Factors influence the digital media teaching of primary school teachers in a flipped class: A Taiwan case study

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The current study focuses on the key roles that affect the success of a flipped classroom. The research was conducted with a questionnaire survey created from a study of literature review. Out of a total of 441 samples, 424 valid samples (96.14%) from teachers have been received. The study key conclusions are as follows: (1) a principal leadership has positive effect on student's learning achievement; (2) a principal leadership has positive effect on teacher's attitude of digital media teaching; (3) a teacher's attitude of using digital media has positive effect on student's learning achievement; (4) a teacher's attitude towards digital media teaching moderates the relationship between principal leadership and student's learning achievement; and (5) parental involvement has a positive effect on student's learning achievement. However, administrative support appeared to weakly influence teacher's attitudes towards digital media teaching. Very often in the culture of Taiwanese primary school, the teachers tend to only obey the principal and neglect the requirements of the administrative staff.

Keywords: digital media; flipped classroom; learning achievement; teaching attitude

Background

The so-called 'flipped classroom' has become one of the normal learning aspects in general classrooms in recent years. It refers to the flipping of traditional teaching methods, along with digital teaching materials, in order to increase an instructors' ability in teaching conceptions, and in motivating learners to learn and promote learning achievement (Huang, 2014). Moreover, the creation of a flipped classrooms approach has placed new demands on teachers to transform their pedagogical practices (Kong & Song, 2013), where students may become more efficient in learning by means of information technology (Win, 2011). Furthermore, flipped classroom approaches can remove the traditional transmissive lecture and replace it with active, in-class tasks and pre-/post-class work (Abeysekera & Dawson, 2015). Despite the negative high start-up cost, Touchton (2015) has argued that flipping the classroom does have merit in its implementation as it can improve both effective and affective instructional outcomes. Apart from that, whether the flipped classroom is effective or not for teaching is still debated by researchers (Fautch, 2015; Galway, Corbett, Tabora & Frank, 2014). Therefore, Galway et al. (2014) concluded with a call for more research into flipped classrooms promising pedagogy, so as to contribute its knowledge base across disciplines. The educational setting of primary school has several essential factors, including principal leadership, administrative support, parental involvement, and student's learning achievement. This article is concerned with how these factors relate to the attitude of teacher on the application of digital media technology. It is widely known that principal leadership is central to school improvement (Brooke-Smith, 2005). When a school changes its teaching methods, its culture will also be transformed. However, since the principal holds a key position, the teaching styles and the formation of campus culture as well as the school administrative operations will all be affected by the principal's decisions. Huang (2008) believes that ideally, principle leadership can enhance the teacher's performance, maintain teaching quality, and thereby, enable students to learn and grow. Principle leadership also has a direct link with school administration in general.

Furthermore, He and Guo (2012) have indicated that the school administration functions to assist in the amelioration of the student's learning difficulties as well as the teacher's management problems in classroom teaching. For Tickle, Chang and Kim (2011), administrative support is highly relevant to the teaching experience, the student's behaviour, as well as the teacher's satisfaction. In the context of the flipped classrooms, administrative support at primary school is related not only to teachers and students, but also parents, since parents play a significant role in the learning culture of a Taiwanese primary school. With the strong support of parents, a teacher may become open and assertive of new technology in terms of digital media teaching in a flipped class.

In addition, El-Hilali and Al-Rashidi (2015) have claimed that parents' positive attitude towards participation in school education has an important influence on the teenagers and the schools in the developed countries. The research of Lavenda (2011) presents that parents' participation is relevant to children's learning success and efficiency in school.

Lee, Cheng and Liu (2011:3) also define student's learning achievement as follows: "students learn from some relevant knowledge and abilities through the formal curriculum of schooling and demonstrate the learning results in the cognition, affection and skills and so on". Bester and Brand (2013) have demonstrated that significant

differences were found between the average achievements of a group of learners, exposed to technology during a lesson, compared to a group not exposed to technology.

With that in mind, we outline the questions of this study as follows:

1. What would be the influence of principal leadership towards the use of digital flipped classroom by the primary school teacher on the student's learning achievement? And also examine the influence of principal leadership on teacher's attitudes.
2. What are the role and influence of the school administrative support and the parents' participation on the use of digital flipped classroom by the primary school teachers?

