# Philippine Enhanced Basic Education (K to12) Dropout Simulation Model

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## *Abstract*

*This study aims to produce a simulation model to predict the number of dropouts when a child completes the K-12 curriculum. This simulation model is to ascertain the impact of the implementation of K-12 on the dropout rate and its prevalent and predictive determinants. Reducing the number of school leavers is, therefore, as important as uplifting the standards and quality of learning for any basic education system. The stimulated randomized datasets were the academic enrollment of a certain grade level. Experimental criterion measures the dropout rate of students per year. The determinants identified which will contribute to the probability of students to drop were: (1) Apas (Parents' Ability to Support); (2) Blc (Learning Capacity), and (3) Cgs (Government Subsidy). With thorough computation of random datasets, the first simulation run for 100 enrollees were utilized for simulation. In the analysis of dropout probability in a six-year simulation for the completion of students, the findings revealed that the frequency of students' promotion per year decreases. Upon completion of the curriculum, promotion rate of the population is only 11%. Dropout probability increases per academic year and percentage of dropouts in K-12 implementation will reach to 89%.*


*Keywords: Philippines Enhanced Basic Education, K to12 implementation, dropout, dropout rate, simulation model*

## 1.0 Introduction

A 12-year program is found to be a standard for recognition of students and/or professionals abroad *(i.e., the Bologna Process for the European Union and the Washington Accord for the United States)*. Other countries like Singapore have 11 years of compulsory education, but have 12 to 14 years of pre-university education, depending on the track. The Philippines is the last country in Asia and one of only three countries worldwide *(the other two being Angola and Djibouti)* with a 10-year pre-university cycle (Allensworth, 2005). Hence, pursuant to Republic Act No. 10533, the Philippine Enhanced Basic Education was implemented. It aims to produce global graduates by strengthening the curriculum and increasing the number of years in schooling to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare graduates for employment and entrepreneurship.

In the Philippine educational system, a number of dropouts in secondary level have been recorded for decades (Lehr, et al., 2003). Since 2004 up to 2010, an average increase of 9.65% dropout rate was noticed (Badcock, 2010). Moreover, for every 650 who finished primary education, only 66% graduated secondary level and from those who graduated, only 35% enter college and from

those number, only 18% got a degree (DepEd, 2011). Consistently, according to Orbeta (2010), for the 980 thousand population of secondary students, 893 thousand (91%) dropped out of basic education either temporarily or permanently, about 14 thousand (1.4%) are expected to enter schooling, and the remaining 72 thousand (7.4%) are likely to never enter schooling.

This record occured in Philadelphia, USA where 70% of students were classified as "near dropouts," or students who attended class less than 50% of the time, who were in the ninth or 10th grade. These students had 45% chance of dropping out upon reaching ninth grade, 34% chance upon reaching tenth grade, 23% chance upon reaching eleventh grade, and 16% chance upon reaching twelfth grade (Neild & Balfanz, 2006). The results of the study showed that every time a student progresses in each year level, dropout rate also increases. Hence, every school year, only few were able to finish the said program.

In 2012, National Statistics Authority stated that 5 of 9 basic sectors (fishermen, farmers, self-employed, unemployed) have higher poverty incidence at upper 70%. This income gap has increased over recent years: median earnings of families of high school dropouts were nearly 30% lower in 2004 (Achieve, 2006). Families who earned less had higher probability of dropping their children from school since parents could not sustain and support the financial needs of all their children in school for the entire school year.

It is not only the individuals who were financially pressed suffer from dropping out but also those with low learning capacity. Based on the 2007 East Asian Summit, Filipino students had an intellectual capacity of 86. The poor quality of education and its outcome were reflected in the low achievement levels of students (Raya, 2007). Moreover, students who quit schooling had a history of poor academic achievement from third grade (Jacobs, et al., 1997). On average, those who dropped had less effective reading and study skills, earned lower grades, obtained lower achievement test scores, and are more likely to have repeated a year level than their classmates who graduated (Battin-Pearson et al., 2000).

