30-45 minutes and is designed to be carried out twice per week during the school year. The alternative thinking strategy curriculum has 35 lessons in grade 6 and 25 lessons in grade 9. The average number of lessons in the elementary and middle school curriculum is 35 lessons. During the intervention stage, the learning process is observed so that it can be controlled and supervised according to curriculum implementation guidelines. Observations were carried out using an assessment rubric. The learning observation rubric with the alternative thinking strategy curriculum includes assessing student suitability, quality and responsiveness. Aspects of suitability include conformity of implementation to the core components of the curriculum, lesson structures that are in accordance with the curriculum, and learning objectives that are in line with the curriculum.

3.3.3 Data collection and instrument

Pretest and posttest evaluations were carried out focusing on two subjects, namely English and Science in class 6 and class 9 in both groups. The researchers evaluated the implementation of the curriculum from several aspects, namely suitability, quality of implementation, frequency, coverage of the curriculum, and student responsiveness by means of structured observation by the researcher. Observations used a rubric in accordance with assessment indicators from the alternative thinking strategy curriculum developed from curriculum implementation assessment literature. The learning observation rubric with the alternative thinking strategy curriculum includes assessing student suitability, quality and responsiveness. Aspects of suitability include conformity of implementation to the core components of the curriculum, lesson structures that are in accordance with the curriculum, and learning objectives that are in line with the curriculum.

Quality aspects include the quality of teachers, students' motivation, clarity of material, and students' responsiveness. The responsiveness aspect includes aspects of student involvement and students' comprehension of lesson material. All items in each aspect are assessed using a scale of 0-100. The average score is calculated for each aspect. The high score is in line with the frequency of curriculum implementation in schools. The student outreach aspect is assessed from the level of student attendance during the learning process. Indicators of the frequency of implementing the learning process according to the curriculum are assessed through the suitability of the delivery of the material to the predetermined schedule. For example, the lesson material that should have been presented at meeting 8 was only delivered at meeting 10. This rubric was tested first and refined based on the results of the trial assessment of the implementation of the alternative thinking strategy curriculum. Test recordings were also used to examine inter-rater reliability (Intercorrelation Coefficient = 0.94). During the curriculum implementation, the teachers were observed in implementing the learning process according to the alternative thinking strategy curriculum. Observations were carried out randomly and moderated to minimise deviant implementation. Researchers did several things to make the analysis simple, namely not using collinearity and overfitting models, and determining the differences between applied constructs and exploratory factor analysis. This stage was carried out to investigate the differences between two factors that contributed 70% of the general variation in the data related to procedural suitability ($\alpha = 0.95$), quality aspects and responsiveness aspects ($\alpha = 0.95$) which showed differences with other aspects, namely the frequency and reach of the curriculum. Fifty (50) classes of participants were observed in the second semester of the experiment and showed an average value of fidelity (8.10), quality/responsive aspect (9.08) and coverage aspect (11.12). The results of observations were that almost all students in each class followed the learning process during the intervention, the majority of teachers followed established procedures, teachers were able to carry out teaching well and students were able to provide good responses. The average frequency of providing the learning process reached 40%, some teachers were late in delivering the material or not all of the material had been delivered before the class schedule ended.

3.4 Data analysis

The research results were standardised using z score conversion to see the comparison of effect sizes (Cohen's d) with a value of 2.38 in all analysis models. The researcher determined fixed effects with random intercepts in a two-level hierarchical linear model (school and student level) because the data analysed were hierarchical. Effect sizes were determined using repeated generalised least squares that had values equivalent to maximum likelihood estimates. Analysis of intention to improve used the label objective 1 while subgroup analysis with objective 2. Allocation of the experimental group with control and variables for the proportion of students who meet the criteria were adjusted at the school level. Apart from that, aspects of gender, eligibility for student status, and academic achievements in the pretest phase were also adjusted at the individual student level. Interactions between groups and students were adjusted to investigate the impact of secondary objectives or subgroups. There is no reduction in the number of classes at the school level and at the student level. In

grade 6, there were several withdrawals at school level, there were two schools that were not involved in data analysis due to incomplete data on student grades in the national curriculum and 30 students had problems with their attendance levels.