Theoretical Background and Hypotheses
Principal leadership
The research of Lee et al. (2011) indicates that a principal leadership is a dynamic leadership process, geared towards the improvement of the quality of schooling through various direct or indirect actions relevant to teaching. Hallinger and Murphy (1985) proposed three dimensions of the principal's instructional leadership (management of curriculum and instruction) role, which included leadership practices aimed directly at improving teaching and learning processes (i.e., manages the instructional programme), as well as practices aimed at shaping the direction (i.e., defines the school's mission) and the climate (develops a positive school learning climate) of the school, and ten functions of the instructional management framework as indicated in Table 1.

Operationally, it reflects the principal's actual behaviour according to the following six operational levels: teaching goal of the communication development; management of curriculum and teaching; supervision and teaching evaluation; enhancing teacher's professional development; motivating student learning improvement; and developing supportive learning environment (Wu & Lin, 2000). Thus:

H_1: Principal leadership is positively associated with student's learning achievement.

Table 1 Dimensions of instructional management

Defines the Mission	Manages Instructional Programme	Promotes School Climate
Framing school goals	Supervising and evaluating instruction Monitoring student progress	Protecting instructional time Promoting professional development Maintaining high visibility Providing incentives for teachers Enforcing academic standards Providing incentives for students

Note. Source: Hallinger and Murphy (1985).

Teacher's attitude of digital media teaching
In the flipped classroom model, students learn course content through videos, presentations, and activities outside of class, as well as engage in enrichment and practice during class time. The practical steps for implementation in K-12 classrooms emphasise technological integration and provide a research-based synthesis of the approach (Hodges & Weber, 2015). Unfortunately, some teachers have ignored the importance of establishing digital classrooms, despite the fact that there are many benefits to incorporating digital media, including stronger teacher-student relationships (Nowell, 2014).

Advanced multimedia included audio, video, animation, graphics, text, and special effects (Hallett & Faria, 2006), as in Figure 1. Hobbs (2013) has emphasised the importance of teacher's attitude in using digital media in primary school as a tool for learning. Furthermore, Flumerfelt and Green (2013) have claimed the academic achievement and behaviour referral improvement experienced in a pilot flipped classroom instruction using screencast video technology to have been notable.

Thus:

H_2: Principal leadership is positively associated with the attitude of primary school teacher using digital media in a flipped classroom.

H_3: The attitude of the primary school teacher using digital media in a flipped classroom is positively associated with student's learning achievement.

H_4: The attitude of the primary school teacher using digital media in a flipped classroom moderates the relationship between principal leadership and student's learning achievement.

Administrative support
He and Guo (2012) have indicated that the school administration is a supporting function to provide adequate resources for assisting in improving student's learning difficulties and teacher's management problems in the teaching classroom. Tickle et al. (2011) meanwhile determined that administrative support is highly relevant to teaching experience, student's behaviour, and teacher's satisfaction. Moreover, Kurland and Hasson-Gilad (2015) have suggested that it could effectively improve student's learning achievement by school organisation through administrative support. Thus:

H_5: Administrative support moderates the relationship between principal leadership and student's learning achievement.

H_6: Administrative support is positively associated with the attitude of primary school teacher using digital media in a flipped classroom.

Parental involvement
Wu and Hou (2002) came up with seven possible ways of parental involvement, namely: (1) participation at home; (2) participation via written submissions or telephone contact; (3) involving in school-related meeting and plan drafting; (4) attending school activities; (5) assisting in school administration or teaching activities; (6) financial contributions; and (7) participation in parents' groups. There is no direct evidence by literature that parental involvement motivates teacher using digital media in a flipped classroom. However, it is understood that the parental involvement may support and encourage teachers using new technology in teaching activity, especially, for digital media in a flipped classroom based on Wu and Hou's study according to 4 or 5 above.

Thus:

H_7: Parental involvement is positively associated with the attitude of primary school teacher using digital media in a flipped classroom.

Figure 1 The technology of Augmented Reality (AR) has been used for digital storytelling in primary school class.
Note. Source: Photographed by the authors.