Additionally, the Department of Budget and Management (DBM) reported that the Department of Education (DepEd) has been given biggest budget among all national government agencies this year, with a 2014 allocation amounting to P309.43 billion. Comprising this is a P44.6-billion appropriation for the construction, repair and rehabilitation of at least 43,000 kindergarten, elementary and secondary school buildings nationwide (DBM, 2014). Among other education targets for the year include the procurement of additional textbooks and workbooks to attain the ideal 1:1 student per textbook ratio. This budget allocation would like to guarantee all parents and learners that education is available and accessible even to the most remote areas in the country. In support of the K-12 Program, an appropriation of P1.7 billion has likewise been set aside for the procurement of over 42 million learning modules and teaching guides (Official Gazette, 2014).This is to make learning more interactive, efficient and aided appropriately with necessary materials that enhance learning and skills development.

Through the existing facts presented and various researches and literature, only numerical values of dropouts were presented per year. Most of the factors of dropouts highlighted were on poverty, population, and availability of school resources. With the unresolved issues about dropout students per academic year, no research yet could explain the occurrence of such phenomenon. Moreover, no model has been presented for future projections of dropouts.

In this endeavor, the researchers would like to produce a model to predict the number of dropouts when a child completes the K-12 curriculum. This simulation model is to ascertain the impact of the implementation of K-12 on the dropout rate to its prevalent and predictive determinants. Reducing the number of school leavers is, therefore, as important as uplifting the standards and quality of learning for any basic education system.

## 2.0 Conceptual Framework

This study is anchored on Labeling Theory that students fail and stop schooling based on background, parents' financial capacity to support children to be in school, government support, peers and pregnancy (Desforges, 2003). Dropping out begins before high school, and students exhibit identifiable warning signs at least one to three years before they drop out (e.g., Allensworth, 2005; Neild & Balfanz, 2006; Roderick, 1994; Rumberger, 2004). Parental support strongly influenced their child's level of attainment in school (Crozier, G. 1997). The higher the parents' ability to support the educational endeavors of their children, the higher the level of attainment the latter achieved. But, according to Bawa (2000) the difference of parents' involvement and support was associated according to their level of social class, poverty, health and also with parental perception of their role and their level of confidence in fulfilling it.

Furthermore, the levels of attainment of each student in school differ according to their capacity of grasping lessons and individual development. The analysis of Sobel (2002) hypothesized that cognitive ability of man affects repeatedly to learning. The same author says that the average cognitive mean ability of a person is 46.2. This implies that learning capacity varies greatly across population. The disparity of dropout rate varies with the government's allocation of fund per year. A clear evidence of the value placed on education is the proportion of the national government budget going to the Department of Education (DepEd). The said department is given the highest budget allocation among government agencies each year as required by the 1987 Philippine Constitution. However, it is perplexing to think that for a huge reform such as K to 12, the funding behind the program is quite sketchy. This means that with the abrupt implementation of the new curriculum, numerous details are not complete or clear yet especially in terms of the predictions of dropouts. These concepts are conceptually represented below:

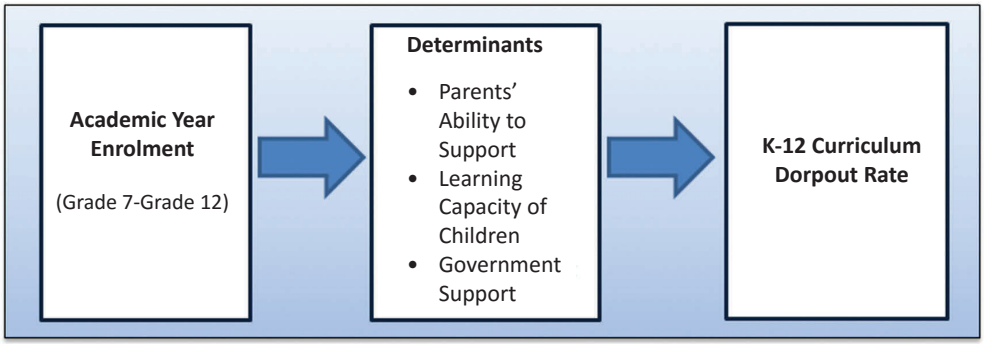


**Figure 1: Conceptual Framework Diagram**

### 3.0 Research Design and Method

This study utilized an experimental design using simulation modeling. The simulated randomized datasets were the academic enrollment of a certain grade level. While, the experimental criterion measures the dropout rate of students per year. The determinants identified which will contribute to the probability of students to drop where: (1) $A_{pas}$ (Parents' Ability to Support, 2 $B_{lc}$ (Learning Capacity), and (3) $C_{gs}$(Government Subsidy).