School comparisons were not conducted in schools that showed significant differences between school level and individual grades ($F(6, 38) = 1.64$, $p = 0.192$). Student attendance was examined using logistic regression analysis. Students having incomplete data in the aspects of gender, language and academic competence are not too numerous and significant so they do not affect the validity of the research. Students who have complete data meet the criteria for students who have low socioeconomic status with a value of ($\beta = 0.64$, $p < 0.001$). Thus, the imputation procedure was carried out with the assumption that there were missing variables. This was done to minimise bias in reducing students. Demographic variables analysed include gender, socioeconomic status, ethnicity, attitudes, student attendance, and English and Science competency variables.

4. Results

Based on the results of model analysis without conditions or explanatory variables, research findings show that the school level in the model contributes to variance of around 20% of students' reading ability and 30% of students' science ability. Based on the intervention intensity model, the research results show that the alternative thinking strategy curriculum has a significant impact on student academic achievement. This finding was found in academic achievement in grades 6 and 9 in the assessment of results, Science and English and reading subjects, and the analysis framework for subgroup intervention intensity can be seen in Table 3 with values showing $p < 0.05$. Reading and science abilities were included in the follow-up phase and constants served as additional variables to be used to account for missing values.

Table 4. Results of analysis of the impact of alternative thinking strategy curriculum on academic outcomes

Intercept (SE)		**Class 6 read/write β0ij = − 0.01 (0.07)**			**Class 6 Science β0ij = − 0.02 (0.07)**			**Class 9 English β0ij = 0.05 (0.05)**			**Class 9 Science β0ij = 0.07 (0.05)**		
Level		**β**	**SE**	**p**	**β**	**SE**	**p**	**β**	**SE**	**p**	**β**	**SE**	**p**
School		0.03	0.02	0.04	0.06	0.03	0.013	0.03	0.01	0.003	0.04	0.01	0.002
	Socioeconomic status	− 0.10	0.03	0.003	− 0.14	0.06	0.007	− 0.06	0.04	0.035	− 0.04	0.04	0.036
	Additional language skills	0.13	0.05	0.004	0.04	0.06	0.042	0.05	0.04	0.003	0.10	0.04	0.005
	If Curriculum	− 0.02	0.08	0.418	− 0.01	0.09	0.484	− 0.04	0.04	0.004	− 0.06	0.06	0.034
Child		0.435	0.03	0.002	0.35	0.02	< 0.001	0.40	0.03	0.003	0.34	0.03	0.00
	If female	0.02	0.05	0.036	0.06	0.04	0.108	− 0.03	0.04	0.046	− 0.13	0.05	0.002
	If the socio-economic	− 0.12	0.02	0.024	− 0.12	0.04	0.015	− 0.13	0.05	0.002	− 0.14	0.07	0.030

	status is low												
	Stage (basic)	1	0.45	0.04	0.002	0.56	0.03	0.002	0.45	0.03	0.003	0.68	0.03	0.002
Interactions	Trial Group*FSM		− 0.02	0.12	0.045	0.03	0.04	0.03	0.04	0.03	0.002	− 0.04	0.07	0.034