Student's learning achievement
Fite, Cooley, Williford, Frazer and DiPierro (2014) reported that when the level of parental involvement is high, the student's achievement improve significantly. The research of Pintrich and De Groot theorised that parent involvement increases student's intrinsic motivation in academic tasks by supporting student's positive competence beliefs in themselves and enhancing their perceptions of the intrinsic, utility and attainment value of the tasks (Daniel, Wang & Berthelsen, 2016). For example, Kung and Lee (2016) also argued that parents influence children's mathematical achievement, either directly or through their internalised beliefs, i.e., through their children's self-efficacy. The results suggest a need to distinguish between parental beliefs, managerial involvement, and structural involvement in Taiwan. Furthermore, Sahin, Cavlazoglu and Zeytuncu (2015) have pointed out that students from the flipped classroom showed positive attitudes towards learning chemistry, and became more interested in chemistry. Moreover, they noted that student's learning achievements were highly influenced by the strength of relationship they had with their parents. Thus:

H_8: Parental involvement is positively associated with student's learning achievement.

Based on the discussion above, the research model can be summarised as in Figure 2.

Method
Sample
Twenty-six primary schools of Taichung City in central Taiwan were selected using a stratified random sampling method. Of the 424 teachers selected, which represents 3.78% of the total population, 103 were men (24.29%) and 321 were women (75.71%). The average age was 33.21 years, with a range of 26–55 years. The average tenure at the school was 13.56 years. The sample group was highly educated, with 0.5% in possession of diplomas; 48.4% bachelor's; 49.45 Master's; and 1.65% PhDs (Doctoral degree). In terms of job position, 4.2% were department heads and 18.2% were team leaders. The sample and size of the school were as follows: 25.5% of samples were from school, with fewer than 24 classes; 51.7% samples were from school with 25–60 classes; and 22.9% samples were from school with over 61 classes.
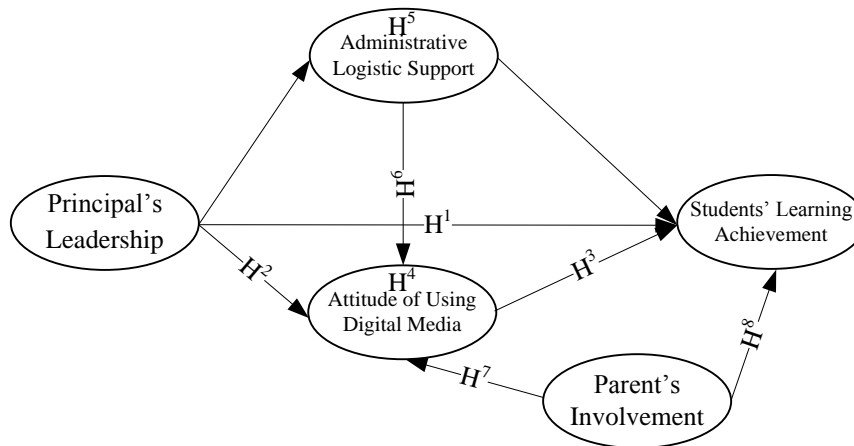
Figure 2 The proposal model
Note. Source: Organised by the authors.

Procedures

The questionnaires were given to the participants during working hours. All participants received the same questionnaire comprising two sections. The first section consisted of general demographic information. The second was more specific, with 63 items including: 13 concerning principal leadership; 14 concerning administrative support; 14 concerning teacher's attitude towards digital media teaching; 10 concerning parental involvement; and 12 concerning student's learning achievement. All items were composed of a 5-point Likert-type scale and rated from 1 ('very strongly disagree') to 5 ('very strongly agree'). The average time for filling out of each questionnaire was 25–30 minutes.

Measures

Principal leadership

Principal leadership was measured with a 13-item principal leadership scale form, the Principal Leadership Questionnaire, developed by Hsieh and Chu (2013). This scale identified the following three dimensions associated with principal leaders: mission initiation; ability to get along with subordinates; and innovative vision. Sample items included "principal understands teacher's needs" and "principal encourages teachers to think creatively and apply creativity on their teaching".

Administrative support

Administrative support was measured with 14 items, as originally developed by Hung (2011). The scale identified the following three dimensions associated with administrative logistical support: emotional support; informational support; and practical support. Sample items included "administrators advocate the importance of flipped classroom teaching" and "my school offers a supportive

environment in order to ensure teachers complete advanced study successfully".

Teacher's attitude of digital media teaching

Teacher's attitude towards digital media teaching was measured with 14 items by the scale form, using the Usability Satisfaction Questionnaire, as developed by Cheng and Huang (2014). This scale identified the following three dimensions associated with teacher's attitude towards digital media teaching, that is: easy to use; valuable to use; and practical to use. Sample items included "digital media teaching is very helpful for flipping teaching", and "I often use digital media in flipped classroom".