With the assumed maximum population N= 100, the simulation of random datasets begun at the probability of $A_{pas}$ with assumed probability of success equals to 0.20. Each respondent has an assumed normal Learning Capacity ($B_{lc}$) with a mean value of 0.50 and a standard deviation (σ) of 0.10. The percent share of DepEd of the annual Gross Domestic Product (GDP) is assumed to be ranging from 40% to 60%. The Dropout probability ($D_r$) is shown as the product of:

$$D_r = \% A_{pas} \, x \, \% B_{lc} \, x \, \% C_{gs}$$

The dropout ($D_r$) indicator is identified at 12.5% as the minimum multiplicative threshold rate of the variables. If the Dropout probability is less than 0.125, then the student has dropped; if otherwise, the student has been promoted.

**Assumptions:**

The simulation model is anchored on the following assumptions:

1. The ability of parents to support their children is derived from the poverty index.
2. Learning capacity of students is assumed to be normally distributed with a mean value of 0.50.
3. Percentage share of education in the annual Gross Domestic Product (GDP) is 40% to 60%.
4. The dropout probability of the respondents can be between 12.5% and below; the percentage of promotion is between 12.5% and above.
5. The simulation cycle is assumed to generate within six years of junior and senior high school.

### 4.0 Results and Discussion

With thorough computation of random datasets, Table 1 shows the simulation run for n = 100 enrollees during the first year of the curriculum implementation. Probabilities of the parents' ability to support, learning capacity and government subsidy were determined.