Table 5. Descriptive statistics of implementation cluster implementation

Year group	Cluster group	No. classes	Fidelity	Quality/responsiveness	Reach	Dosage
All Class – 6 and 9	Very high frequency (C1)	0	–	–	–	–
	High frequency (C2)	8	9.60 (0.63)	8.78 (1.44)	10.30 (0.82)	57.40 (5.78)
	Medium frequency (C3)	15	8.90 (1.89)	9.50 (1.09)	7.89 (1.32)	50.79 (3.50)
	Low frequency (C4)	30	9.24 (1.89)	9.15 (1.52)	8.42 (0.78)	41.45 (4.45)
	Very low frequency (C5)	12	6.51 (3.42)	8.60 (1.81)	9.35 (1.40)	19.51 (7.30)
Class 6	Very high frequency (C1)	0	–	–	–	–
	High frequency (C2)	7	7.82 (0.53)	9.78 (1.60)	8.24 (0.83)	72.30 (5.78)
	Medium frequency (C3)	8	8.35 (2.13)	9.81 (0.85)	9.36 (1.12)	51.73 (1.82)
	Low frequency (C4)	7	8.78 (2.56)	8.52 (1.81)	8.14 (0.79)	42.13 (5.42)
	Very low frequency (C5)	5	9.45 (1.07)	8.78 (1.32)	8.02 (0.79)	23.81 (5.73)
Class 9	Very high frequency (C1)	0	–	–	–	–
	High frequency (C2)	2	8.46 (0.00)	9.48 (0.02)	9.03 (0.00)	60.07 (0.00)
	Medium frequency (C3)	5	9.81 (1.52)	8.87 (1.50)	9.14 (1.52)	53.30 (4.89)
	Low frequency (C4)	23	9.43 (1.60)	9.40 (1.20)	9.50 (0.81)	41.40 (4.71)
	Very low frequency (C5)	7	6.72 (3.80)	8.40 (2.25)	8.03 (1.52)	17.80 (8.21)

Data analysis in schools included in the experimental group used a personal approach because this technique was used in several previous studies. This is done because of convention and there is no relationship between aspects proposed by the majority of theory application models. Furthermore, school cluster analysis is also used because homogeneous students within groups are heterogeneous between groups, which have higher validity than the person approach. Analysis was carried out on all data from all classes that fully participated (n=30 schools) and then a comparison was made with the total

number of participating schools. Hierarchical cluster analysis was carried out using Ward's method and implementation of squared Euclidean distance. Indicators of curriculum implementation analysed include suitability of stages, quality and responsiveness of students, frequency and reach of the curriculum. The indicator analysis was carried out using factor analysis, which was used as a grouping variable in determining the number of clusters. Cluster division was carried out by considering the plot and agglomeration coefficient. Hierarchical coefficient analysis was carried out in the second stage to determine cluster groups for each class teacher in the next stage of analysis. The final analysis was carried out using multivariate variance (MANOVA) to investigate whether there were significant differences in grouping variables between clusters. The specified implementation profile was used at the class level in a linear hierarchical analysis model at the class and student level with a dummy variable approach. This profile represents the lowest level of implementation that will be used as a reference group, such as gender, student socioeconomic status, and student academic achievement in the pretest phase at the student level. The multiple imputation stage was carried out in grade 6 due to missing data and complete case analysis was carried out in grade 9.

Table 6. Analysis of the relationship between implementation variability and academic results in implementing the alternative thinking strategy curriculum

Intercept (SE)		Class 6 read/write β0ij = 0.11 (0.16)			Class 6 Science β0ij = − 0.06 (0.17)			Class 9 English β0ij = 0.05 (0.12)			Class 9 Science β0ij = 0.11 (0.09)		
Level		β	SE	p	β	SE	p	β	SE	p	β	SE	P
Classroom		0.08	0.05	0.041	0.12	0.03	0.007	0.07	0.03	0.001	0.03	0.02	0.041
	Implementation of each cluster	0.31 (if high)	0.31	0.003	0.04 (if high)	0.02	0.041	0.03 (if high)	0.34	0.039	0.24 (if high)	0.24	0.037
	Comparison with the lowest group	0.18 (if mod)	0.21	0.091	− 0.03 (if mod)	0.33	0.38	0.02 (if mod)	0.20	0.046	− 0.00 (if mod)	0.15	0.029
		− 0.12 (if low)	0.24	0.041	− 0.12 (if low)	0.22	0.032	0.03 (if low)	0.14	0.038	− 0.02 (if low)	0.10	0.037
Child		0.51	0.04	0.002	0.451	0.04	0.002	0.41	0.03	0.002	0.45	0.04	0.002
	If female	0.04	0.07	0.021	0.04	0.07	0.041	− 0.06	0.06	0.152	− 0.12	0.06	0.031
	If your socioeconomic status is low	− 0.06	0.08	0.043	− 0.15	0.08	0.005	− 0.21	0.07	0.004	− 0.12	0.07	0.040
	Capabilities at baseline	0.81	0.04	0.002	0.71	0.04	0.001	0.82	0.04	0.002	0.71	0.04	0.002