Parental involvement

Parental involvement was measured with 12 items by the scale form using the Parents Participate in Schooling Questionnaire, as developed by Chen (2005). This scale identified the following three dimensions associated with parental involvement: active communicator; aggressive supporter; and teamwork player with teacher. Sample items included "parents actively inquire student learning in school", and "parents are willing to work as a teaching assistant in the classroom".

Student's learning achievement

Student's learning achievement was measured with 15-items by the scale form using the Usability Satisfaction Questionnaire as developed by Cheng (2009). This scale identified three dimensions associated with student's learning achievement, namely the cognitive, affective, and psychomotor domains. Sample items included "students become more aggressive after digital media teaching", and

"digital media teaching facilitates student's critical thinking".

Data Analysis

Guided by engagement researches and theories, this study acquires four latent factors (principal leadership, administrative support, teacher's attitude of digital media teaching, and parental involvement) through 12 dimensions. Computer software SPSS 18.0 and AMOS 17.0 (Analysis of Moment Structures) were applied for data analysis and processing. The tests included reliability analysis, descriptive statistics analysis, and structural equation modeling (SEM). Furthermore, a large measure of the rigour and procedures associate with SEM is grounded in advanced statistical theory (Little, 2013). SEM has the potential to analyse relationships between manifest variables (directly measured or observed indicator) and latent variables (the underlying theoretical construct) (Ma, Han, Yang & Cheng, 2015). In addition, SEM is about the estimation of curvilinear and interactive effects of latent variables and the estimation of curvilinear and interactive effects of latent variables (Kline, 2011).

Results & Discussion

Factor Structure of Constructs

To ensure an adequate reliability and good psychometric characteristics, each indicator has to reach relatively high standardised factor loading, e.g. >.70 (Kline, 2011). Composite scale reliability had to be above .70 threshold and an extracted variance had to be above the .50 threshold (Hair, Black, Babin, Anderson & Tatham, 2010). The use of these criteria led to the retention of 14 items for principal leadership; nine items for administrative logistical support; 10 items for teacher's attitude towards digital media teaching; seven items for parental involvement; and 11 items for student's learning achievement.

When factor analysis was applied, it explained 46% of the variance on the principal leadership; where 63.62% variance was explained by administrative support, 53.49% variance was explained by teacher's attitude towards digital media teaching, 52.90% variance was explained by parental involvement, and 59.07% variance was explained by student's learning achievement.

The estimated α coefficient of the support for principal leadership was .957, the administrative support was .944, the teacher's attitude towards digital media teaching was .914, the parental involvement was .894, and the student's learning achievement was .917. High α reliability scales supported the questionnaire's adequacy. In addition, the AVE (average variance extracted) created by Fornell and Larcker (1981) provides a measure of convergent validity, which was suggested to be greater than 0.5 (see Table 2).

Descriptive Statistics

The results in Table 3 illustrated 73.79% of the principal leadership had neutral (41.75%) and positive ('agree' and 'strongly agree') (32.04%) perceptions of principal leadership. Within administrative support, 73.28% of the scale was neutral (32.25%), and agreed (41.03%) that the principal leadership and administrative support could be described as gentle and continually adaptive to affect, which requires more time to pursue consensus. With regard to teacher's attitude towards digital media teaching, most participants agreed (43.99%) and strongly agreed (27.83%) that there is a need to use digital media. Educational policy greatly encouraged the execution of flipped classroom and changing classroom to fit the ideal model of educational reform.

When it came to parental involvement, most teachers claimed neutrality (42.22%), and agreed (31.96%) that parental involvement does not have strong linkage with school. The educational policy of the flipped classroom has not yet been mastered by parents. Therefore, parental involvement does not fit the ideal model of educational reform.

With respect to student's learning achievement, a majority of the teachers expressed agreement (38.21%), and strongly agreed (43.51%) that the notion of flipped classroom often introduced new ideas for school improvement and change. However, the faculty believed that students need more time to enhance their learning achievement based on the statistics.

Table 3 also showed that there was mid-level positive perception of the primary school teachers with regard to their principal leadership (mean = 3.33), administrative logistical support (mean = 3.61), teacher's attitude of digital media teaching (mean = 3.92), parental involvement (mean = 3.21), and student's learning achievement (mean = 3.61).