**Table 1. First Year Simulation**

| Year 1 | A (pas) | prob1 | B (lc) | C (gs) | Dropout Prob | Dr Indi |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 0.313828 | 0.4 | 0.125531 | 1 |
| 2 | 1 | 0.4 | 0.577976 | 0.8 | 0.184952 | 1 |
| 3 | 1 | 0.6 | 0.550451 | 0.6 | 0.198162 | 1 |
| 4 | 1 | 0.8 | 0.652454 | 0.4 | 0.208785 | 1 |
| 5 | 1 | 0.8 | 0.601629 | 0.4 | 0.192521 | 1 |
| 6 | 1 | 0.8 | 0.495696 | 0.6 | 0.237934 | 1 |
| 7 | 1 | 0.8 | 0.292425 | 0.4 | 0.093576 | 0 |
| 8 | 0 | 0.8 | 0.571209 | 0.4 | 0.182787 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 1 | 1 | 0.467207 | 0.6 | 0.280324 | 1 |
| 10 | 1 | 0.8 | 0.502468 | 0.6 | 0.241185 | 1 |
| 11 | 1 | 0.8 | 0.503072 | 0.4 | 0.160983 | 1 |
| 12 | 1 | 1 | 0.439201 | 0.8 | 0.351361 | 1 |
| 13 | 1 | 0.8 | 0.458422 | 0.6 | 0.220043 | 1 |
| 14 | 1 | 0.8 | 0.559405 | 0.6 | 0.268514 | 1 |
| 15 | 1 | 0.8 | 0.551693 | 0.4 | 0.176542 | 1 |
| 16 | 1 | 0.8 | 0.493725 | 0.6 | 0.236988 | 1 |
| 17 | 1 | 0.4 | 0.477572 | 0.2 | 0.038206 | 0 |
| 18 | 1 | 1 | 0.441237 | 0.8 | 0.35299 | 1 |
| 19 | 1 | 0.8 | 0.59264 | 0.6 | 0.284467 | 1 |
| 20 | 1 | 0.4 | 0.562305 | 0.6 | 0.134953 | 1 |
| 21 | 1 | 0.8 | 0.501097 | 0.6 | 0.240526 | 1 |
| 22 | 1 | 0.8 | 0.444698 | 0.4 | 0.142303 | 1 |
| 23 | 1 | 0.6 | 0.419775 | 0.6 | 0.151119 | 1 |
| 24 | 1 | 0.8 | 0.553031 | 0.8 | 0.35394 | 1 |
| 25 | 0 | 0.8 | 0.513705 | 0.4 | 0.164385 | 1 |
| 26 | 1 | 0.8 | 0.508351 | 0.6 | 0.244008 | 1 |
| 27 | 1 | 0.8 | 0.431402 | 0.8 | 0.276097 | 1 |
| 28 | 1 | 0.8 | 0.493 | 0.6 | 0.23664 | 1 |
| 29 | 0 | 0.8 | 0.343647 | 0.4 | 0.109967 | 0 |
| 30 | 1 | 0.4 | 0.346535 | 0.4 | 0.055446 | 0 |
| 31 | 1 | 0.8 | 0.373405 | 0.4 | 0.11949 | 0 |
| 32 | 1 | 0.8 | 0.525173 | 0.4 | 0.168055 | 1 |
| 33 | 0 | 0.8 | 0.308278 | 0.6 | 0.147974 | 1 |
| 34 | 1 | 0.8 | 0.362416 | 0.2 | 0.057987 | 0 |
| 35 | 1 | 1 | 0.343939 | 0.2 | 0.068788 | 0 |
| 36 | 1 | 1 | 0.399573 | 0.6 | 0.239744 | 1 |
| 37 | 1 | 0.8 | 0.536133 | 0.4 | 0.171562 | 1 |
| 38 | 1 | 0.8 | 0.67463 | 0.2 | 0.107941 | 0 |
| 39 | 0 | 0.8 | 0.217269 | 0.4 | 0.069526 | 0 |
| 40 | 1 | 0.8 | 0.667873 | 0.4 | 0.213719 | 1 |
| 41 | 1 | 0.8 | 0.523809 | 0.4 | 0.167619 | 1 |
| 42 | 1 | 0.8 | 0.572581 | 0.2 | 0.091613 | 0 |
| 43 | 1 | 0.8 | 0.399734 | 0.4 | 0.127915 | 1 |
| 44 | 1 | 0.6 | 0.501711 | 0.4 | 0.120411 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 45 | 0 | 0.8 | 0.58546 | 0.6 | 0.281021 | 1 |
| 46 | 0 | 0.6 | 0.315437 | 0.6 | 0.113557 | 0 |
| 47 | 1 | 0.8 | 0.35679 | 0.6 | 0.171259 | 1 |
| 48 | 1 | 1 | 0.509045 | 0.4 | 0.203618 | 1 |