The results of implementing the alternative thinking strategy curriculum show that the curriculum is able to be the best solution for each sample cluster. From the results of the dendogram analysis, data from the five clusters used were four clusters from the second to the fifth cluster. The results of the analysis of the

average level of each aspect of curriculum implementation are presented in Table 4 and Table 5 which includes aspects of suitability of implementation, quality and responsiveness of students, and frequency of coverage in each cluster. Based on the results of MANOVA analysis, each cluster shows significant differences between grouping variables with a value of $F(16, 488) = 10.11$, $p < 0.001$). Furthermore, the results of the ANOVA analysis in the follow-up phase found that the difference in average scores in each cluster was caused by differences in the frequency of implementing the curriculum with grades ($F(4, 122) = 336.04$, $p < 0.001$). The analysis results in each cluster are given a label according to the frequency of each application starting from C1 with a very high frequency, C2 with a high frequency, C3 with a medium, C4 with a low frequency, and C5 with a very low frequency. It can be emphasised from these findings that the frequency of application in each group is the main differentiating variable regarding aspects of suitability of application, quality and responsiveness of students, and reach. From the results of the analysis it was found that high frequencies produce fidelity, coverage which is quite good but lacking in aspects of quality or responsiveness. This can be caused by the level of student boredom. Furthermore, medium frequencies are able to produce aspects of fidelity, quality and responsiveness, and medium range too but their position is better compared to low frequencies.

Low frequencies produce low category coverage and produce very low fidelity, quality and responsiveness aspects. So, from the three clusters, the cluster that has the most significant impact on assessing the effectiveness of the alternative thinking strategy curriculum is medium frequency or C3. Based on the results of the unconditional model analysis or without the involvement of explanatory variables, it was found that the class level in the analysis model was able to contribute quite a large variance of around 10% in grade 6 Science subjects and 20% in English subjects, contributing 20%. Furthermore, research findings show that the alternative thinking strategy curriculum provides a significant moderating effect on variability between the frequency of implementation and academic achievement. This finding is in accordance with several previous findings which show that social emotional learning can have an impact on students' academic competence. An increase in academic achievement was seen in the subjects studied, namely Science and English, including reading ability (all $p < 0.05$).

5. Discussion

This research is to investigate the impact of alternative thinking strategy curriculum design on student academic achievement. This curriculum is designed to emphasise social emotional learning and look at its impact on student academic achievement. Research findings show that alternative thinking strategy curriculum design is not only able to improve students' social and emotional competence, but is also able to increase students' academic achievements (Edgar & Morrison, 2020; Hadianto et al., 2021a; Lashley & Halverson, 2020). This can be seen in the average increase in student academic achievement and better student attitudes compared to students in the control group who received the national curriculum intervention. This finding is in accordance with several previous findings which show that social and emotional

learning can improve students' academic competence in several subjects, especially Science and English (Cheung et al., 2022; Datu & Restubog, 2020). The next findings are about the profile of alternative thinking strategy curriculum implementation and investigate its moderating role on aspects of curriculum implementation. Of the several frequency distribution clusters, the one that is most superior in providing an impact on every aspect is the cluster with medium frequency or C2. This is reinforced by previous research findings, namely that alternative thinking strategy curriculum design has a positive impact on the practice of the learning process from various aspects, including implementation aspects, social emotional aspects and students' academic aspects (Barfod & Bentsen, 2018; Bopardikar et al., 2021).