Table 2 Factor loading and reliability of constructs ($N = 424$)

Construct	Measure[a,b]	Factor loadings (> .7)	Composite reliability (ρc) (> .7)	AVE[c] (> .5)
			.957	.618
	PL1	.685		
	PL2	.714		
	PL3	.723		
	PL4	.742		
	PL6	.744		
	PL7	.837		
Principal leadership	PL8	.825		
	PL9	.737		
	PL10	.784		
	PL11	.845		
	PL12	.853		
	PL13	.855		
	PL14	.853		
	PL15	.777		
			.944	.655
	AS6	.787		
	AS7	.878		
	AS8	.889		
	AS9	.853		
Administrative logistical support	AS11	.740		
	AS12	.771		
	AS13	.816		
	AS14	.807		
	AS15	.725		
			.914	.516
	TA1	.784		
	TA2	.746		
	TA3	.734		
	TA4	.679		
Teacher's attitude towards digital media teaching	TA5	.761		
	TA7	.679		
	TA8	.735		
	TA11	.685		
	TA12	.706		
	TA14	.666		
			.894	.548
	PI4	.642		
	PI6	.691		
	PI8	.682		
Parental involvement	PI9	.814		
	PI10	.811		
	PI11	.712		
	PI12	.809		
			.917	.502
	SL4	.703		
	SL5	.699		
	SL7	.695		
	SL8	.746		
	SL9	.683		
Student's learning achievement	SL10	.730		
	SL11	.743		
	SL12	.731		
	SL13	.688		
	SL14	.698		
	SL15	.669		

Note. [a]PL = principal leadership, AS = administrative logistical support, TA = teacher's attitude towards digital media teaching, PI = parental involvement, SL = student's learning achievement. [b]All items were rearranged, after the value of factor loading was inspected (e.g., > 0.7). [c]AVE = Σ (loading) 2/ [Σ (loading) 2 + Σ (variance)]. Source: Arranged by the authors.

Table 3 Descriptive statistics of the measures

	Percentage (%)					Total	
Scale	sd	d	n	a	sa	Mean	*SD*
Principal leadership	4.11	10.94	41.75	32.04	11.15	3.33	.777
Administrative logistical support	4.30	8.53	32.25	41.03	13.89	3.61	.919
Teacher's attitude of digital media teaching	1.76	4.48	21.93	43.99	27.83	3.92	.744
Parental involvement	5.37	14.33	42.22	31.96	6.13	3.21	.803
Student's learning achievement	0.76	5.84	38.21	43.51	11.67	3.61	.660

Note. sd = strongly disagree (1); d = disagree (2); n = neutral (3); a = agree (4); sa = strongly agree (5). Source: Arranged by the authors.

Correlation of the measure means, standard deviations, correlations, and α coefficients among the variables were presented in Table 4. Principal leadership had a significant and positive correlation with administrative support (γ_{pl-as} = .511, $p < .01$), teacher's attitude of digital media teaching (γ_{pl-ta} = .443, $p < .01$); parental involvement (γ_{pl-pi} = .462, $p < .01$); and student's learning achievement (γ_{pl-sl} = .453, $p < .01$). Administrative support had a significant and positive correlation with teacher's attitude of digital media teaching (γ_{as-ta} = .218, $p < .01$); parental involvement (γ_{as-pi} = .236, $p < .01$); and students' learning achievement (γ_{as-sl} = .248, $p < .01$). Teacher's attitude towards digital media teaching had a significant and positive correlation with parental involvement (γ_{ta-pi} = .270, $p < .01$), and student's learning achievement (γ_{ta-sl} = .339, $p < .01$). Parental involvement had a significant and positive correlation with students' learning achievement (γ_{pi-sl} = .497, $p < .01$). These results indicated that many of the variables significantly correlated with each other, but were all less than .60 (see Table 4).

Table 4 Means, standard deviations and α coefficients

	Correlations				
Variable	PL	AS	TA	PI	SL
Principal leadership	-				
Administrative logistical support	.511**	-			
Teacher's attitude of digital media teaching	.443**	.218**	-		
Parental involvement	.462**	.236**	.270**	-	
Student's learning achievement	.453**	.248**	.339**	.497**	-

Note. N = 424, ** $p < 0.01$. Source: Organised by the authors.