| 49 | 1 | 0.8 | 0.600229 | 0.6 | 0.28811 | 1 |
| 50 | 1 | 0.8 | 0.572845 | 0.8 | 0.366621 | 1 |
| 51 | 1 | 0.8 | 0.456913 | 0.6 | 0.219318 | 1 |
| 52 | 1 | 0.8 | 0.569154 | 0.4 | 0.182129 | 1 |
| 53 | 1 | 0.4 | 0.612377 | 0.4 | 0.09798 | 0 |
| 54 | 1 | 1 | 0.50769 | 0.4 | 0.203076 | 1 |
| 55 | 1 | 0.8 | 0.433193 | 0.4 | 0.138622 | 1 |
| 56 | 1 | 0.8 | 0.427107 | 0.2 | 0.068337 | 0 |
| 57 | 1 | 0.8 | 0.525351 | 0.6 | 0.252168 | 1 |
| 58 | 1 | 0.8 | 0.529914 | 0.6 | 0.254359 | 1 |
| 59 | 0 | 0.8 | 0.500272 | 0.6 | 0.240131 | 1 |
| 60 | 1 | 0.8 | 0.31147 | 0.6 | 0.149505 | 1 |
| 61 | 1 | 0.8 | 0.436843 | 0.4 | 0.13979 | 1 |
| 62 | 0 | 1 | 0.57161 | 0.2 | 0.114322 | 0 |
| 63 | 1 | 0.8 | 0.416962 | 0.6 | 0.200142 | 1 |
| 64 | 1 | 0.8 | 0.650164 | 0.6 | 0.312079 | 1 |
| 65 | 1 | 0.8 | 0.567772 | 0.4 | 0.181687 | 1 |
| 66 | 1 | 0.8 | 0.383252 | 0.4 | 0.122641 | 0 |
| 67 | 1 | 0.8 | 0.373267 | 0.4 | 0.119446 | 0 |
| 68 | 1 | 0.8 | 0.388327 | 0.2 | 0.062132 | 0 |
| 69 | 1 | 0.8 | 0.39148 | 0.6 | 0.187911 | 1 |
| 70 | 1 | 1 | 0.456863 | 0.2 | 0.091373 | 0 |
| 71 | 1 | 0.8 | 0.594544 | 0.4 | 0.190254 | 1 |
| 72 | 1 | 0.2 | 0.461815 | 0.4 | 0.036945 | 0 |
| 73 | 1 | 0.4 | 0.611566 | 0.6 | 0.146776 | 1 |
| 74 | 1 | 0.8 | 0.686103 | 0.4 | 0.219553 | 1 |
| 75 | 0 | 0.8 | 0.583817 | 0.4 | 0.186821 | 1 |
| 76 | 0 | 0.8 | 0.458809 | 0.6 | 0.220228 | 1 |
| 77 | 0 | 1 | 0.690976 | 0.6 | 0.414586 | 1 |
| 78 | 1 | 0.8 | 0.761498 | 0.6 | 0.365519 | 1 |
| 79 | 1 | 0.8 | 0.406225 | 0.6 | 0.194988 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 80 | 1 | 0.8 | 0.621611 | 0.4 | 0.198915 | 1 |
| 81 | 1 | 0.8 | 0.38723 | 0.4 | 0.123914 | 0 |
| 82 | 1 | 0.6 | 0.203563 | 0.4 | 0.048855 | 0 |
| 83 | 1 | 1 | 0.549069 | 0.2 | 0.109814 | 0 |
| 84 | 1 | 0.8 | 0.491282 | 0.2 | 0.078605 | 0 |
| 85 | 1 | 0.8 | 0.444528 | 0.6 | 0.213374 | 1 |
| 86 | 1 | 1 | 0.513164 | 0.4 | 0.205266 | 1 |
| 87 | 1 | 0.8 | 0.436829 | 0.4 | 0.139785 | 1 |
| 88 | 0 | 0.8 | 0.526395 | 0.6 | 0.252669 | 1 |
| 89 | 1 | 0.8 | 0.304824 | 0.4 | 0.097544 | 0 |
| 90 | 1 | 0.4 | 0.587592 | 0.4 | 0.094015 | 0 |
| 91 | 1 | 1 | 0.591359 | 0.6 | 0.354815 | 1 |
| 92 | 1 | 0.8 | 0.511709 | 0.4 | 0.163747 | 1 |
| 93 | 1 | 0.4 | 0.476036 | 0.6 | 0.114249 | 0 |
| 94 | 1 | 0.8 | 0.435772 | 0.8 | 0.278894 | 1 |
| 95 | 1 | 1 | 0.52591 | 0.4 | 0.210364 | 1 |
| 96 | 1 | 0.4 | 0.499195 | 0.4 | 0.079871 | 0 |
| 97 | 1 | 0.8 | 0.595777 | 0.6 | 0.285973 | 1 |
| 98 | 1 | 0.8 | 0.556353 | 0.2 | 0.089017 | 0 |
| 99 | 1 | 0.8 | 0.584234 | 0.4 | 0.186955 | 1 |
| 100 | 1 | 0.2 | 0.472973 | 0.2 | 0.018919 | 0 |