The alternative approach to social and emotional learning contained in the alternative thinking strategies curriculum design has aspects that are similar to literacy programmes for early childhood so it is not too difficult to adapt the curriculum in elementary schools. In contrast to grade 9, it requires adjustments to social and emotional attitudes which are needed by grade 9 students in order to prepare students for advanced school. This aspect causes the implementation of an alternative learning strategy curriculum to be found to have superior results at the elementary school level. This is in accordance with the learning theory that early age students are more easily formed in their attitudes and characters compared to more mature students (Khazanchi et al., 2021; Mavilidi et al., 2019). This can also be seen in the effect of implementing the curriculum on academic achievement in grade 9, showing an increase that is no better than the increase in grade 6. These findings are strengthened by several previous studies which show that intervention programmes for students' social and emotional attitudes in early childhood are more effective in shaping students' character while also being able to increase students' cognitive level (Duncombe et al., 2023; Trinter & Hughes, 2021). Future research requires measures of the implementation or quality of social and emotional learning in experimental and control groups to further investigate the impact of the quality of social emotional learning on academic achievement. Cultural adaptation is also needed in designing alternative thinking strategy curriculum content.

Increasing social and emotional competence is the main effect of social emotional learning intervention with alternative thinking strategy curriculum, while academic competence is an indirect effect of proximal changes (Shieh & Reynolds, 2021; Yuen et al., 2018). This alternative thinking strategy curriculum design logic model provides the view that learning is a social process. So, through this curriculum, learning is emphasised on students' abilities to manage their attitudes and behaviour, understand and control emotions, carry out their obligations, and work well with other students. These attitudes and behaviours will make a major contribution to students' academic achievements. Increasing academic competence is the ultimate goal of alternative thinking strategy curriculum interventions. The intervention trial was able to show an increase in academic achievement even though the implementation of the curriculum was relatively short. If the implementation of the curriculum takes longer, it is likely that it will be able to improve academics even better. Thus, further research into the impact of alternative thinking strategies on later academic achievement is

essential to investigate the impact of the curriculum on students' advanced abilities (Barfod & Bentsen, 2018; Bopardikar et al., 2021). These impact findings complement previous findings which found that the results of alternative thinking strategy curriculum interventions only aimed at the proximal domain or students' social, emotional and psychological health competencies, compared to the impact on academic achievement (Edgar & Morrison, 2020; Hadianto et al., 2021a; Lashley & Halverson, 2020). The difference in the impact of previous research results with the current findings is the duration and focus of the alternative thinking strategy curriculum design.

6. Conclusion, Implications, and Recommendation

This study designed an alternative thinking strategy curriculum and investigated its impact in improving students' social emotional competence, psychological health and academic competence. From the findings, it shows that alternative thinking strategy curriculum design is not only able to improve students' social and emotional competence, but is also able to increase students' academic achievements. This can be seen in the average increase in student academic achievement and better student attitudes compared to students in the control group who received the national curriculum intervention. Of the several frequency distribution clusters, the one that is most superior in providing an impact on each aspect is the cluster with medium frequency or the second cluster (C2). Another cluster shows that the implementation of the alternative thinking strategy curriculum is less than optimal regarding aspects of suitability, quality, responsiveness and reach of the curriculum. This is due to differences in the duration of implementation time. This alternative thinking strategy curriculum design also needs to consider students' cultural aspects related to geographic location. This is important to do as content for intervention in improving students' social and emotional competence. Cultural content in the curriculum will shape positive student attitudes and behaviour, which can ultimately increase student discipline and learning motivation, which will have a positive impact on student academic competence.