Hypothesis Test

H_1 examined the relationship between principal leadership and student's learning achievement. The results indicated that principal leadership was significantly and positively related to student's learning achievement (λ_{pl-sl} = .213***, $p < .001$), and that the t value for 3.226 was explained. Therefore, the findings supported Hypothesis 1. Figure 3 showed the results of this analysis.

H_2 examined the relationship between principal leadership and teacher's attitude of digital media teaching. The results indicated that principal leadership was significantly and positively related to teacher's attitude of digital media teaching (λ_{pl-ta} = .411***, $p < .001$), and that the t value for 6.171 was explained. Therefore, the findings supported Hypothesis 2.

H_3 examined the effect of teacher's attitude of digital media teaching on student's learning achievement. The results indicated that teacher's attitude towards digital media teaching was significantly and positively related to student's learning achievement (λ_{ta-sl} = .143**, $p < .01$), and that the t value for 2.169 was explained. Thus, H_3 was supported.

H_4 predicted the moderating effect of teacher's attitude of digital media teaching on the relationship between principal leadership and student's learning achievement. The results showed that principal leadership was significantly and positively related to teacher's attitude of digital media teaching (λ_{pl-ta} = .411***, $p < .001$). Moreover, the interaction between teacher's attitude of digital media teaching and student's learning achievement was significant (λ_{ta-sl} = 0.143**, $p < .01$). Also, the total moderating effects were .272. Therefore, H_4 was supported (Figure 3).

H_5 predicted a moderating effect of administrative support on the relationship between principal leadership and student's learning achievement. The results showed that principal leadership was significantly and positively related to administrative support (λ_{pl-as} = .511***, $p < .01$). However, the interaction between administrative support and student's learning achievement was not significant (λ_{as-sl} = .024, ns). Therefore, H_5 was not supported.

H_6 examined the relationship between administrative support, and teacher's attitude towards digital media teaching. The results showed that this was statistically significant (λ_{as-ta} = -0.012, ns) and accounted t value for -0.216. Administrative support appeared to weakly influence teacher's attitude of digital media teaching. Therefore, the findings do not support H_6.

H_7 examined the relationship between parental involvement, and teacher's attitude of digital media teaching. The results showed that this was not statistically significant ($\lambda_{pi\text{-}ta}$ = 0.083, *ns*) and accounted *t* value for 1.445. Parental involvement appeared not to strongly influence teacher's attitude towards digital media teaching. Therefore, the findings do not support H_7.

H_8 examined the relationship between parental involvement and student's learning achievement. The results showed that this was statistically significant ($\lambda_{pi\text{-}sl}$ = .366***, *p* < .001) and accounted *t* value for 6.076. Parental involvement appeared to strongly influence students' learning achievement. Therefore, the findings supported H_8 (Figure 3).
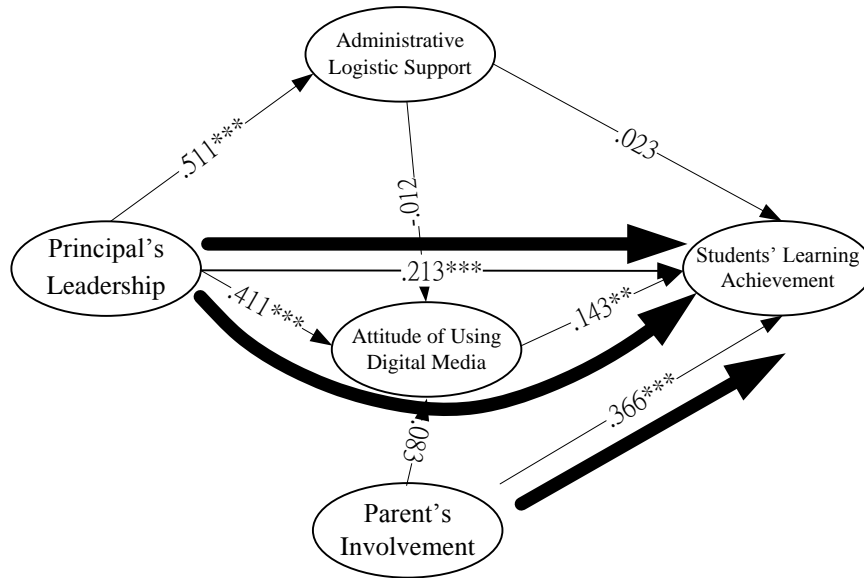

Figure 3 The results of SEM paths
Note. Source: Organised by the authors.