Note: **Dropout Indicator: 0 = 30, 1=70; where N=100**

Table 1 above shows that in the first year of implementation, about 30 students are probable to drop with 0 as the indicator. This result is about 30% of the enrollees. The first simulation result was utilized to predict the dropouts of the succeeding years. To determine the complete simulation, datasets must be run six times and in each try, frequency of dropouts and dropout probability were identified.

Table 2 manifests the complete cycle of simulation for junior and senior high school students over the period of six years in order to complete the academic level of senior high school program. Frequency of promotion and frequency of dropouts from the complete simulation were determined to identify the dropout probability. The dropout probability showed an increasing percentage per year.

**Table 2. Summary of Complete Simulation**

| Year | Frequency (f) of Promotion | Frequency of Dropout | Dropout Probability |
|---|---|---|---|
| 1 | 70 | 30 | 0.30 |
| 2 | 48 | 22 | 0.52 |
| 3 | 36 | 12 | 0.64 |
| 4 | 24 | 12 | 0.76 |
| 5 | 17 | 7 | 0.83 |
| **6** | **11** | **6** | **0.89** |

In the analysis of Dropout probability in a six-year simulation for the completion of students with the senior high program, the findings are the following:

1. The frequency of students' promotion per year decreases.
2. Upon completion of the curriculum, promotion rate of the population is only 11%.
3. Dropout probability increases per academic year.
4. Percentage of dropouts in K-12 curriculum is 89%.

**Discussion**

1. Majority of the families who are within the poverty threshold could not afford another additional 2-year educational expense in basic education. Thus, leading to a decreasing frequency of students' promotion per year. In effect, only 11% of the population will complete the junior and senior high school.

   Based on the Philippine Human Development Report of 2009, most students who drop out were from the poorest families with more or less family members. They cannot afford the cost associated even with free basic education and more with senior high school program that requires more facilities in learning the skills. Higher education implies higher cost of learning. Secondary school age children are expected to contribute to family income due to their difficulties of living. Those who engaged in child labor are 7.07 times more likely to be out of school (Research APIS, 2007). Like the parents of poor families, the dropout children are also destined for low-skill jobs and unemployment, repeating the cycle of a life of poverty.
2. With the 11% promotion rate, one of the identified factors causing it is the accessibility of school within the locality (Marinas, 2014). In 2016, a number of private and public schools in secondary level could not offer the senior high school to accommodate their graduates in their locality (Maligalig, et al, 2008). Therefore, interested graduates have to look for schools offering courses that interest them the most. Due to long travel distance or low quality of schools available near their residence, a learner may decline to be in school which caused them to become early leaver of school (Rodriquez, 2007). This situation explains why only 11% of the promotion rate was achieved when the student had completed the curriculum.
3. Every year in both the junior and senior high school programs, dropout probability increases *(see Table 2)*. This finding leads to low students' interest to pursue and specialize on the demand of their community due to localization and contextualization as stipulated in the curriculum. It increases the number of uninterested graduates who will pursue higher education specializing on what are offered in their place. Decision making of the course to be taken became restrictive. Moreover, more students were contained in an over-crowded classroom with a ratio of 1 is to 70 (Zakaria, 2010) due to only few offered senior high school programs. Worse, some interests of students were not accommodated. Hence, they are forced to

take the second option, the third and the least priority in acquiring the necessary skills. This reality eventually dampered their zeal in learning that continued until the sixth year of schooling. This scenario contributed to the annual increase of dropout. Thus, out of 100 students, 89% will be dropped due to the identified determinants.

4. With the above findings, prediction through the simulation model states that percentage of dropouts in the new curriculum is 89%. The numerical value of this finding is quite alarming to the implementation of enhanced basic education. Moreover, myriad of factors causing such behavior of enrollment must be thoroughly assessed. With this, teachers' availability and competence require intensive assessment at the same time to meet global demands (Albert, 2012).

   Since 2010, teacher shortage has reached 145, 827. As of January, 2013, there were 34, 953 hired. The implementation of K to 12 requires all teachers to be expert of the field they are teaching. Thus, this demand will increase the number of teachers who are highly competent to teach.

**5.0 Conclusion**

As the Philippines embraces the new K-to-12 curriculum in the educational system, learners learn best through the varied competencies stipulated in each learning area. Learners acquire skills through a spiral learning model. But with this transition and paradigm shift, dropout rates among the students were determined. The Philippine Basic Education (K to 12) leads to a very high dropout probability in junior and senior high school program which is very alarming to all educators. This increasing dropout counts are due to parents' ability to support their children, learning capacity of learners through formal and higher education and government subsidy to the increasing population of students. This indicates that the newly implemented curriculum is still dynamic and a number of loopholes must be revisited to enhance the program and to diminish the number of dropouts. Additionally, the pros and cons of this implementation must be addressed to resolve some issues including the dropout rates, students' personal interest and families' capacity to support financially, and teachers' competence to teach in senior high school.

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