The implication of this research is that alternative thinking strategy curriculum design can be used as an alternative intervention for education in Indonesia, especially for early and junior high school students or young students. This needs to be done because young students are very easy to direct or develop their social and emotional competence so that they have positive attitudes and behaviour which can also have an impact on increasing their academic competence. Furthermore, this curriculum the alternative thinking strategies is a new breakthrough for students in Indonesia which not only focuses on academic competence, but also on students' social emotional competence. This curriculum can be adapted by Indonesian stakeholders and used in primary and secondary schools, or can be a reference for stakeholders in formulating alternative thinking strategy curriculum designs that are adapted to suit Indonesian culture.

This research has several limitations, including that the student participants only focused on class 6 at elementary school level and class 9 at junior high school level, only focusing on students who have low socioeconomic status who tend to have less academic achievement. Besides that, the duration of curriculum implementation is not optimal, and there is no assessment of the quality of the

social emotional learning process in the classroom. So, it is still not possible to determine the impact of the quality of the social emotional learning process on student academic achievement. Based on the explanation of these shortcomings, the researcher recommends several suggestions, including the need to carry out research at more grade levels, the duration of the curriculum intervention being longer, involving students from various levels of socioeconomic status, and the need to assess the quality of the social emotional learning process so that stakeholders get indicators of good quality of social and emotional learning processes.

7. References

Ahlqvist, G., Larsson, J. O., Von Rosen, T., Westling Allodi, M., & Rydelius, P. A. (2019). The Sävsjö-school-project: A cluster-randomized trial aimed at improving the literacy of beginners - Achievements, mental health, school satisfaction and reading capacity at the end of grade three using an alternative school curriculum. *Child and Adolescent Psychiatry and Mental Health*, *13*(1), 1–15. https://doi.org/10.1186/s13034-019-0285-0

Anderson, J. (2020). The STEM education phenomenon and its impact on school curriculum. *Curriculum Perspectives*, *40*(2), 217–223. https://doi.org/10.1007/s41297-020-00107-3

Barfod, K., & Bentsen, P. (2018). Don't ask how outdoor education can be integrated into the school curriculum; ask how the school curriculum can be taught outside the classroom. *Curriculum Perspectives*, *38*(2), 151–156. https://doi.org/10.1007/s41297-018-0055-9

Bopardikar, A., Bernstein, D., Drayton, B., & McKenney, S. (2021). Designing educative curriculum materials in interdisciplinary teams: designer processes and contributions. In *Instructional Science* (Vol. 49, Issue 2). Springer Netherlands. https://doi.org/10.1007/s11251-021-09538-5

Brown, J. C., & Livstrom, I. C. (2020). Secondary Science Teachers' Pedagogical Design Capacities for Multicultural Curriculum Design. *Journal of Science Teacher Education*, *31*(8), 821–840. https://doi.org/10.1080/1046560X.2020.1756588

Byrne, C., & Prendergast, M. (2020). Investigating the concerns of secondary school teachers towards curriculum reform. *Journal of Curriculum Studies*, *52*(2), 286–306. https://doi.org/10.1080/00220272.2019.1643924

Cheung, A. C. K., Keung, C., & Tam, W. (2022). Understanding Hong Kong Pre-primary School Teachers' Curriculum Beliefs: A Modified Version of the Curriculum Orientation Inventory. *Early Childhood Education Journal*, *50*(6), 959–968. https://doi.org/10.1007/s10643-021-01211-3

Ching, Y. H., Yang, D., Wang, S., Baek, Y., Swanson, S., & Chittoori, B. (2019). Elementary School Student Development of STEM Attitudes and Perceived Learning in a STEM Integrated Robotics Curriculum. *TechTrends*, *63*(5), 590–601. https://doi.org/10.1007/s11528-019-00388-0