Discussion

First, findings from H_1 indicated that principal leadership had a positive perception with regard to student's learning achievement. These results were consistent with several other studies, which revealed that principal leadership was significantly and positively related to student's learning achievement (Cohen, 2015). Moreover, student's outcomes will promote changes in school organisation and in the leadership practice of the principal (Pina, Cabral & Alves, 2015).

The H_2 result indicated that principal leadership correlated with teacher's attitude towards digital media teaching. The results were consistent with the previous studies. For example where Cohen (2015) found that the relationship between principal leadership and the level of teacher's commitment to be high. It is understood that good principal leadership may encourage teacher to accept new policy of schooling, such as adopting new method or technology for teaching. Thus, the principal should use his own strength of leadership skill to develop teacher's commitment. Previous studies have also indicated that principal leadership motivated followers to transcend their own self-interest for the sake of changing attitude of teaching strategy (Pina et al., 2015). Moreover, in an emerging economy such as South Africa, there is a need for principal

instructional strategy to extend its focus from a unitary teaching method to multiple teaching methods, such as that of applying new digital technology to teaching.

The H_3 indicated that teacher's attitude towards digital media teaching correlated with student's learning achievement. Gan, Menkhoff and Smith (2015) discovered that interactive digital technologies offer an opportunity for both instructors and students to learn collaboratively. Previous studies have indicated the varied impact of digital storytelling on students, including increased understanding of course content, willingness to explore, and ability to think critically, factors that are important in preparing students for an ever-changing 21st century (Yang & Wu, 2012). Furthermore, Mao (2014) has suggested that for social media to be used as effective learning tools and to assure students can afford these tools, complex efforts in designing, scaffolding, and interacting with students during the process are necessary.

The current study results were consistent with the study of Davies, Dean and Ball (2013), where a technology-enhanced flipped classroom was both effective and scalable. This can facilitate learning better than the simulation-based training. Students

were found to be more motivated, where it allowed for greater differentiation of instruction.

Furthermore, the H_4 result indicated that a teacher's attitude towards digital media teaching correlated moderately with principal leadership and student's learning achievement. Although no similar study has been found, Gan et al. (2015) argued that enhancing student's learning process through interactive digital media offers a new opportunity for collaborative learning. It is clear that principal leadership can motivate student's learning by enhancing teacher's attitude towards using digital media.

Finally, the H_8 revealed parental involvement to be positively associated with student's learning achievement. The result was consistent with several other studies, which indicated that most parental models linked to high student achievement are those focusing on general supervision of the children's learning activities. The strongest associations are found when the families have high academic expectations for their children, where they develop and maintain good communication with the children about school activities, and help their children to develop healthy reading habits (Castro, Expósito-Casas, López-Martín, Lizasoain, Navarro-Asencio & Gaviria, 2015). With the mediating role of children's theory of intelligence taken into account, mothers' control was not directly related to children's achievement. However, mothers' autonomy support was directly related to girls' but not to boys' achievement (Zhao & Wang, 2014). Hence, parental involvement does have an impact on a child's achievement in school, even after the most powerful predictor of academic success has been accounted for (Karbach, Gottschling, Spengler, Hegewald & Spinath, 2013).

The SEM model constructs causal relations among different variables. In the current study, we used previous research to explain these significant paths. However, those that are insignificant also matter. For example, the path between parent involvement and teacher's attitude towards using digital media teaching in flipped class is not significant. The possible reason is that the general concept of parent involvement does not accurately measure parents' support in digital media teaching. Furthermore, a teacher tends to obey principal leadership and ignore administrative logistic support in the culture of Taiwan's primary school, which also makes it insignificant.

Conclusion
The Implications of Theory
The educational reform plan in Taiwan is highly subsidised by the Taiwanese government. Therefore, schools tend to work hard to improve their chances of receiving government's subsidy, as well as, at the same time, to offer quality education. These efforts have led to flipped classroom in many primary schools. As a result, many schools have also experience positive student learning achievement. While implementing these improvement efforts, the school principal undoubtedly plays an important role in upgrading the school.

The study result of Karbach et al. (2013) demonstrated the relative importance of the leadership practices (vision, individual consideration, and intellectual stimulation) of school principal and teacher's psychological states. It also showed that certain psychological factors (sense of self-efficacy and internalisation of school goals into personal goals) had a strong effect on teacher's participation in the professional learning activities. In addition, the study pointed out the importance of principals' work toward student learning, as well as the way in which principals can directly or indirectly influence student's learning through influencing teacher's attitude towards digital media teaching and fostering collaboration and communication in the flipped classroom. The study result clearly supports the conclusion that a technology-enhanced flipped classroom can be both effective and scalable. It can facilitate learning better than the simulation-based training. Students found this approach to be more motivating, where it allows for greater differentiation of instruction.

This research also examines the influence of principal leadership and teacher's attitude towards digital media teaching on student's learning achievement. The findings reveal that principal leadership, teacher's attitude towards digital media teaching, and parental involvement, respectively, have a positive influence on student's learning achievements. School principals play a central role in promoting educational reform in many ways. When school principals used leadership to affect the school teacher's attitude of digital media teaching, the effect of principal leadership on student's learning is greater than that of teacher's attitude towards digital media teaching alone, as shown in Figure 3. Such a result is also consistent with the findings of El-Hilali and Al-Rashidi (2015) as well as Lavenda (2011). This study tried to link teacher's attitude towards applying digital media with other factors. The study revealed that a positive attitude of teacher towards digital media teaching might result in teaching action and ability to apply digital media.

Furthermore, when school principals apply the strategy of using leadership, parental involvement and a teacher's attitude towards digital media teaching at the same time, student's learning becomes highly effective in achieving a flipped classroom in primary school. Certainly, principals can seek additional resources from parents, such as increasing parent's contribution in terms of finance or manpower to support various school innovation projects. Given limited resources and time, principals can also promote student's learning and support

by flipping a classroom in parallel, in addition to using their leadership.

Overarching Conclusions

To execute the flipped classroom in primary school is different from doing so in high school or college. The key to execution is a principal leadership and teacher's attitude towards digital media teaching. In order to increase the interaction between teachers and students in the class, the principal is obliged to work together with teachers and parents to provide the support for digital media technology usage. Very often, teachers tend to only obey the principal and neglect the requirements of the administrative staff. Therefore, there is a need to strengthen the communications between teachers and administrative staff. The plan to promote flipped classroom in primary schools can only be successful if all relevant staff and resources can be fully integrated. Consequently, the way in which a principal integrates the resources from the educational authorities and the communities is also the key to programme success. The results are further consistent with the study of Kirby, Berends and Naftel (2001), which hold principal leadership to be the single most important predictor for implementing whole-school reform at both the teacher and school levels.

Limitations and Suggestions

The results of this study may include several limitations that suggest further empirical research opportunities. First, the results revealed that the participants perceived principal leadership, teacher's attitude towards digital media teaching, and parental involvement, as significant predictors for explaining student's learning achievement. However, other contextual factors, such as individual characteristic differences of followers and leaders, the structure and culture of the school, and the values present in the broader context of national cultures, may also influence the execution of flipped classes.

Secondly, this study suggested that more studies are needed regarding the influence of other factors, such as the type of school performance, faculty climate, class cohesion, leader-member turnover, and innovative atmosphere. Hence, effective performance required a cooperative effort on the part of leaders, teachers and parents, and the programme ought to be flexible and adaptive in response to situational change.

Moreover, the sample comprised only the principals of primary school, whose aim it is to promote the development, implementation and integration of the plan of flipping classroom in schools. Survey data based on self-reports by 424 teachers may also be subject to social desirability bias. Social desirability bias may affect exit survey results, due to the fact that samples were not perfectly random. The survey would be more representative if a greater number of samples were used. Therefore, possible future studies could expand the sample size to include participants such as principals, teachers, students, parents, and administrative staff. In addition, the school principals played a key role in educational innovation. If school principals had adequate resources and time, they could easily carry out digital media learning and teaching, as well as provide other logistical support. This could have important impact on boosting school innovation by means of the implementation of flipped classes.

In this research area, there is a need for additional and improved qualitative data gathering. For example, interviews with selected participants from primary schools and/or focus groups, and with participants affiliated with the schools, to talk about the special characteristics of their individual schools. In the policy-making and practical application, there is a need to identify and explore optimal strategies for using digital media teaching method for teachers.

In summary, differential effects on the success of flipped class were found with principal leadership practices, as well as the teacher's technique of using digital media, and the level of parental involvement. Based on our study findings, we would like to stress the need to conduct further research, using models that contain factors at both the school and teacher levels, to better understand changing mechanisms in schools.

Note

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