Datu, J. A. D., & Restubog, S. L. D. (2020). The emotional pay-off of staying gritty: linking grit with social-emotional learning and emotional well-being. *British Journal of Guidance and Counselling*, *48*(5), 697–708. https://doi.org/10.1080/03069885.2020.1758922

Duncombe, S. L., Barker, A. R., Price, L., Walker, J. L., Liu, Y., Paris, D., & Stylianou, M. (2023). Making a HIIT: co-design of high-intensity interval training workouts with students & teachers within the curriculum. *BMC Public Health*, *23*(1), 1–16. https://doi.org/10.1186/s12889-023-16613-8

Edgar, S. N., & Morrison, B. (2020). A vision for Social Emotional Learning and arts

education policy. *Arts Education Policy Review*, *0*(0), 1–6. https://doi.org/10.1080/10632913.2020.1774830

Foster, C., Francome, T., Hewitt, D., & Shore, C. (2021). Principles for the design of a fully-resourced, coherent, research-informed school mathematics curriculum. *Journal of Curriculum Studies*, *53*(5), 621–641. https://doi.org/10.1080/00220272.2021.1902569

Hadianto, D., Damaianti, V. S., Mulyati, Y., & Sastromiharjo, A. (2021a). Enhancing scientific argumentation skill through partnership comprehensive literacy. *Journal of Physics: Conference Series*, *2098*(1). https://doi.org/10.1088/1742-6596/2098/1/012015

Hadianto, D., Damaianti, V. S., Mulyati, Y., & Sastromiharjo, A. (2021b). The role of multimodal text to develop literacy and change social behaviour foreign learner. *International Journal of Instruction*, *14*(4), 85–102. https://doi.org/10.29333/iji.2021.1446a

Hadianto, D., S. Damaianti, V., Mulyati, Y., & Sastromiharjo, A. (2022). Effectiveness of Literacy Teaching Design Integrating Local Culture Discourse and Activities to Enhance Reading Skills. *Cogent Education*, *9*(1). https://doi.org/10.1080/2331186X.2021.2016040

Haigh, M. (2020). Curriculum design for diversity: layering assessment and teaching for learners with different worldviews. *Journal of Geography in Higher Education*, *44*(4), 487–511. https://doi.org/10.1080/03098265.2020.1803224

Hellman, D. S., & Milling, S. (2020). Social emotional learning in arts teacher education policy: a content analysis of assurance standards and course descriptions. *Arts Education Policy Review*, *0*(0), 1–11. https://doi.org/10.1080/10632913.2020.1793251

Khazanchi, R., Khazanchi, P., Mehta, V., & Tuli, N. (2021). Incorporating Social–Emotional Learning to Build Positive Behaviors. *Kappa Delta Pi Record*, *57*(1), 11–17. https://doi.org/10.1080/00228958.2021.1851581

Koglbauer, R. (2022). Ofsted's Curriculum research review for languages - what does this mean for language teachers, department leaders, curriculum design and professional development? *Language Learning Journal*, *50*(2), 262–267. https://doi.org/10.1080/09571736.2022.2045681

Kumaravel, B., Jenkins, H., Chepkin, S., Kirisnathas, S., Hearn, J., Stocker, C. J., & Petersen, S. (2020). A prospective study evaluating the integration of a multifaceted evidence-based medicine curriculum into early years in an undergraduate medical school. *BMC Medical Education*, *20*(1), 1–11. https://doi.org/10.1186/s12909-020-02140-2

Lashley, Y., & Halverson, E. R. (2020). Towards a collaborative approach to measuring social-emotional learning in the arts. *Arts Education Policy Review*, *0*(0), 1–11. https://doi.org/10.1080/10632913.2020.1787909

Mavilidi, M. F., Lubans, D. R., Morgan, P. J., Miller, A., Eather, N., Karayanidis, F., Lonsdale, C., Noetel, M., Shaw, K., & Riley, N. (2019). Integrating physical activity into the primary school curriculum: Rationale and study protocol for the "Thinking while Moving in English" cluster randomized controlled trial. *BMC Public Health*, *19*(1), 1–12. https://doi.org/10.1186/s12889-019-6635-2

Menzi Çetin, N., & Akkoyunlu, B. (2020). Integrating scientific communication into middle school lessons: A curriculum design research. *Education and Information Technologies*, *25*(4), 2371–2391. https://doi.org/10.1007/s10639-020-10208-1

O'Brien, A., Hamilton, S., Humphrey, N., Qualter, P., Boehnke, J. R., Santos, J., Demkowicz, O., Panayiotou, M., Thompson, A., Lau, J., Burke, L., & Lu, Y. (2023). Examining the impact of a universal social and emotional learning

intervention (Passport) on internalising symptoms and other outcomes among children, compared to the usual school curriculum: study protocol for a school-based cluster randomised trial. *Trials*, *24*(1), 1–15. https://doi.org/10.1186/s13063-023-07688-0

Omasta, M., Graham, M., Milling, S. L., Murray, E., Jensen, A. P., & Siebert, J. J. (2020). Social emotional learning and the national core arts standards: a cross-disciplinary analysis of policy and practices. *Arts Education Policy Review*, *0*(0), 1–13. https://doi.org/10.1080/10632913.2020.1773366

Potari, D., Psycharis, G., Sakonidis, C., & Zachariades, T. (2019). Collaborative design of a reform-oriented mathematics curriculum: contradictions and boundaries across teaching, research, and policy. *Educational Studies in Mathematics*, *102*(3), 417–434. https://doi.org/10.1007/s10649-018-9834-3

Richerme, L. K. (2020). Every Student Succeeds Act and social emotional learning: opportunities and considerations for P-12 arts educators. *Arts Education Policy Review*, *0*(0), 1–7. https://doi.org/10.1080/10632913.2020.1787284

Roth McDuffie, A., Choppin, J., Drake, C., Davis, J. D., & Brown, J. (2018). Middle school teachers' differing perceptions and use of curriculum materials and the common core. *Journal of Mathematics Teacher Education*, *21*(6), 545–577. https://doi.org/10.1007/s10857-017-9368-0

Shieh, J. J., & Reynolds, B. L. (2021). The origin and impact of an ESL teacher's beliefs on curriculum design. *Asia Pacific Journal of Education*, *41*(3), 574–593. https://doi.org/10.1080/02188791.2020.1832043

Stokes, A., & Harmer, N. (2018). The value of 'having a go': Trialing a project-based learning activity to inform curriculum design. *Journal of Geoscience Education*, *66*(4), 278–292. https://doi.org/10.1080/10899995.2018.1509599

Trinter, C. P., & Hughes, H. E. (2021). Teachers as Curriculum Designers: Inviting Teachers into the Productive Struggle. *RMLE Online*, *44*(3), 1–16. https://doi.org/10.1080/19404476.2021.1878417

Turner, A. J., Sutton, M., Harrison, M., Hennessey, A., & Humphrey, N. (2020). Cost-Effectiveness of a School-Based Social and Emotional Learning Intervention: Evidence from a Cluster-Randomised Controlled Trial of the Promoting Alternative Thinking Strategies Curriculum. *Applied Health Economics and Health Policy*, *18*(2), 271–285. https://doi.org/10.1007/s40258-019-00498-z

Willis, J. (2021). Stepping up Social–Emotional Learning to Reignite All Brains. *Kappa Delta Pi Record*, *57*(1), 18–22. https://doi.org/10.1080/00228958.2021.1851582

Yuen, S., Boulton, H., & Byrom, T. (2018). School-based curriculum development as reflective practice: a case study in Hong Kong. *Curriculum Perspectives*, *38*(1), 15–25. https://doi.org/10.1007/s41297-017-0032-8